

## Appendix E. Regression Equations Used to Estimate Daily Mean Water Temperature in Outflow from Five Reservoirs in the Yakima River Basin

The following section shows regression equations that were used to estimate daily mean water temperature in outflow from five reservoirs in the Yakima River basin. The equations were originally intended for generating input to the Roza–Prosser Reach water-temperature model but were not included in the final version of the model. The equations are included here for documentation purposes.

Regression equations were examined by using S-PLUS (Insightful Corp., 2002) and TableCurve 3D (Systat Software, Inc., 2002) for the purpose of estimating stream water temperatures downstream of five reservoirs. The process of variable selection for the regressions was identical to the process used in Roza Dam and Naches River regression development.

### Bumping: (Linear Robust LTS, S-PLUS)

$$\text{BUM} = -1.809 + \text{AT} * 0.1449 + \text{AT45dav} * 0.7177$$

Robust multiple  $R^2 = 0.89$ , Scale estimate of residual = 1.5 (°C), N = 1620

### Cle Elum: (Linear Robust LTS, S-PLUS)

$$\text{CLE} = 16.28 + \text{AT} * 0.0518 - \text{J}' * 0.09 - \text{Q} * 0.004$$

Robust multiple  $R^2 = 0.89$ , Scale estimate of residual = 2.56, N = 1279

### Kachess: (Linear OLS, S-PLUS)

$$\text{KAC} = -2.1 + \text{AT} * 0.1729 + \text{AT45dav} * 0.7995$$

Multiple  $R^2 = 0.95$ , Residual Standard Error = 1.0 (°C), N = 460

### Keechelus: (Linear OLS, S-PLUS)

$$\text{KEE} = 3.5 + \text{AT} * 0.2028 + \text{AT45dav} * 0.4633$$

Multiple  $R^2 = 0.91$ , Residual Standard Error = 1.4 (°C), N = 742

### Rimrock: (Linear Robust LTS, S-PLUS)

$$\text{RIM} = 15.85 - \text{AT45dav} * 0.1071 - \text{J}' * 0.073 + \text{Q} * 0.004$$

Robust multiple  $R^2 = 0.98$ , Scale estimate of residual = 0.90, N = 360

### Explanation of variables:

AT = Air temperature at Yakima Air Terminal as provided from NOAA (°C).

AT45dav = 45 day moving average of air temperature at Yakima Air Terminal (°C).

Q = Flow downstream of dam (cubic meters per second).

J' = Number of days from warmest average water day (for CleElum J' = ABS(Julian day – 233), for Rimrock, J' = ABS(Julian day – 258).

(°C) = degree Celsius.

N = Number of data sets used in regression development.