Appendix K:
Model of TSS as a function of Turbidity

In order to determine compliance with the TMDL, TSS is needed. A model which relates TSS to turbidity, an inexpensively measured field parameter, is as follows.

ODEQ data from all Pudding River Watershed sites was compared to develop a relationship for the watershed between total suspended solids and turbidity. TSS correlates well with turbidity. The relationship, ln(TSS) = 0.8048 ln(Turbidity) + .2365 (r^2 = 0.62, p = <0.0001) is shown in Figure K-1.

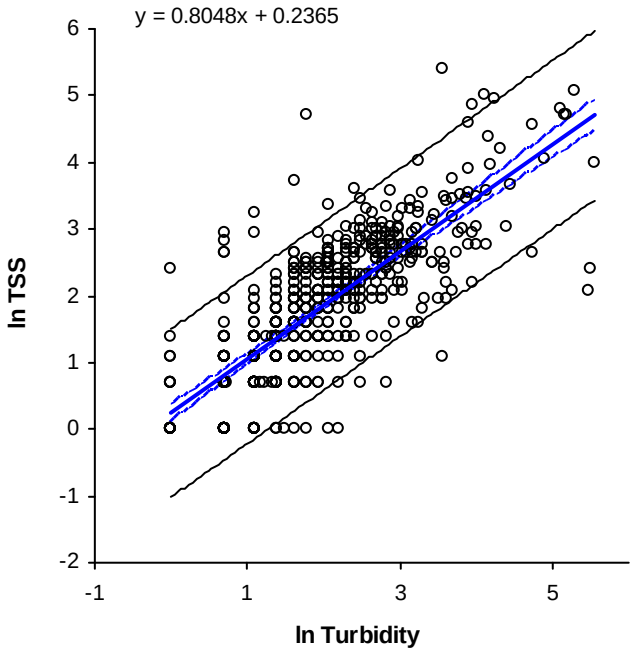

Figure K-1. TSS vs. Turbidity

This equates to TSS = 1.26677 $Turb^{0.80478}$. However, since the both TSS and turbidity required log transformations to derive normal distributions, a bias term must be added (Helsel and Hirsch, 2002; Koch 2005).

b_o = y intercept = 0.2365
b_1 = slope = 0.8048

Model

$$\ln TSS = b_o + b_1 \ln Turb + \varepsilon$$

$$e^{\ln TSS} = e^{(b_o + b_1 \ln Turb + \varepsilon)}$$

$$TSS = e^{b_o} e^{b_1 \ln Turb} e^{\varepsilon}$$

$$TSS = e^{b_o} (e^{\ln Turb})^{b_1} e^{\varepsilon}$$

$$TSS = e^{b_o} Turb^{b_1} e^{\varepsilon}$$

$$b_o = 0.23647$$

$$b_1 = 0.80478$$

$$TSS = e^{0.23647} Turb^{0.804784} e^{\varepsilon}$$

$$TSS = 1.26677\, Turb^{0.804784.} e^{\varepsilon}$$

Empirical estimate of bias from residuals (differences between model calculated TSS values and observed TSS values).

Bias = $\frac{1}{n}\sum_{i=1}^{n} e^{\varepsilon_i}$ = 1.2361

$\therefore$ Final Model

$$TSS = 1.26677\, Turb^{0.804784.} e^{\varepsilon}$$

$$TSS = 1.2361\left(1.26677\, Turb^{0.804784.}\right)$$

$$TSS = 1.5658 Turb^{0.80478}$$