CEE 577 Fall 2017

## *Homework #5*

Attached is a data sheet from a dye study conducted by the Massachusetts DEP on the Millers River. One quart of Rhodamine dye was injected at the Farley Road Bridge (River Mile 5.9) and samples were analyzed for residual dye at the Millers Falls Paper Company Bridge (River Mile 2.1). The dye injection occurred at 9:55 AM on July 15th and the dye slug was followed at the downstream location from 10:30AM to 3:00PM of that same day. Note that most of the fluorometer readings were made with the 10x scale, and as the concentration increased, the scale was reduced to 3x and 1x.

Using the method of moments, estimate:

1. Mean velocity between river miles 5.9 and 2.1 in ft/sec.
2. Mean dispersion coefficient between river miles 5.9 and 2.1 in sq.ft/sec.

Note: In cases where the distance between the point of dye injection and dye detection is large compared to the downstream mixing distance, the ideal initial (t=0) dye slug may be used in place of an upstream dye curve. The attached data may be analyzed in this way.

*Assigned: 18 Oct 2017*
*Due: 25 Oct 2017*

TIME-OF-TRAVEL STUDY ON Millers River
SAMPLING SITE Millers Falls Paper Co. Bridge (RM 2.1)
Dye injected at Farley Bridge (RM 5.9) Time 9:55 Date 7/15/87
Amount injected 1 Qt Type of dye _____ Conc. in % _____
Sampling section discharge 229 cfs; width _____; mean depth _____

| | | | Field Sampling and Analysis | | | | Final Laboratory Analysis | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample No. | Sample Point | Sample Time | Fluorometer Readings | | | | Fluorometer Readings | | | | Dye Conc. (µg/L) | |
| | | | 1X | 3X | 10X | 30X | 1X | 3X | 10X | 30X | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | |
| 1 | | 1030 | | | 24 | | | | | | | |
| 2 | | 1045 | | | 24 | | | | | | | |
| 3 | | 1100 | | | 24 | | | | | | | |
| 4 | | 1115 | | | 27 | | | | | | | |
| 5 | | 1130 | | | 40 | | | | | | | |
| 6 | | 1145 | | | 39 | | | | | | | |
| 7 | | 1200 | | | 41 | | | | | | | |
| 8 | | 1215 | | | 28 | | | | | | | |
| 9 | | 1230 | | | 29 | | | | | | | |
| 10 | | 1245 | | 13 | 43 | | | | | | | |
| 11 | | 1300 | | 29 | | | | | | | | |
| 12 | | 1315 | 20 | 60 | | | | | | | | |
| 13 | | 1330 | 32 | | | | | | | | | |
| 14 | | 1345 | | 18 | | | | | | | | |
| 15 | | 1400 | | 16 | 53 | | | | | | | |
| 16 | | 1415 | | | 42 | | | | | | | |
| 17 | | 1430 | | | 28 | | | | | | | |
| 18+19 | | 1445 | | | 26 | | | | | | | |
| 20 | | 1500 | | | 24 | | | | | | | |

Column 1. Number on sample bottle.

2. When more than one point in section is sampled, indicate as "A," "B," "C," etc., from left to right bank.

3. Military time.

4-11. Fluorometer dial readings on scales used.

12. Based on fluorometer calibration—show dye concentration in micrograms per liter in stream. If background has not been suppressed on the fluorometer, subtract background reading prior to using calibration curve.

Figure 6.—Form for recording dye-sample data.