Friends of the Chicago River
Chicago River Schools Network

Turbidity

Turbidity Test Procedure

For accurate test results please read the procedure before beginning the test.

Introduction

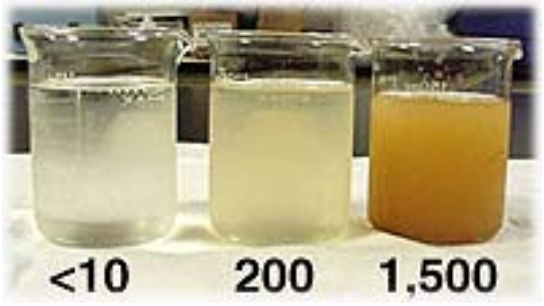
Turbidity is an important water quality parameter in drinking water provision and treatment. The equipment typically used to measure turbidity can be quite expensive, and often provides results which are more precise and accurate than necessary. This high cost is a barrier to many projects in the developing world. The turbidity tube is an alternate device to measure turbidity. A turbidity tube can be purchased commercially, or can be constructed at an extremely low cost using a wide range of locally available materials. It is particularly well-suited to situations when decisions can be made based on approximate turbidity (rounded to the nearest 5 NTU). We give a brief discussion of what turbidity is, how a turbidity tube is constructed, and how to use it properly.

Background

Turbidity is a measure of the cloudiness of water. The higher the turbidity, the harder it is to see through the water. Turbidity measurements are reported in nephelometric turbidity units (NTU) or Jackson turbidity units (JTU). The two units are roughly equivalent and can be used interchangeably for field purposes.

With the naked eye, an average person can begin to see turbidity levels starting at around 5 NTU and greater. Lakes that are considered relatively clear in the United States can have a turbidity up to 25 NTU.

If water appears muddy, its turbidity has reached at least 100 NTU. At 2,000 NTU, water is completely opaque. The picture to the right shows turbidities of <10 NTU, 200 NTU and 1,500 NTU.



Turbidity consists of a number of substances. Mud, silt, sand, small pieces of dead plants, bacteria, aquatic organisms, algae, and chemical precipitates all contribute to turbidity.

Erosion, waste discharge, and urban runoff can add suspended solids to a body of water. Agricultural runoff, in addition to directly increasing suspended solids, can also contribute to the growth of algae. After a storm or flooding, turbidity in surface water generally increases rapidly due to the increase in runoff.

Turbidity is a key indicator used in assessing the suitability of water for human consumption. The material suspended in turbid water can contain a large number of pathogens. High turbidity can also have a variety of negative effects on various methods of water use and treatment.

Using a Turbidity Tube

Before you begin:

- Be sure to use a clean bucket or tube to collect water samples.
- Measurements should be taken in daylight, but not direct sunlight. Cast a shadow on the tube by placing yourself between the sun and the tube.
- Do not wear sunglasses when reading the tube.
- If possible, work with a partner to help verify measurements and disk visibility.

When measuring, remember:

- Highly colored water will register as having a higher turbidity than it actually does.
- The turbidity scale is logarithmic, so it cannot be linearly interpreted.

Turbidity Test Procedure:

1. Locate an undisturbed section of river. Be sure to have no one upstream of your location as they will stir up sediment, giving you a false reading.

2. Make sure the clamp/valve in closed on the small plastic tube at the bottom of the **turbidity tube**. If you're using a **Secchi tube**, there is no clamp/valve.

3. Rinse the tube with the water that is going to be tested and pour it out.

4. Facing into the current, slowly dip the entire tube under the water's surface to a depth of 30-40 centimeters (if the river is not this deep, sample at the mid-depth point). Do not sample surface water.

5. Fill the entire tube with river water. Allow water to flow into the open end of the tube. Do not scrape the opening against any rocks of logs. Keep the open end up off the bottom of the river to avoid picking up any extra sediment.

6. Place the entire tube in the shade (or in your shadow).

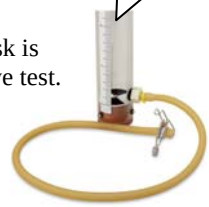
Use this procedure if you have a **turbidity tube**

7. Working with a partner, release the clamp/valve at the bottom of the tube as you observe the water. Your eye should be 10 to 20 cm directly over the tube so that you are looking directly down through the column of water.

8. As soon as you can just see the Secchi disk (the black & white target disk) located in the bottom of the tube, have your partner close the clamp/valve to stop the water's flow out of the tube.

9. Verify with your partner that the Secchi disk is visible. Remember, visibility is a subjective test.

10. Read the height of the column of water left in the sample from the side of the tube.



Use this procedure if you have a **Secchi tube**

7. Pull the string attached to the Secchi disk (the black & white target disk), raising it, until you can see it by observing it down through the column of water. Your eye should be 10 to 20 cm directly over the tube so that you are looking directly down through the column of water.

8. Raise and lower the Secchi disk until you're sure it's at the point where it's just visible.

9. Have a partner verify that the Secchi disk is visible. Remember, visibility is a subjective test.

10. Subtract the level of the water at the top of tube from the level of the Secchi disk.

11. Record the measurement in centimeters.

12. Use the chart below to convert the measurement (in centimeters) to NTU. Find the "Q-value" of your result. Is the turbidity in the river sample healthy or unhealthy?

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5