CE 454 Urban Transportation Systems

Portland State University
Department of Civil and Environmental Engineering
Fall Quarter 2009

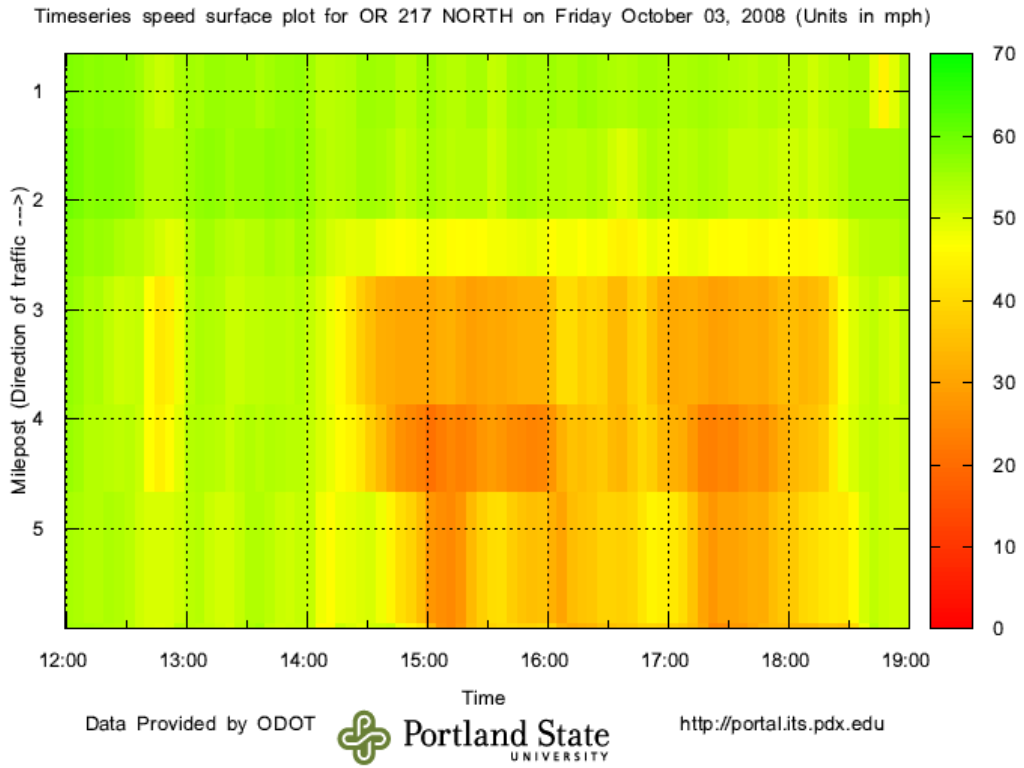
Calculating Some Freeway Performance Metrics

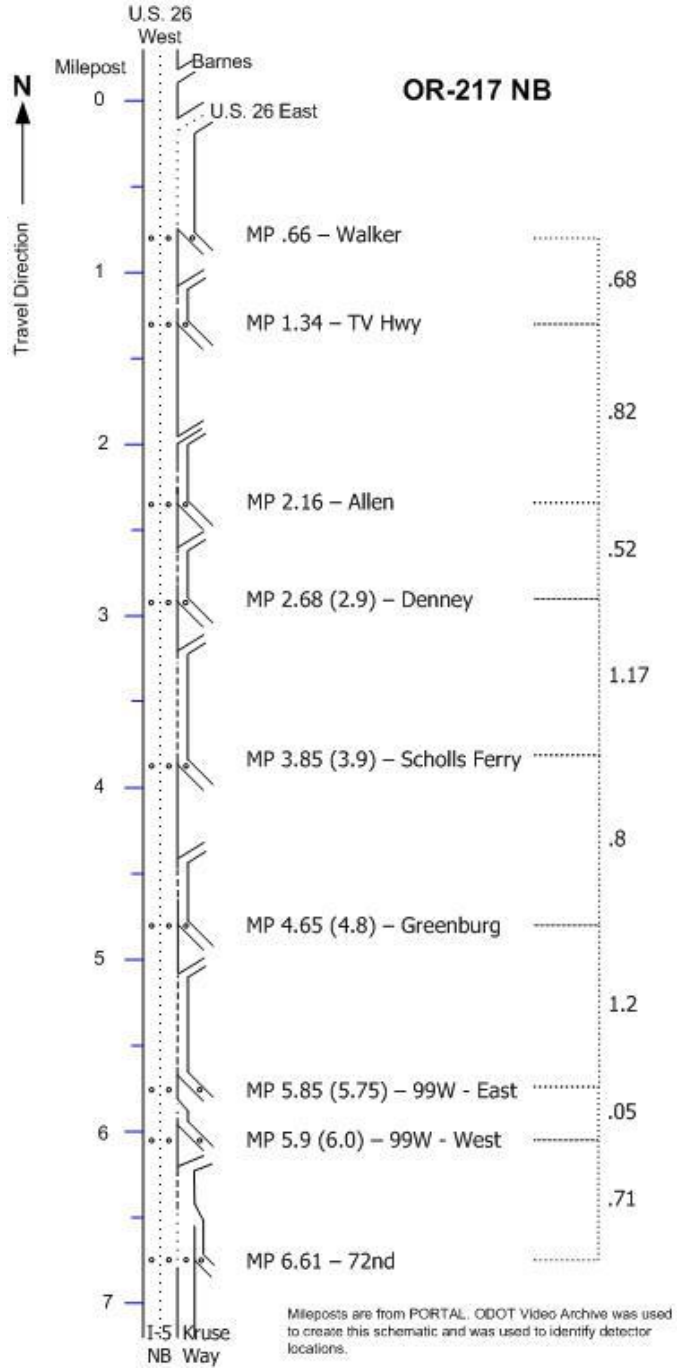
Assigned: 10/5/09, Due date: 10/12/09

Prepare a cover sheet with a summary of answers to all questions below. Pay attention to format (rounding, text, fonts, etc.) and presentation of graphs. Print out spreadsheet (one page for the speed-flow plot (question 1), VMT, VHT, Delay) scaled to fit on an 8.5x11 sheet.

In addition to this instruction sheet, obtain the XLS spreadsheet from the class web. It contains speed and average per lane volume (count) for the freeway OR-217NB from the 99W – West (MP5.9) detector to the Walker detector (MP1.34) in 5 minute aggregations from 12:00 to 19:00 on October 3, 2008. A time-space speed contour plot is below as well as a corridor schematic showing the spatial placement of the detectors on the following page. Note that each on-ramp also has a detector but you are not given any data for these detectors; ignore them.

1. For the Greenburg station, plot speed vs. flow (use all observations). Does it represent what you expect? What would you estimate the "capacity" as defined by the HCM notes for this particular section of freeway?
2. What is the average and standard deviation of the speeds reported at Greenburg and Allen detector stations? Describe how can see this in the time-space speed contour plot.
3. Using the method shown in class, what is the appropriate distance that should be assigned to each detector station (99W to TV Highway) for calculating VMT and VHT?
4. How many mainline lanes does each detector station represent?
5. Between the 99W to TV Highway, what was the total VMT for the corridor? Hint: Be careful of the volume time units. It is given in average flow per hour for the across the number of lanes in #4 but presented as per lane flow (vplph). A sample calculation result for the first 5 minute interval is given so that you can confirm your calculations for VMT.
6. Between the 99W to TV Highway, what was the total VHT for the corridor?
7. Assuming a 60 mph free flow speed, what is the total delay in vehicle hours for the corridor (99W to TV Highway)?
8. ***Bonus Points.*** For a vehicle that starts at the 99W West segment at exactly 14:52:20, what would you estimate its corridor travel time was (assuming its speed can be represented by the average speed readings; use the 20-second speed data)? What was this vehicle's delay? Approximately sketch on the time-space speed contour.
9. For fun, no credit: In Excel 2007, there are some unique conditional formatting approaches to help you look at "large" data sets. Try applying this formatting to the delay matrix (in its in the "styles" box on the "home" ribbon. At which detector and time period appears to contribute most to the corridor delay? You could try a surface contour plot as well but Excel does not excel at this plot type.


Timeseries speed surface plot for OR 217 NORTH on Friday October 03, 2008 (Units in mph)
Milepost (Direction of traffic --->)
1
2
3
4
5
70
60
50
40
30
20
10
0
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Time
Data Provided by ODOT
Portland State
UNIVERSITY
http://portal.its.pdx.edu


U.S. 26
West
Milepost
Barnes
N
OR-217 NB
0
U.S. 26 East
Travel Direction
MP .66 – Walker
1
.68
MP 1.34 – TV Hwy
.82
2
MP 2.16 – Allen
.52
MP 2.68 (2.9) – Denney
3
1.17
MP 3.85 (3.9) – Scholls Ferry
4
.8
MP 4.65 (4.8) – Greenburg
5
1.2
MP 5.85 (5.75) – 99W - East
.05
6
MP 5.9 (6.0) – 99W - West
.71
MP 6.61 – 72nd
7
I-5
NB
Kruse
Way
Mileposts are from PORTAL. ODOT Video Archive was used to create this schematic and was used to identify detector locations.