

# Development of Intersection Performance Measures for Timing Plan Maintenance Using an Actuated Controller

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# Agenda

## ◆ Background

## ◆ Research Phases

- Proof of Concept (in progress – ATRC)
- Data Collection (future)
- Data Management and Analysis (future)

## ◆ Questions

# Background

## ◆ Traffic signal timing maintenance

### ■ Which location?

- ◆ Phone calls
- ◆ Engineering judgment
- ◆ Length of time since previous retime
- ◆ Local development
- ◆ Traffic pattern shift
- ◆ Highway Capacity Manual (HCM) Methodologies

# Background

## ◆ HCM Methodologies

- Arrival Type
- Delay
- Volume/Capacity (V/C) ratio

## ◆ Data collection issues

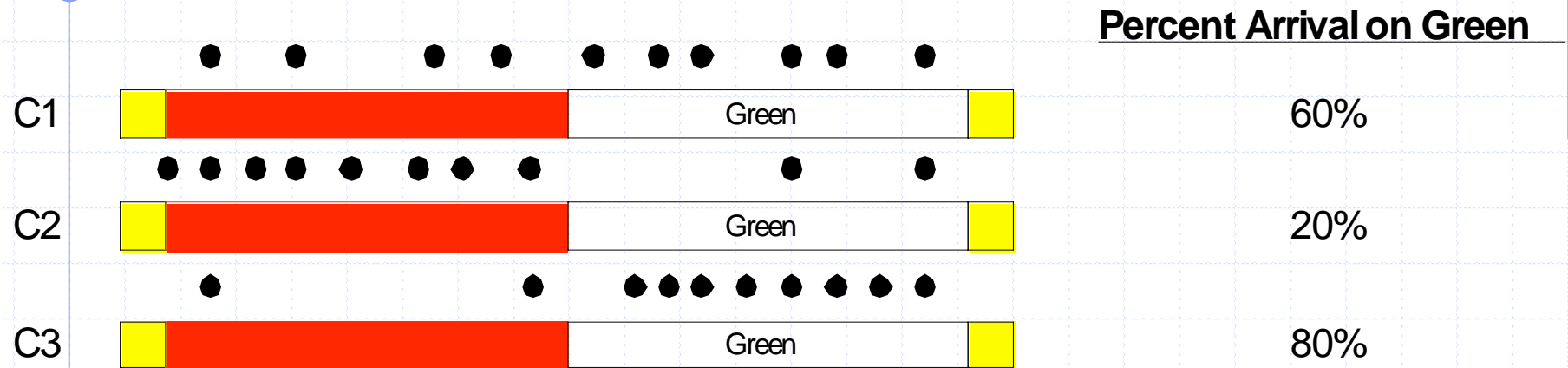
- Time of Day / Day of Week
- Labor intensive
- Peak hours may not match staffing hours
- Snapshot

# Background

- ◆ Controller Enhancement
  - ASC/3 from Econolite Control Products
- ◆ Event data is recorded in binary on controller for all
  - Detectors in use (1-64)
  - Phases in use (1-16)
- ◆ Re-creation of field events from data log



# Event Based Data

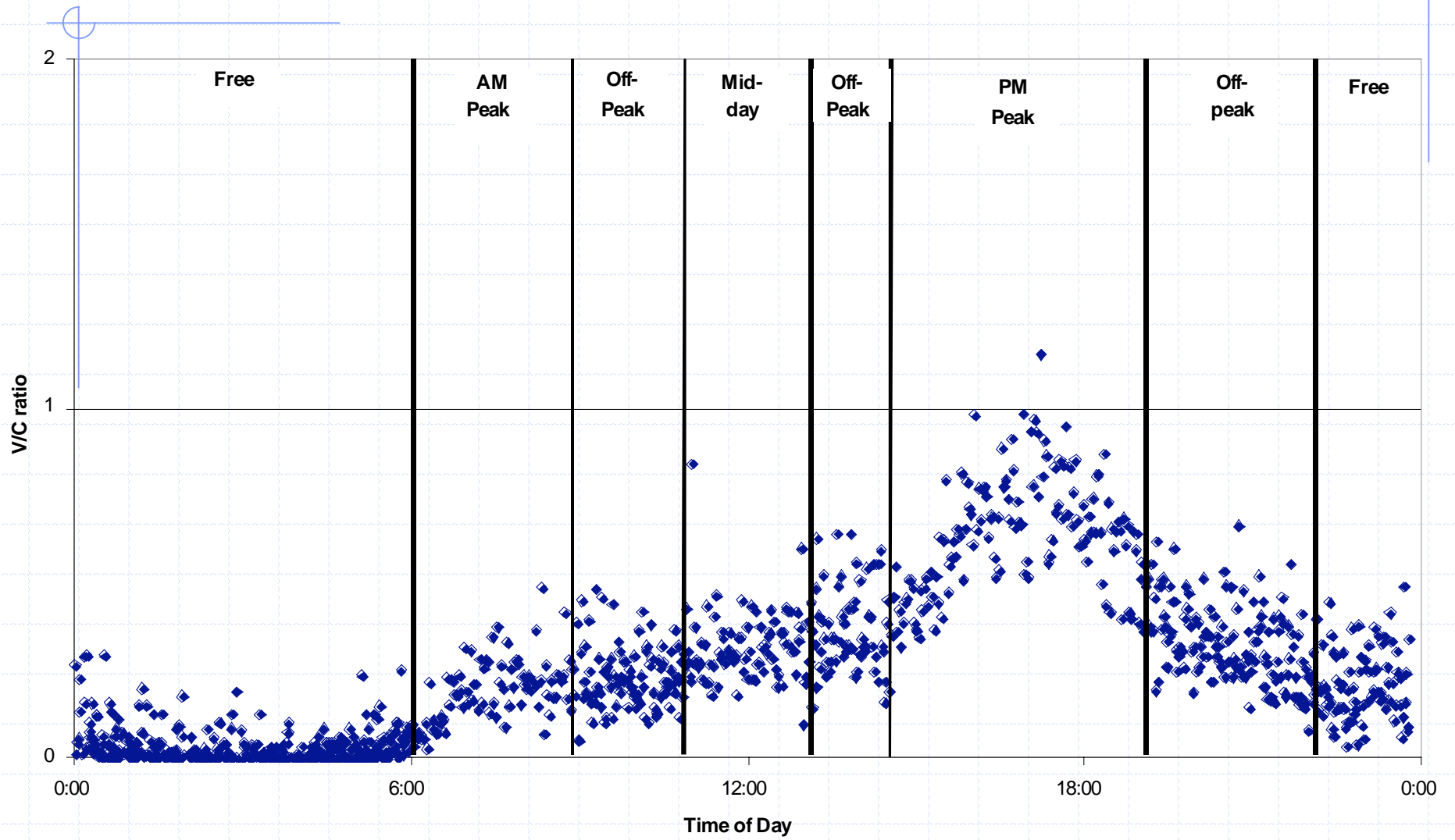


◆ Fidelity of measurements lost when binned together

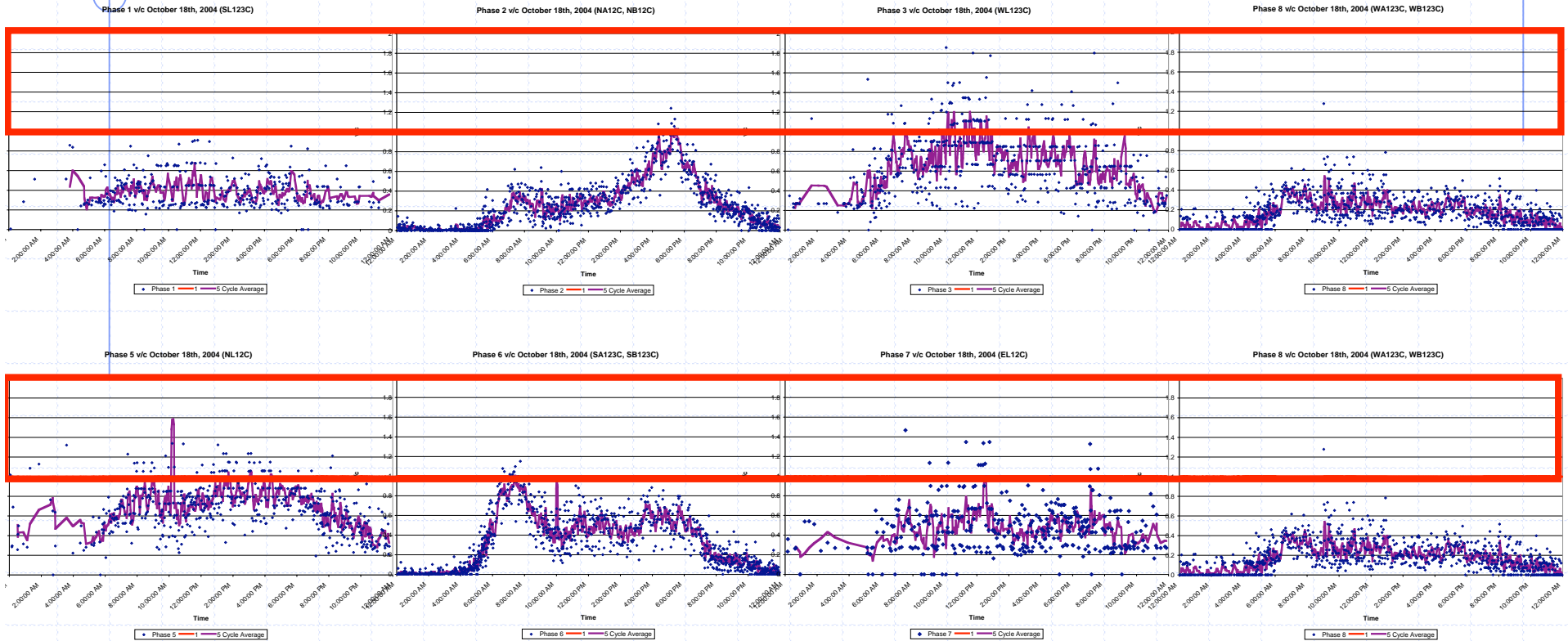
◆ Ex:

■ Avg: 53.3%

# V/C Ratio



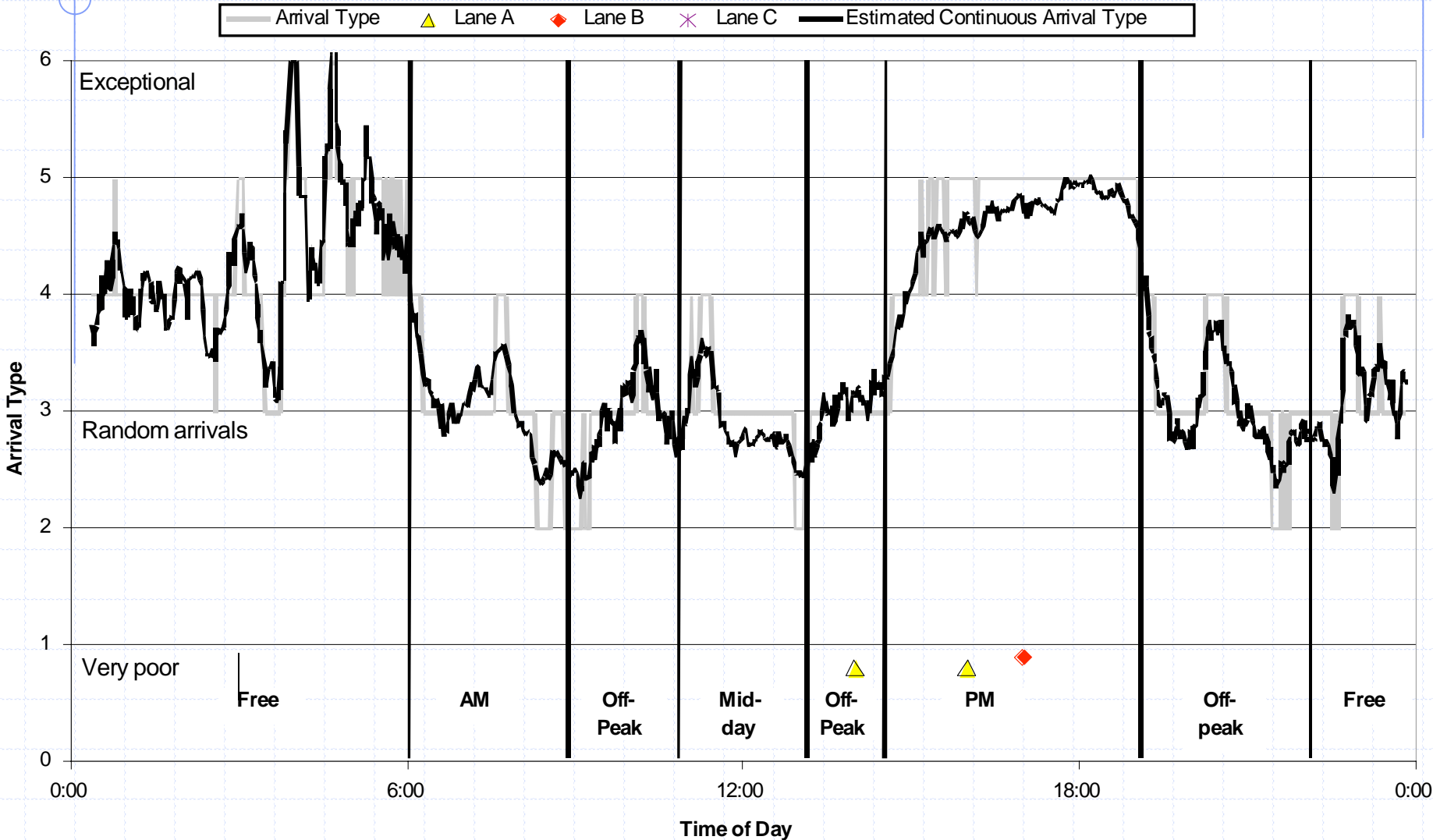
# V/C Plots for all phases



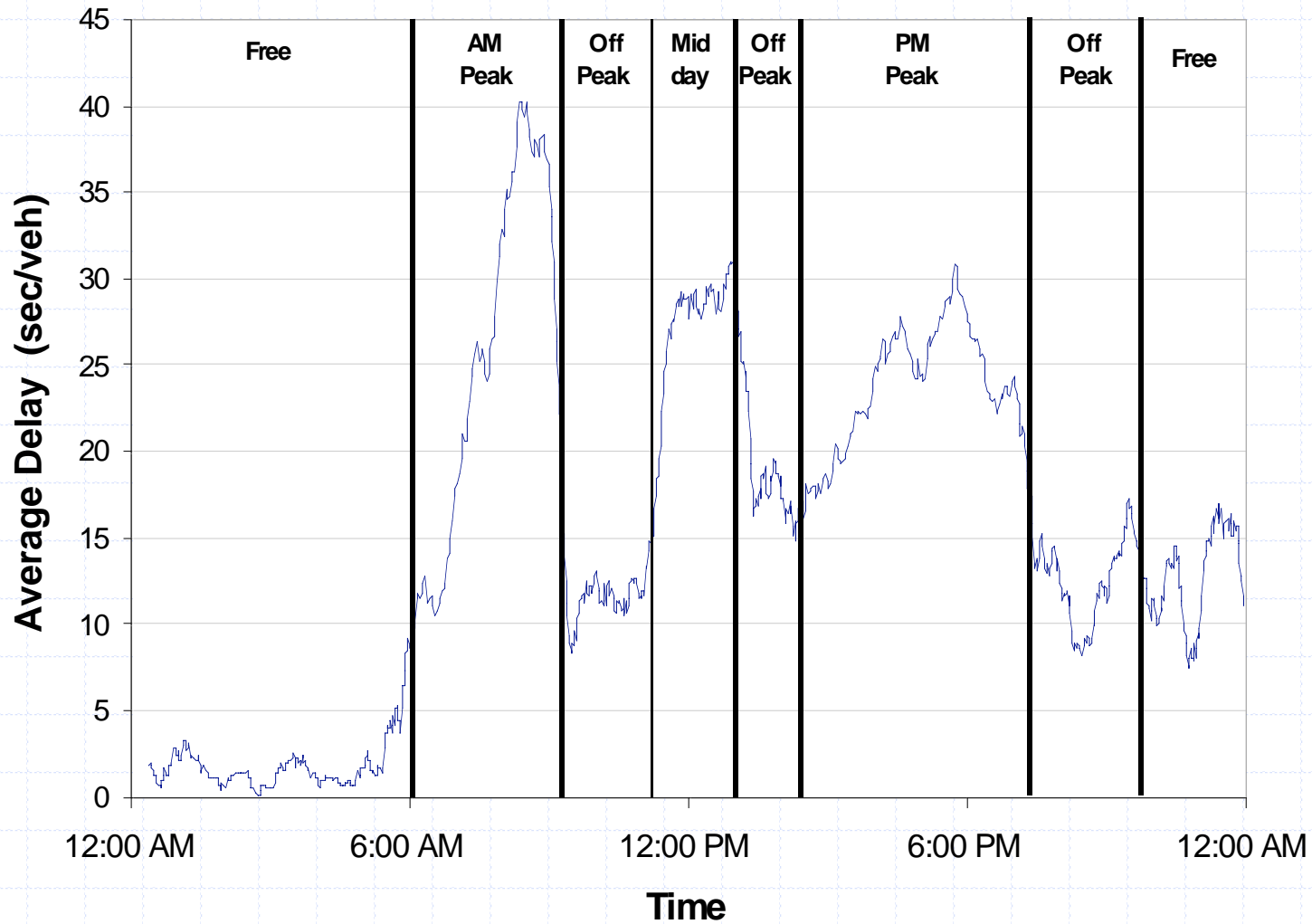
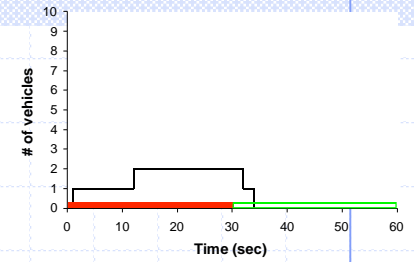
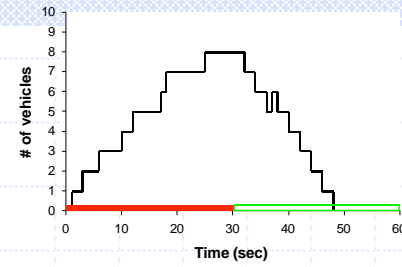
Problems?

1	2	3	4
5	6	7	8

# MOEs – Arrival Type (P2)



# MOEs - Delay

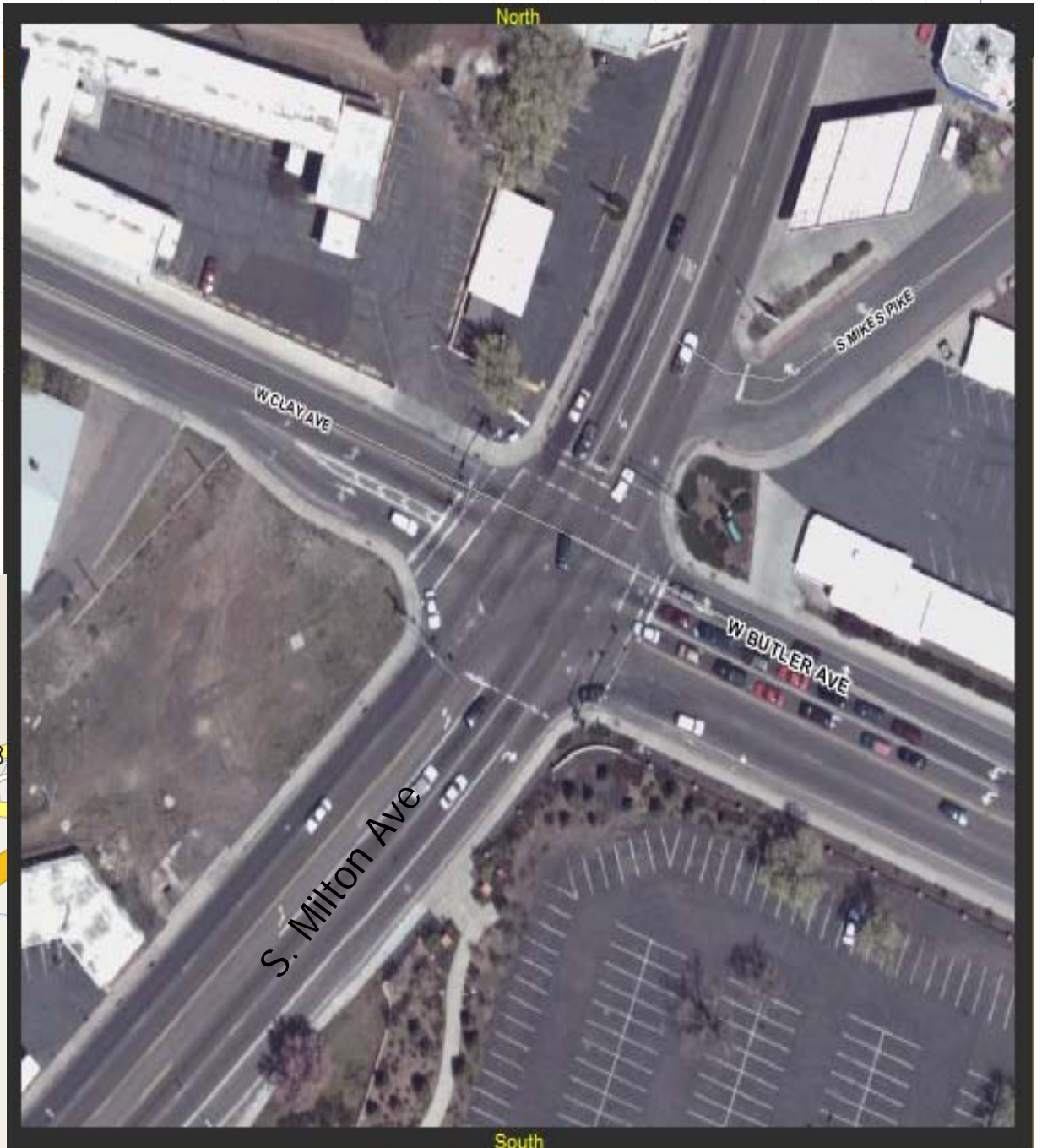
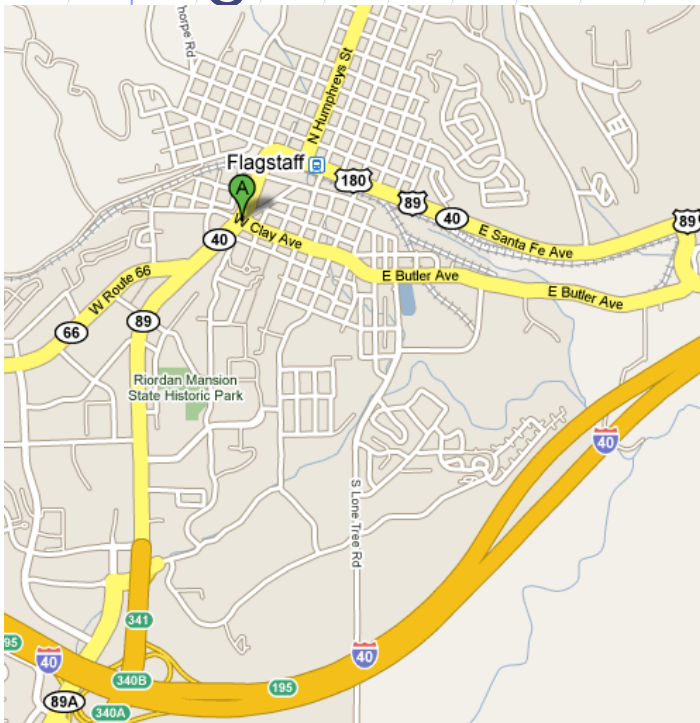


# Proof of Concept

- ◆ Pick a location within ADOT system
- ◆ Enhance cabinet to produce Measures of Effectiveness (MOEs), using ASC/3 as data collector
  - Leverage as much existing equipment as possible
- ◆ Produce MOEs (V/C)
- ◆ Ground truth with manual counts to assess performance

# Location

◆ Butler/Clay &  
Milton,  
Flagstaff, AZ







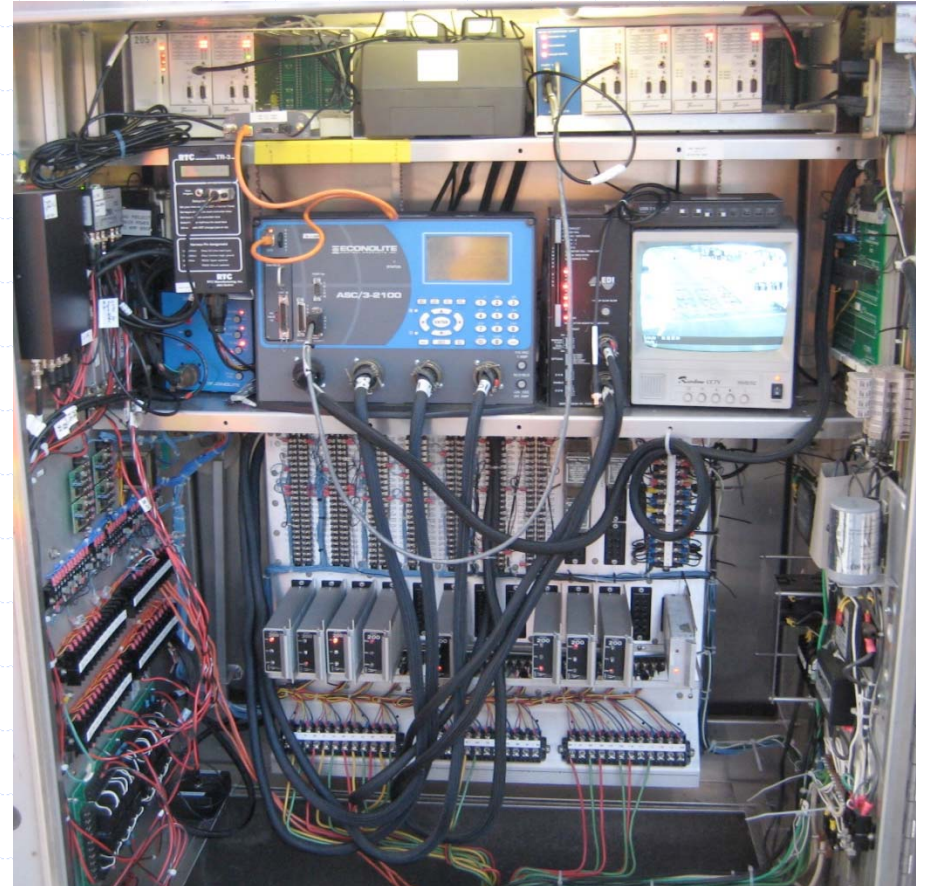


# Cabinet Enhancements

Before



After



# Added / Enhanced Equipment

Detector Rack (TS2)

UPS

(4) Video  
Detector  
Interface  
Cards

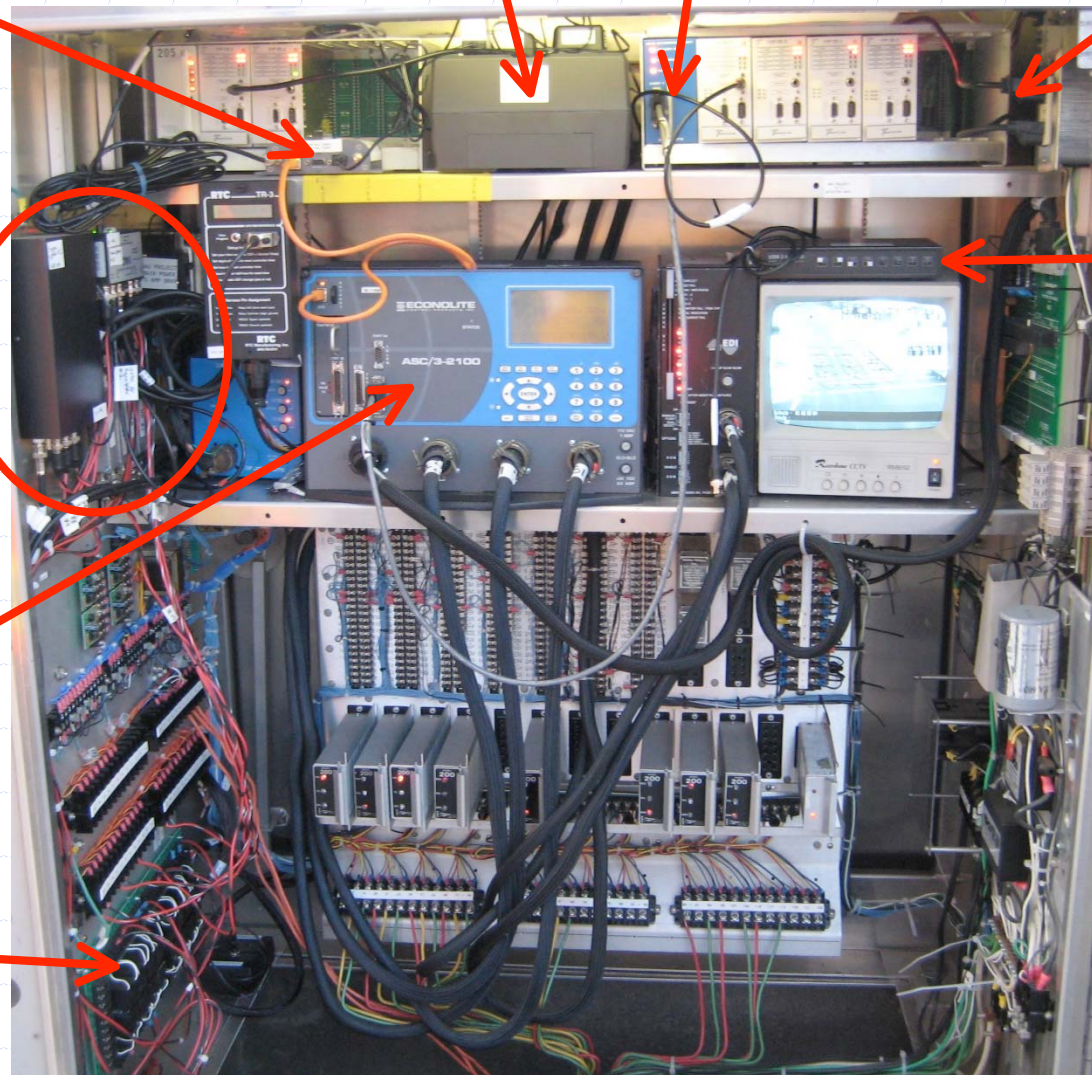
Cell Modem

Video Signal  
Amplification  
Equipment

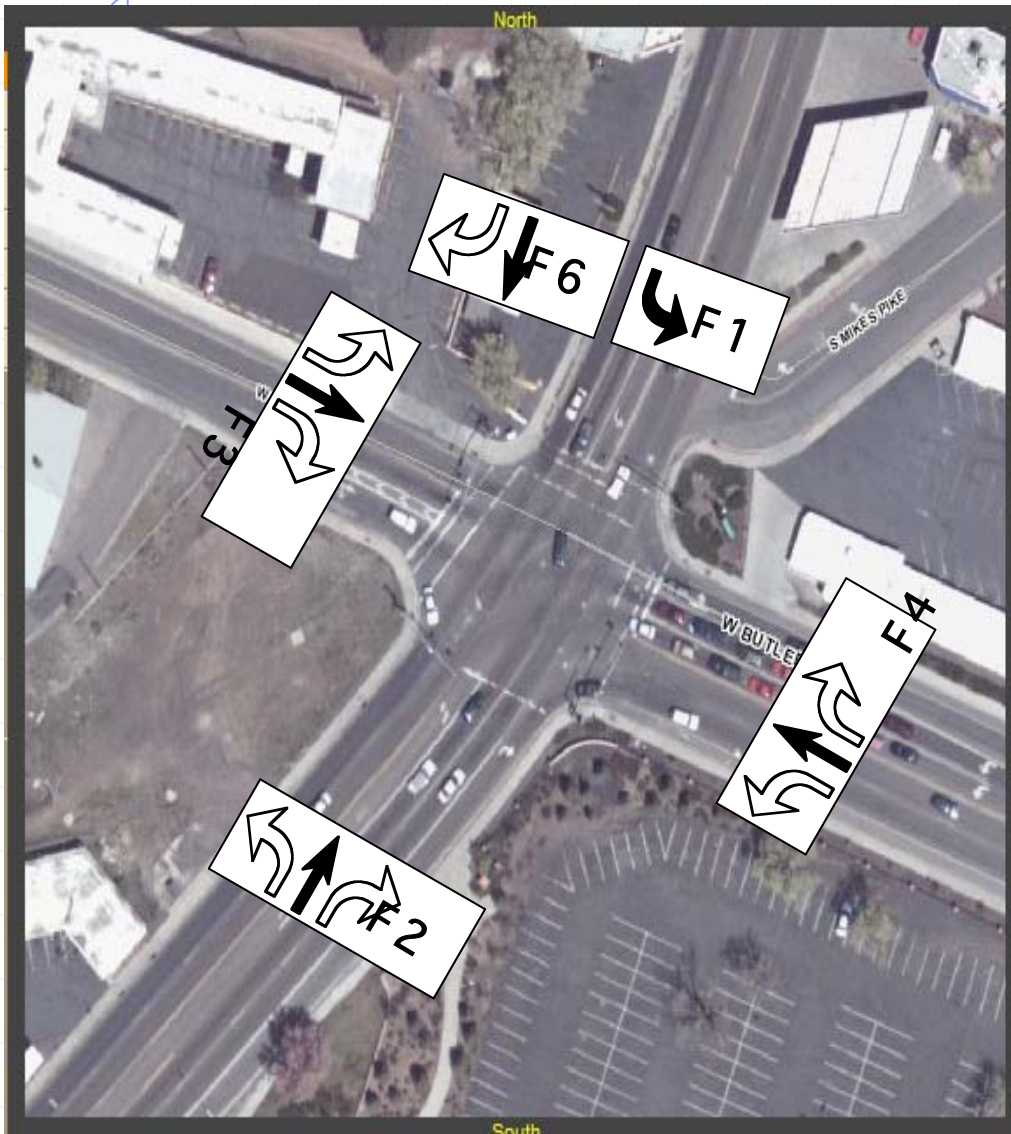
4 channel  
multiplexer

ASC/3  
Controller

Loop  
Termination  
Panel



# V/C Ratio

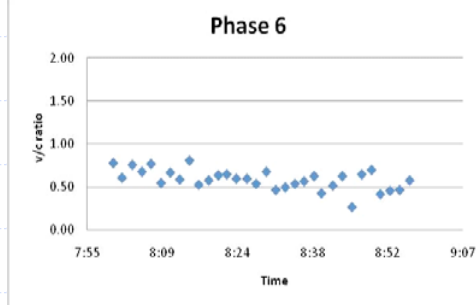
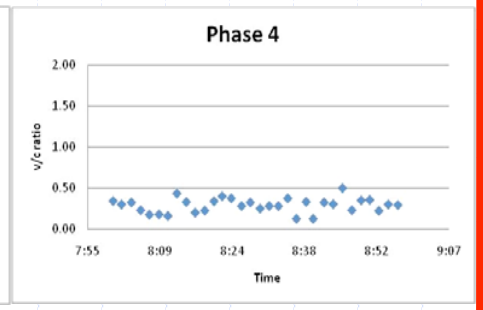
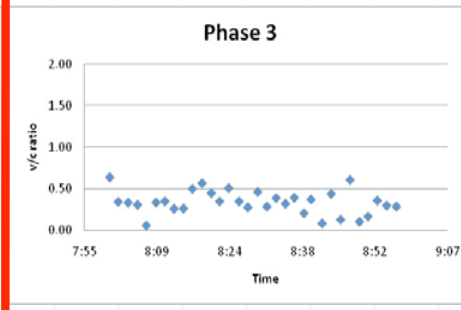
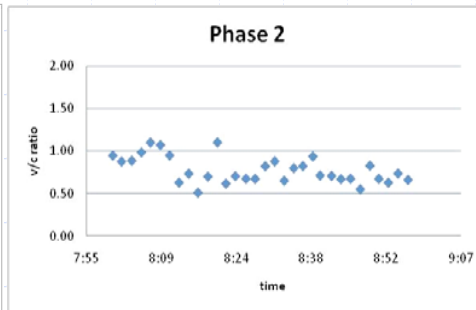
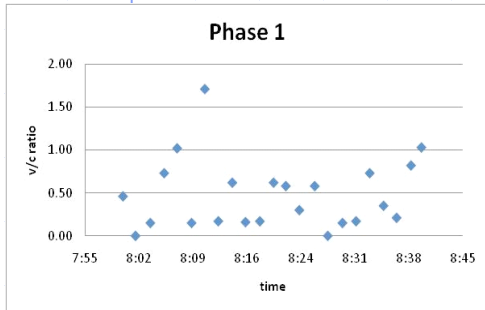
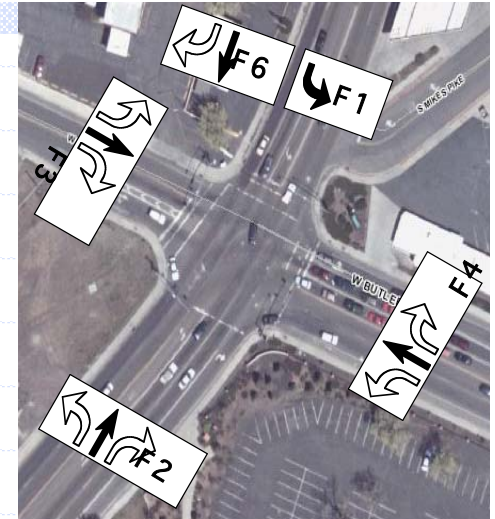


$$\left(\frac{v}{c}\right)_l = \frac{q_g}{\left[s_l * \left(\frac{g_l}{C}\right)\right]} = \frac{(v_l * C)}{(s_l * g_l)}$$

- $v_l$  = Served flow rate for lane group
- $c_l$  = Capacity of lane group
- $q_g$  = Flow rate observed for a green phase
- $s_l$  = Observed lane saturation flow rate
- $C$  = Cycle length
- $g_l$  = Length of green indication for movement

# V/C Ratio

## 8 – 9 AM, 02.19.09



# Proof of Concept

## ◆ Items to accomplish

- Ground truth data with manual counts
- Establish remote connection with cell modem (**recently completed**)
- Submit final report to ATRC in Summer 2009

# Future work

## ◆ Phase II – Data Collection

- Develop and deploy prototype data collection module
- Develop standards to enable data collection at new and rehabilitated locations

## ◆ Phase III ? – Data Management and Analysis

- Desktop computer data storage and management system
- User friendly interface to provide input data for software modules
  - ◆ Synchro
  - ◆ HCS+
  - ◆ Other

# Questions?

