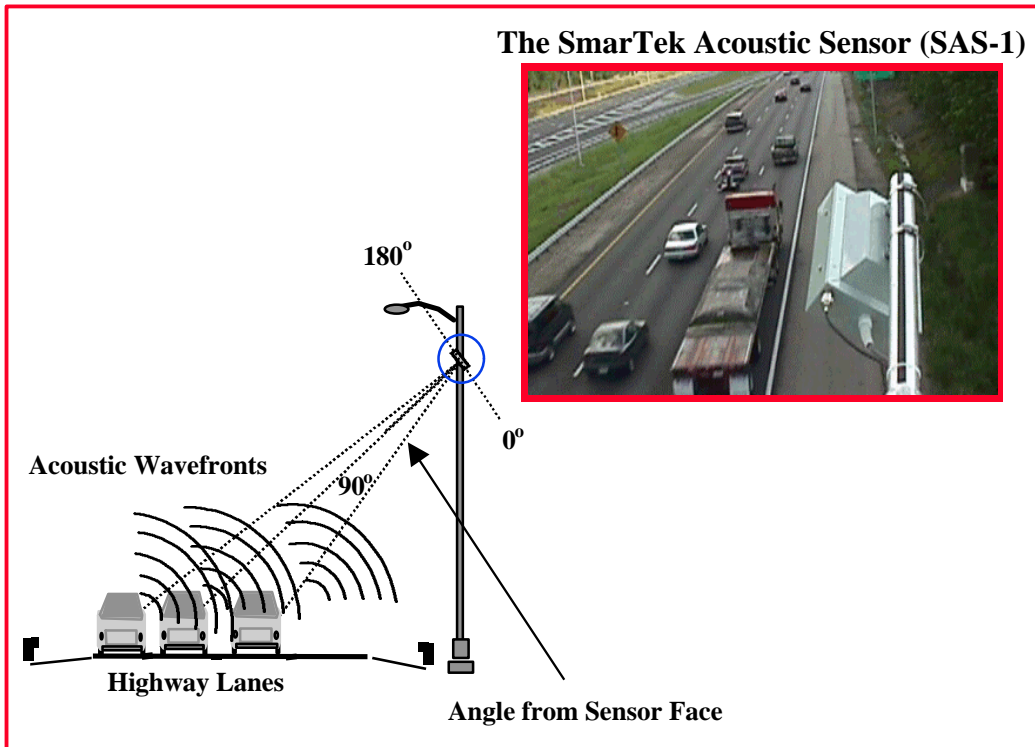


**The SmarTek Acoustic Sensor (SAS-1)**



**SAS-1 Average Speed Measurement Performance  
For  
Stop and Go Conditions**

***SmarTek Systems, Inc.***

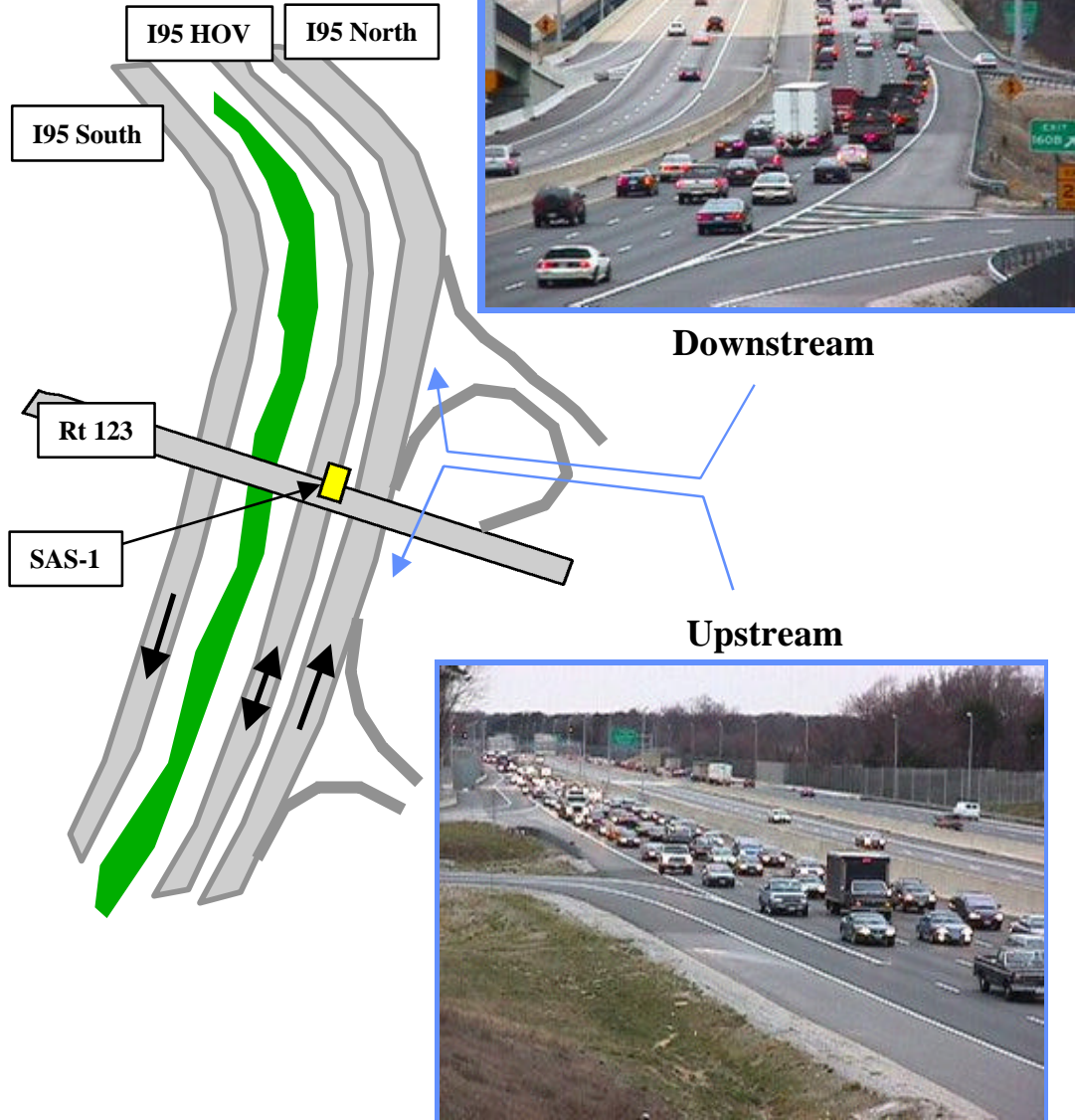
*14710 Kogan Drive  
Woodbridge, VA 22193  
Phone: (703) 680-6554  
Fax: (703) 680-6554*



*160 Ritchie Hwy, 4B  
Serverna Park, MD 21146  
Sales 410-315-9727  
Fax 410-315-9259*

*[www.smarteksys.com](http://www.smarteksys.com)*

## SAS-1 I95 Test Site



### Place:

- I95 at Rt 123 Overpass (20 Miles south of Washington, DC)
- North Bound Lanes (Three Main Line Lanes and One Exit Lane)

### Test Dates and Times....Morning North Bound Rush Hour(s):

- 09 March 1999 (5:30 AM to 7:46 AM)
- 16 March 1999 (5:24 AM to 8:45 AM)

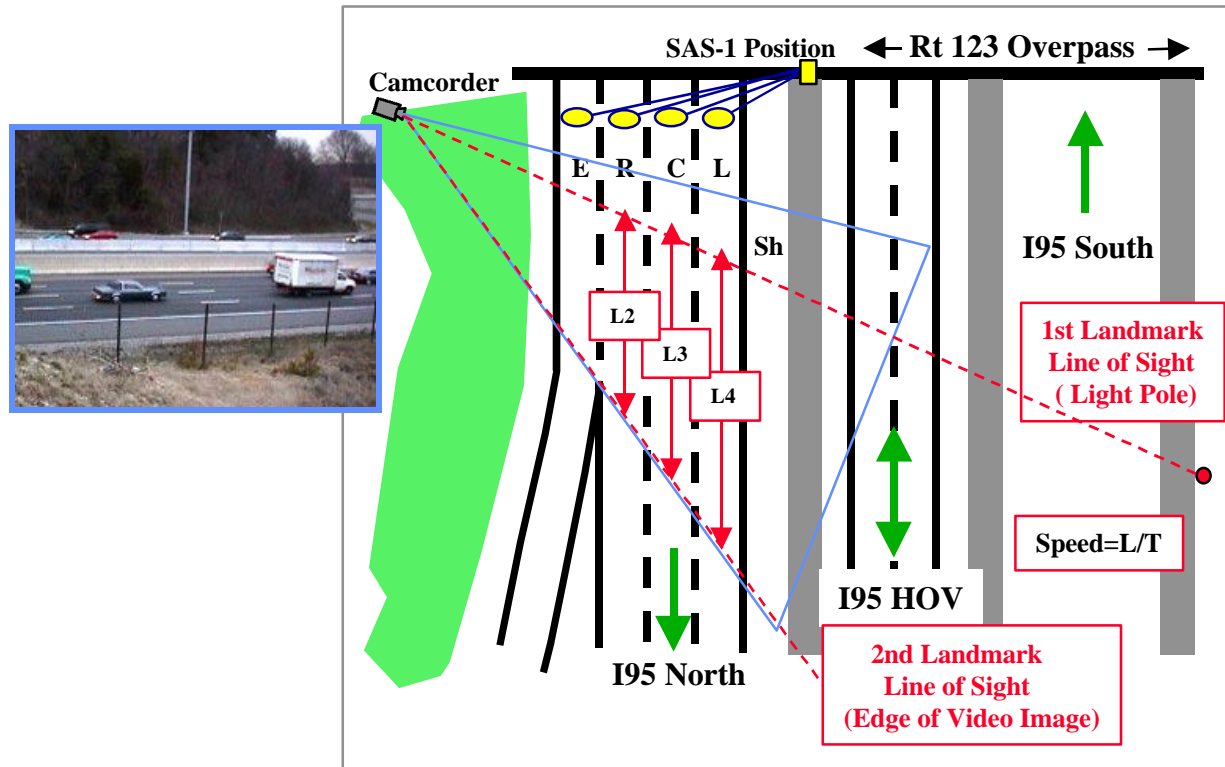


# SAS-1 Installation Configuration

**A Single SAS-1 Monitoring:**  
- 3 Main Line Lanes  
- and an Exit Lane



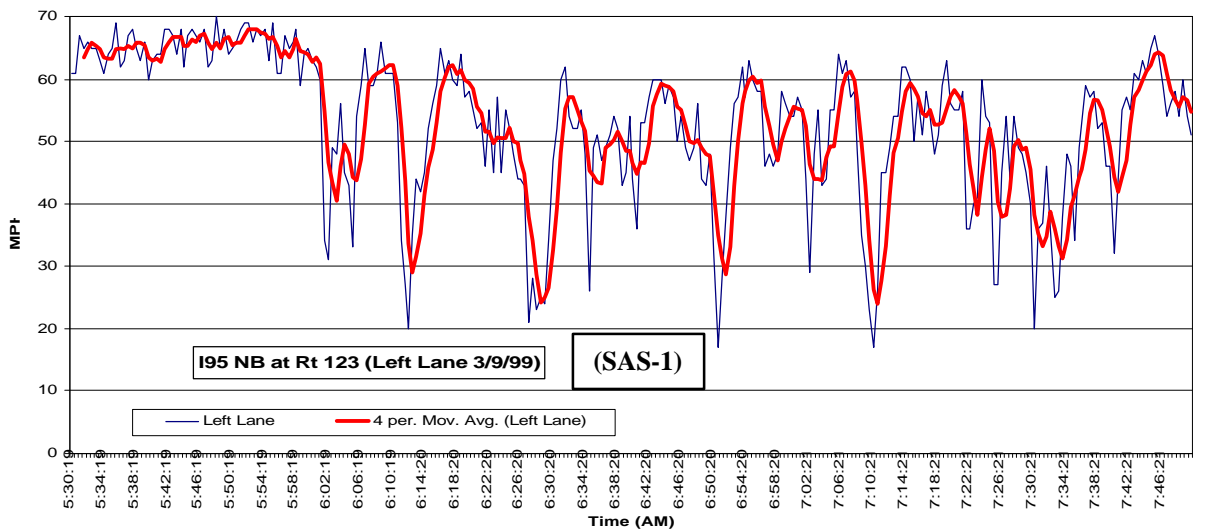
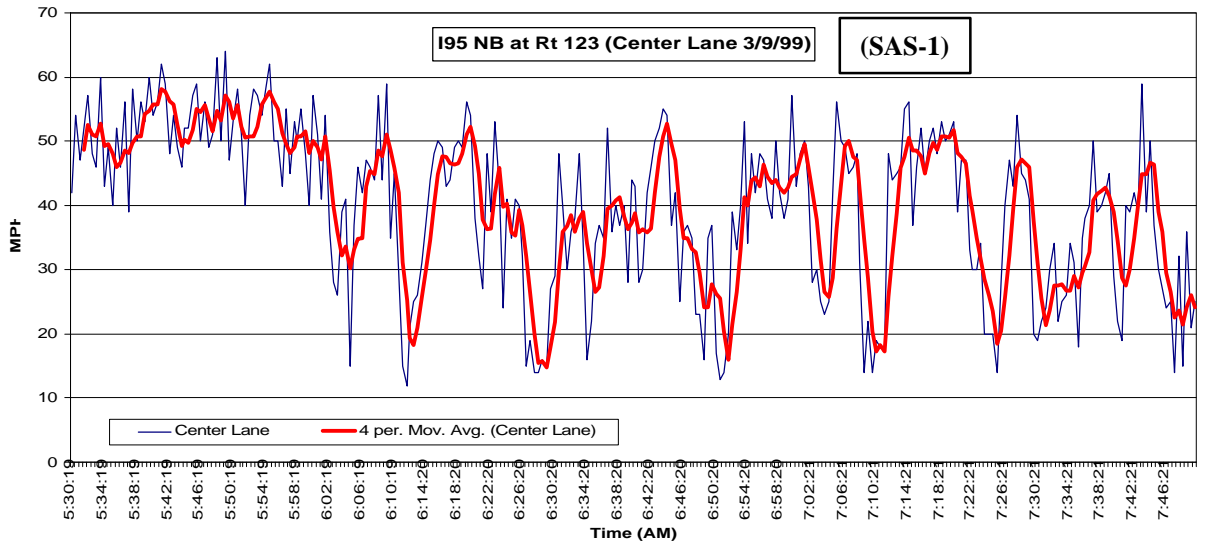
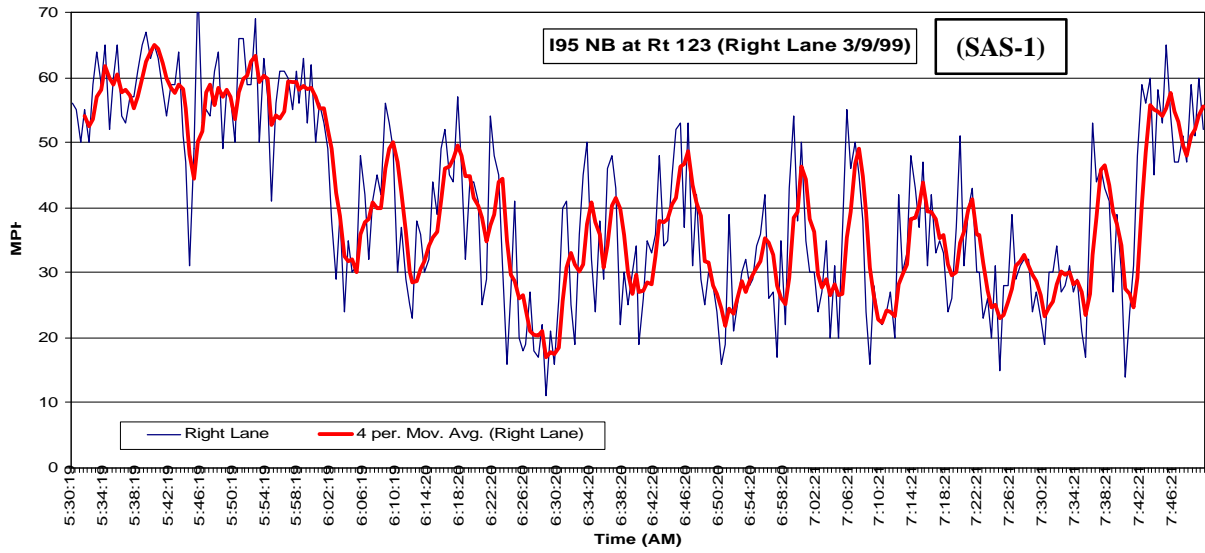
# SAS-1 Testing Configuration

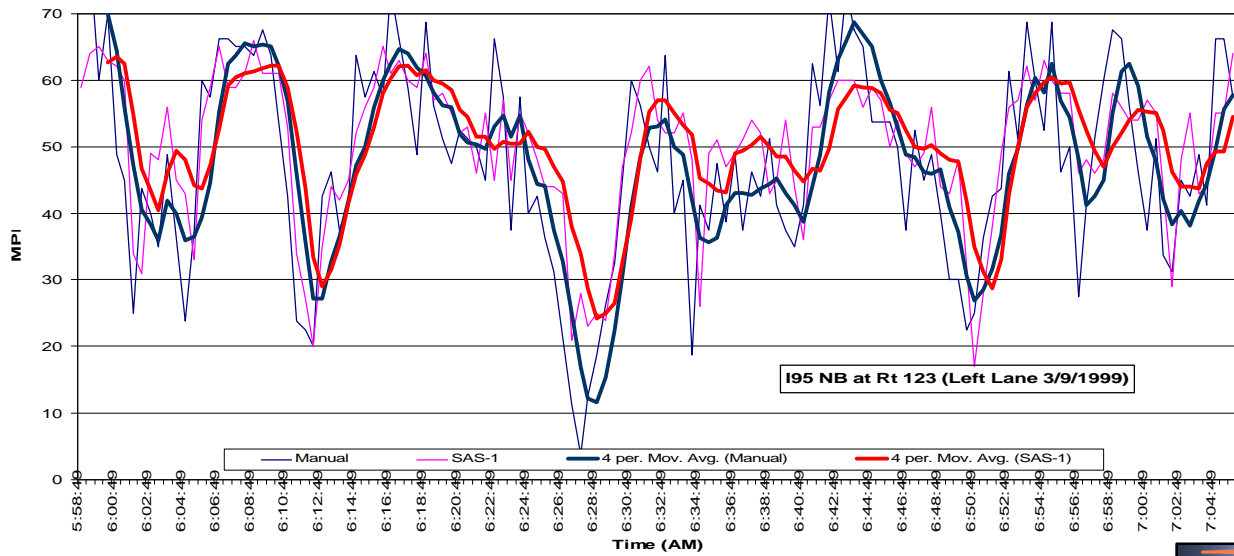
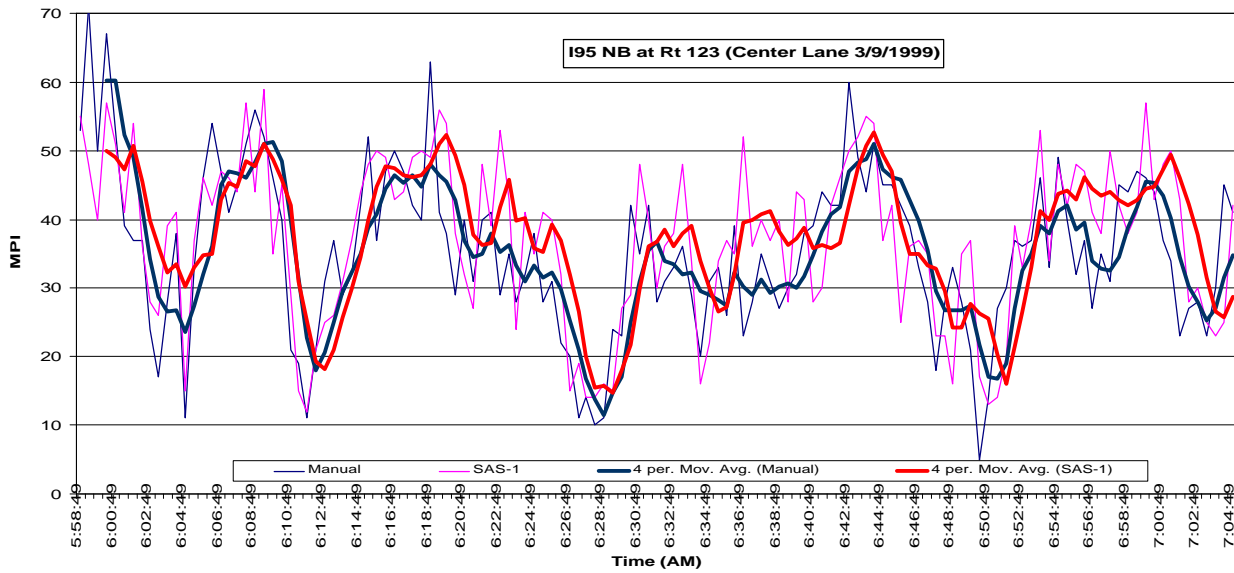
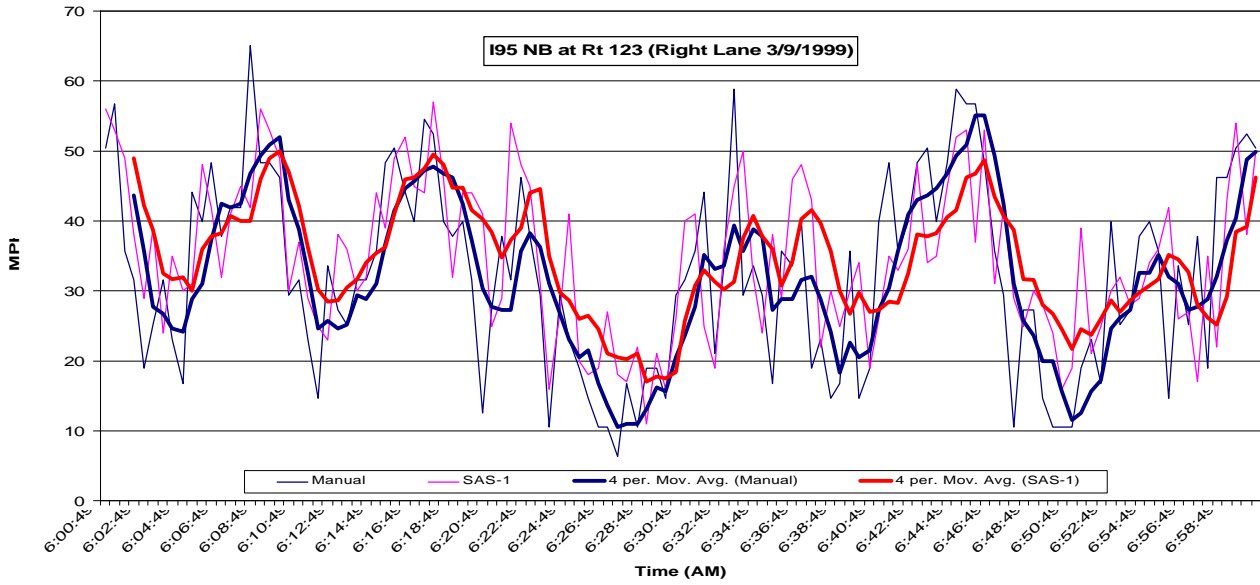


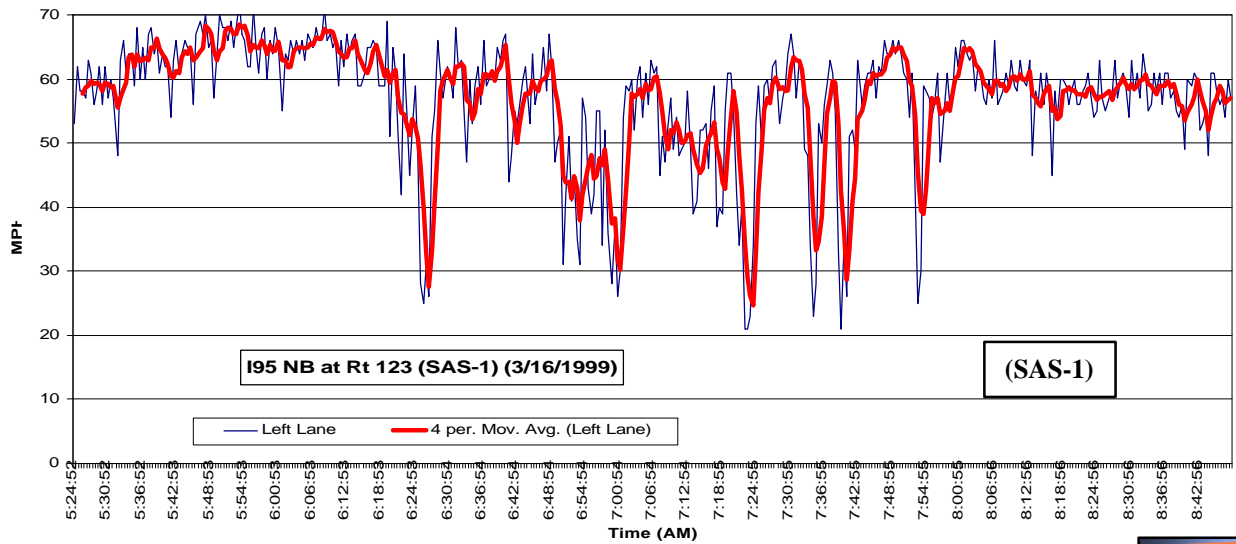
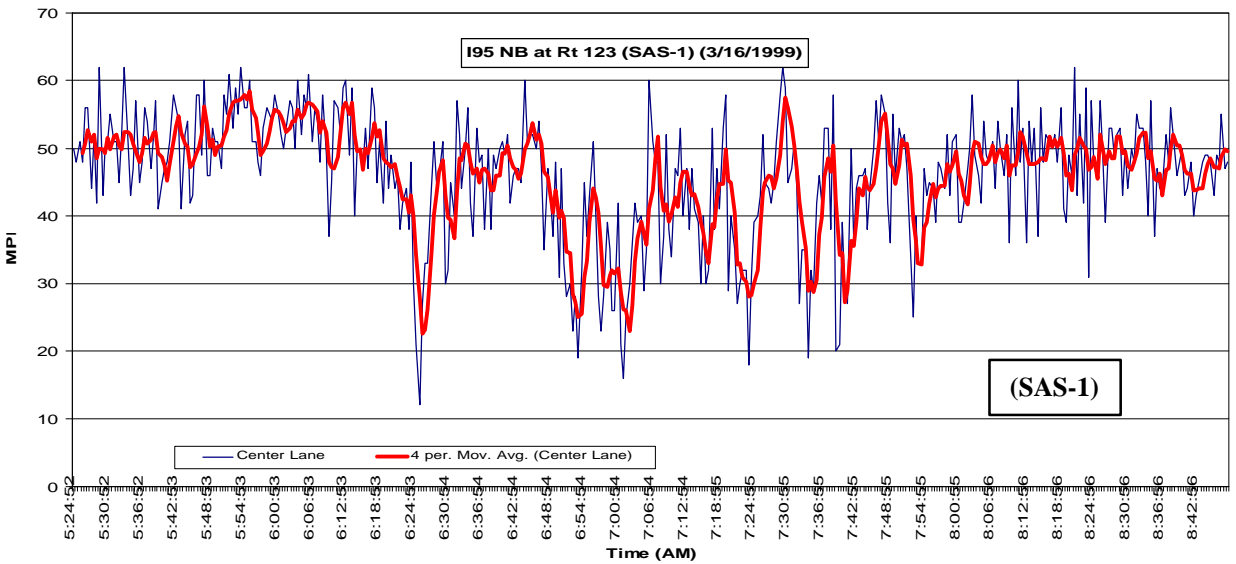
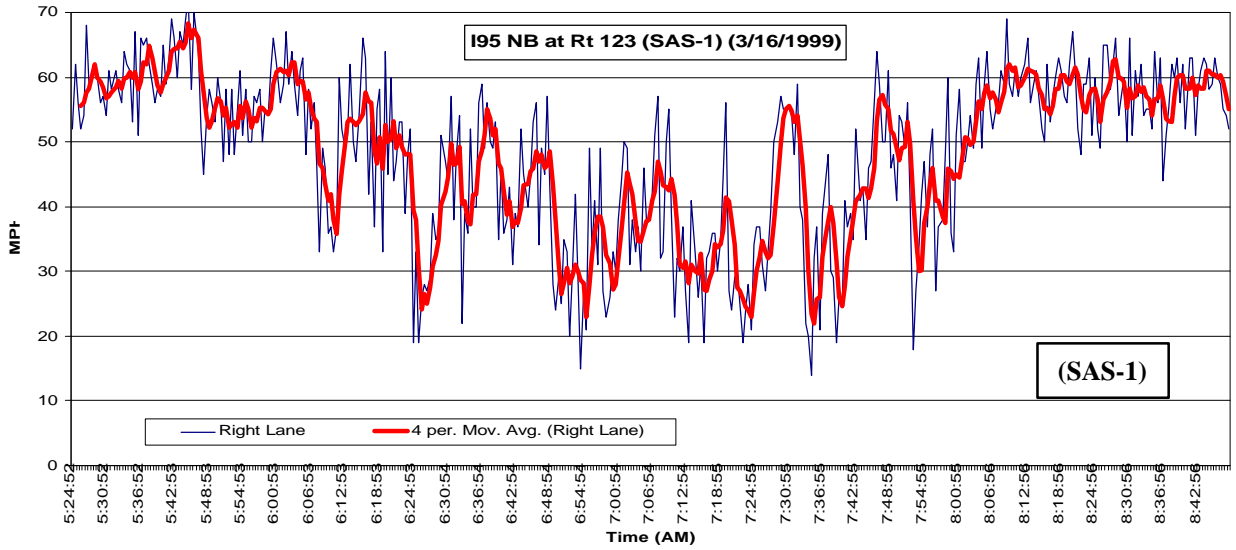
## The Process:

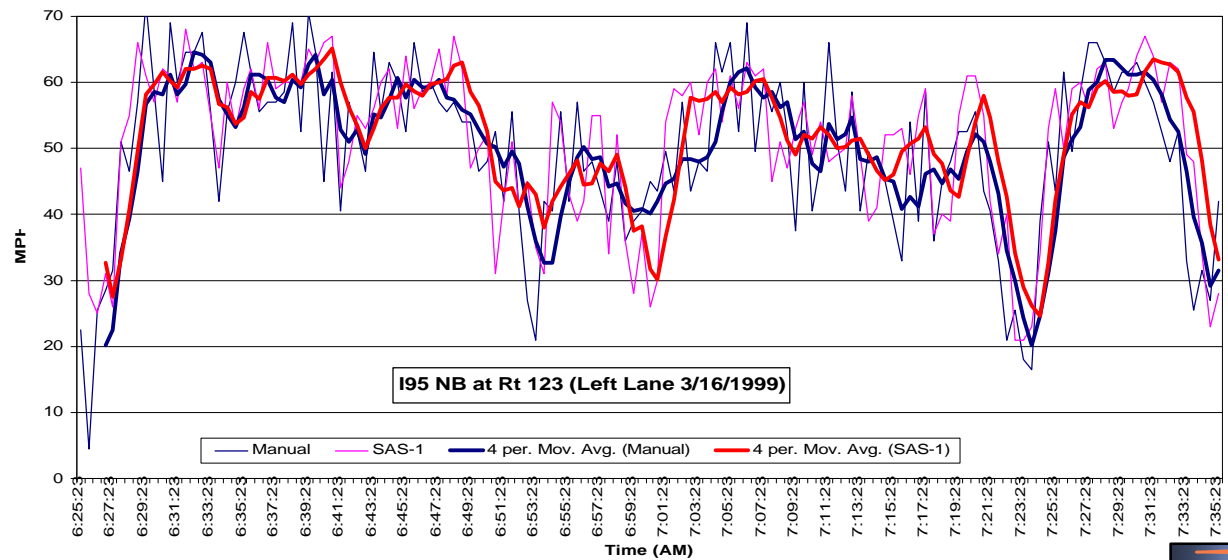
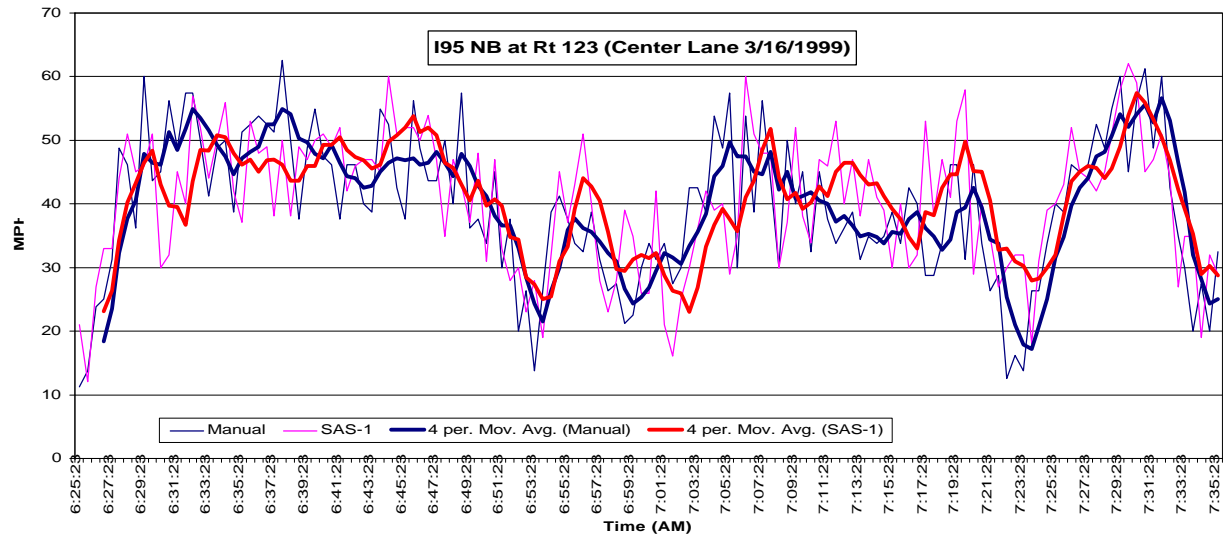
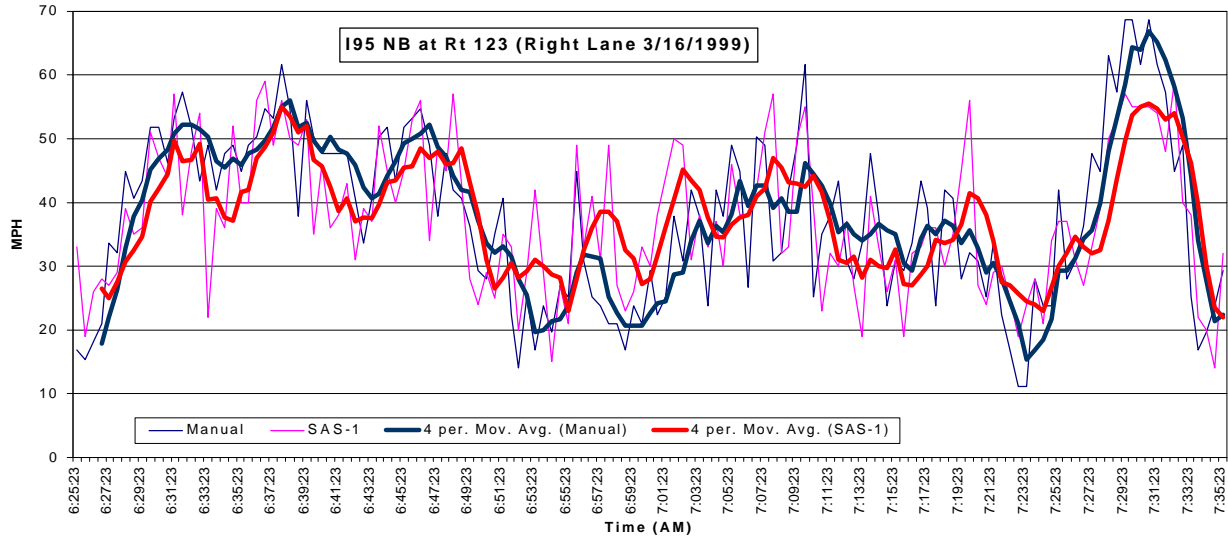
- Single SAS-1 Coverage for Three Main Line and One Exit Lane
- SAS-1 Zones and “Video View” Separated by Approximately 200 Feet
- SAS-1 Measures and Logs Per Lane Traffic Measures Every 30 Seconds
  - Vehicle Volume
  - Lane Occupancy
  - Average Speed
- Record Video (Time is Displayed and Synchronized with Logging PC)
- Make Off-Line Speed Measurements From Video and Log Every 30 Seconds
  - Use Start and Stop Landmarks (100 ft to 150 ft apart)
  - Measure “Landmark to Landmark” Time (for 5 to 8 vehicles per interval)
  - Compute  $Speed=L/T$
  - Average and Log for Intervals Synchronized with SAS-1 Logs
- Plot Both SAS-1 and Manual Average Speed Measurements for Comparison











## Observations and Conclusions:

- Traffic volumes for this location leading into stop and go conditions are 2000 to 3000 vehicles/lane/hour for all three main line lanes.
- Stop and Go conditions for this location typically start between 5:30 AM and 6:00 AM and last for two hours and longer.
- SAS-1 average speed measurements track the situation dynamics very well in all lanes with measurements taken during freeflow leading into stop and go conditions, during stop and go conditions, and freeflow after stop and go conditions ended.
- SAS-1 average speed measurements do not match the manual measurements exactly, however, there is a very high degree of correlation between the two sets:
  - The SAS-1 detection zone is up-road about 200 feet from the manual “landmark to landmark” zone,
  - Viewing the traffic dynamics at the scene and via recorded video, shows that the stoppage in traffic flow occurs in different lanes at different times and at slightly different times for the SAS-1 zones as compared to the manual landmark zones,
  - Manually measuring vehicle travel times (between landmarks) is not without some human error.
- SAS-1 average speed measurements are generally slightly above the manual measurements at very low speeds. This is expected since:
  - Comparison of speed measures using two different sized measurement zones assumes uniform flow through the zones. The low speed flow (below 30 mph) was very erratic and not close to uniform,
  - Vehicles were at full stop typically for about 5 seconds,
  - SAS-1 averages all detected vehicle speeds in the 30 second interval
  - Manual averages were over only 5 to 8 vehicles in the 30 second interval,
  - Chances of vehicles stopped in the smaller SAS-1 zone are smaller than in the much larger “landmark to landmark” zone (roll in fast, then stop before exiting).

### **For This Highly Dynamic Stop and Go Situation:**

**There is excellent agreement between the SAS-1 measured average speed and the manually measured average speed!**

