

Conversion Relationship between Nephelometric Turbidity Units (NTU) into mg/l for Alberta Transportations' Turbidity specification

Conversion of Nephelometric Turbidity Units (NTU) into mg/l for Alberta Transportations turbidity specification is required since NTU is used as a surrogate for Total Suspended Solids (TSS) because it can be measured immediately in the field. NTU can then be converted into TSS once the relationship is formed.

TSS has the most impact on fish and fish habitat. An NTU instrument measures the particles of matter that are naturally suspended in water and these particles can be clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms. Turbidity is a measurement of how light scatters when it is aimed at water and bounces off the suspended particles. It is not a measurement of the particles themselves.

Basically the NTU /TSS relationship is interpreted by linear regression analysis. The relationship between suspended solids and turbidity is unique to each instrument and each construction site, so instruments must be calibrated prior to field deployment.

Procedure:

Step 1

Calibrate the turbidity meter according to manufacturer's instructions. Preferably a 3-point calibration is conducted with fresh calibration standards of known value, typically 0, 40 and 400 NTU. Calibration standards are available from laboratory suppliers, or the calibration can be done by laboratories that typically conduct turbidity tests.

Step 2

Obtain two 20 litre pails of water from the waterbody being worked in. The samples should be allowed to settle for approximately 1 hour or until all suspended sediment is removed from the water column.

Step 3

Prepare a 1 kg slurry of fine material that is expected to be introduced to the waterbody by construction activities. Depending upon the monitoring distance downstream of the activity this may vary from fine sand to just silt and clay sizes. The slurry can be an amalgam of fines from the bed, bank and borrow.

Step 4

In one of the 20 litre pails measure and record the turbidity of the settled water. Extract a water sample for laboratory testing of TSS.

Step 5

Increase the level of suspended solids by introducing a small amount of the prepared slurry to the pail. Stir vigorously to ensure a homogeneous mixture. Measure and record

the turbidity, then extract a water sample for laboratory testing. Continuous stirring may be necessary to keep sand size particles in suspension during this step.

Repeat Step 5 to obtain sufficient points to derive the NTU-TSS relationship similar to Figure 1. Ideally five points should be obtained with readings below 15 NTU and at least five additional points below 500 NTU. At least 20 samples (or more if needed) should be used in total to develop the linear relationship within an R^2 correlation coefficient of at least 85%.

The second pail of water can be used to temper the solution so a particular NTU reading can be obtained. Most instruments fail to respond, or 'blind', above a certain level, typically 1000 NTU for those intended for use in natural water bodies.

Turbid water samples should be sent to a qualified laboratory for total suspended solids testing (ASTM D3977 or similar). Once laboratory results have been obtained, the data can be plotted and an interpolated equation derived. This relationship is a simple straight line fit with a zero intercept unless the native waterbody has high background turbidity from chemical staining or dissolved solids, in which case the relationship will have a turbidity offset.

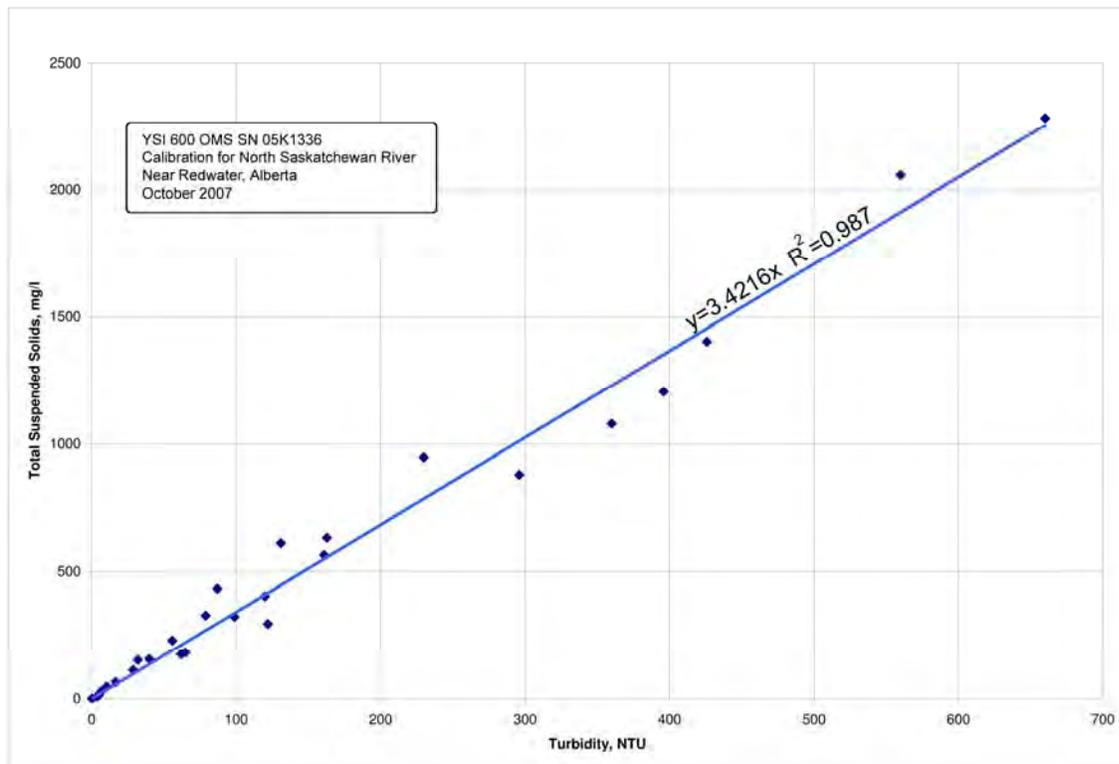


Figure 1 The TSS-NTU Relationship