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New Corridor Operations Strategies

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Outline

Corridors

- Objectives & constraints

Freeways

- Bottlenecks
- Ramp metering and corridor strategies

Signal Systems

- State of practice
- Performance measurement
- Control and management

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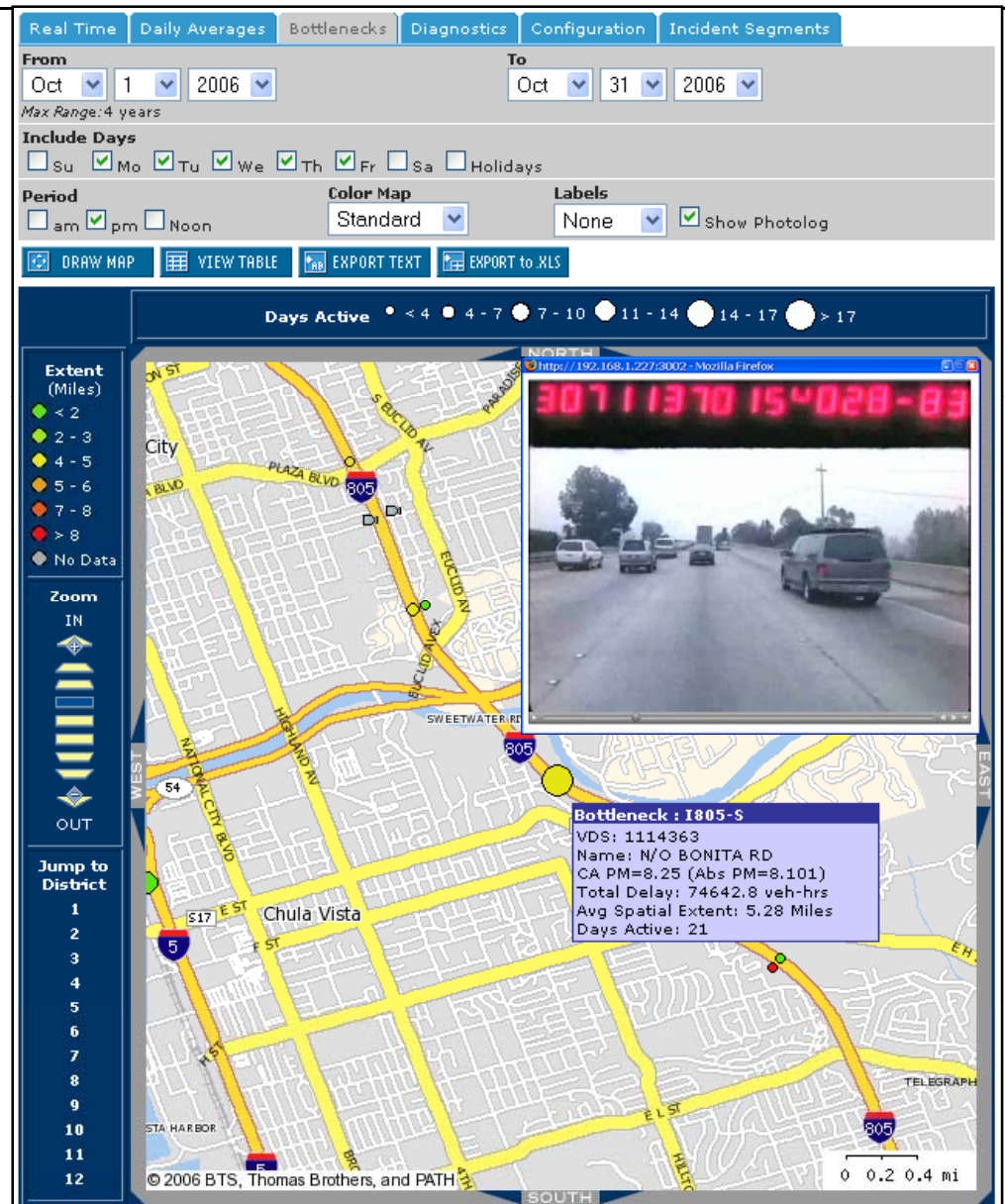
Freeway Bottlenecks

- Congestion occurs at bottlenecks and may be reduced by metering
- Computer algorithm to locate all bottlenecks in a freeway ([PeMS](#))

Map view:

- Bottleneck location
- Delay and queue
- Days active

Map can be tied to Caltrans Photolog





Congestion Delay Weekday Peak Periods (VH): Total, Recurrent, and Worst Bottlenecks

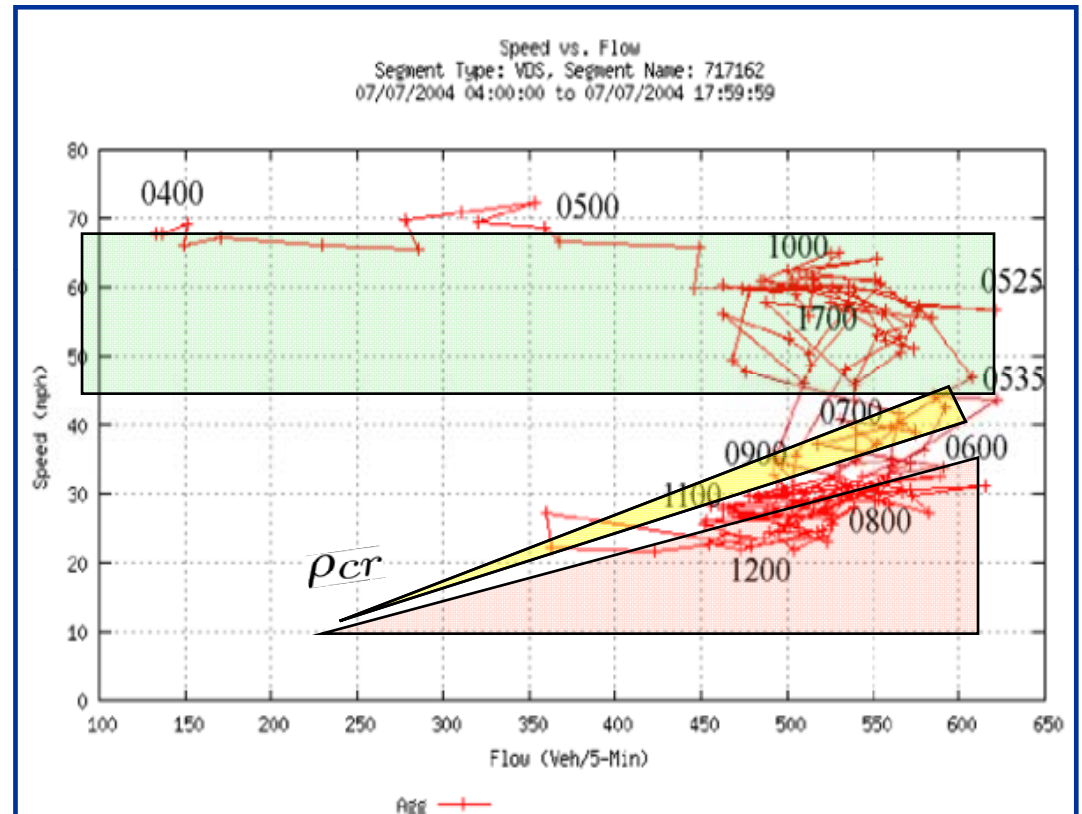
	District	D3	D4	D7	D8	D11	D12	State
AM peak	D_{total}	2677	37091	80840	4102	11722	19450	155882
	595 rec	310	3614	34042	2006	8056	5776	53803
	74 rec							29536
	595 (%)	12	10	42	49	69	30	35
PM peak	D_{total}	6272	26043	136879	7300	23379	29984	229857
	595 rec	1497	10653	72058	4274	15824	19735	124040
	74 rec							73904
	595 (%)	24	41	53	59	68	66	54
All peak	D_{total}	8949	63134	217719	11402	35101	49434	385739
	595 rec	1807	14267	106099	6279	23880	25511	177843
	74 rec							103440
	595 (%)	20	23	49	55	68	52	46



Traffic Flow on Freeways

5-min (flow, speed) data on all 4 lanes, 0400-1700, VDS 717162, show bistable behavior

- Free-flow state 0400-0530, 1300-1700
- Congestion state 0530-1200
- Separated by critical density (\propto flow/speed) ρ_{cr}



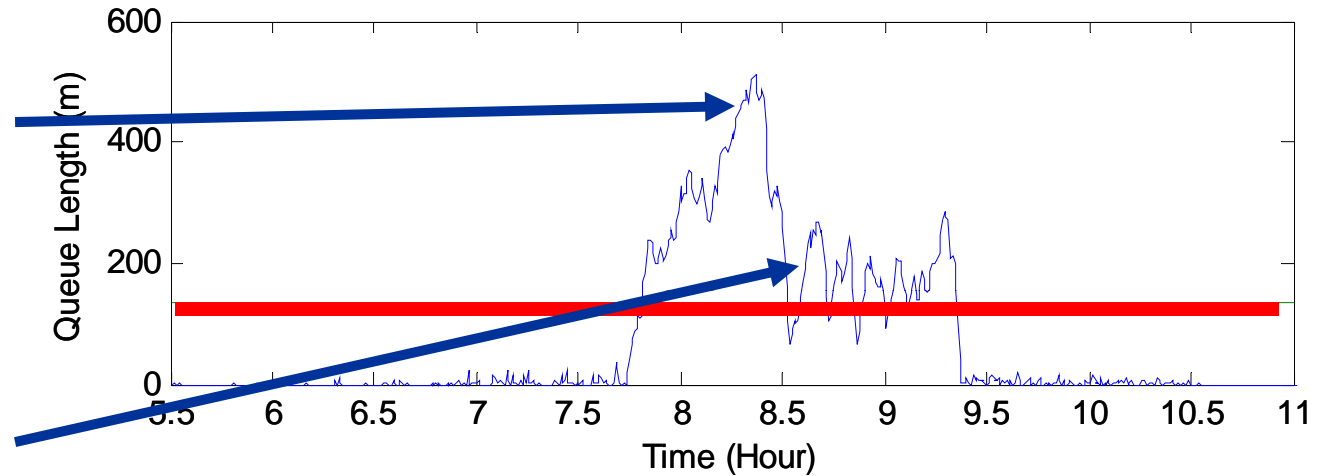


Ramp Metering: On-Ramp Queue Control

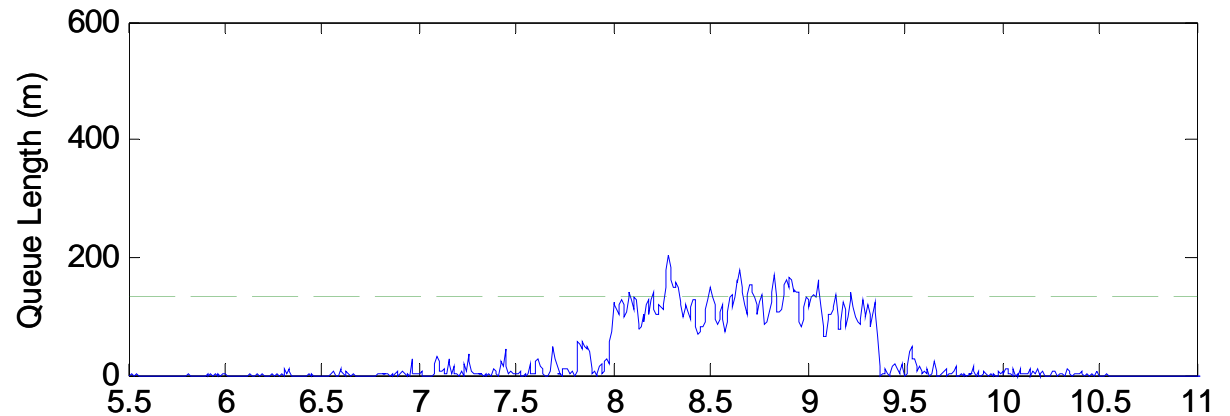
Queue Override

- failed to limit the queue within the limits
- large variation in queue length

Queue Override



Queue Estimation & Control





Ramp Metering: I-210W (1)

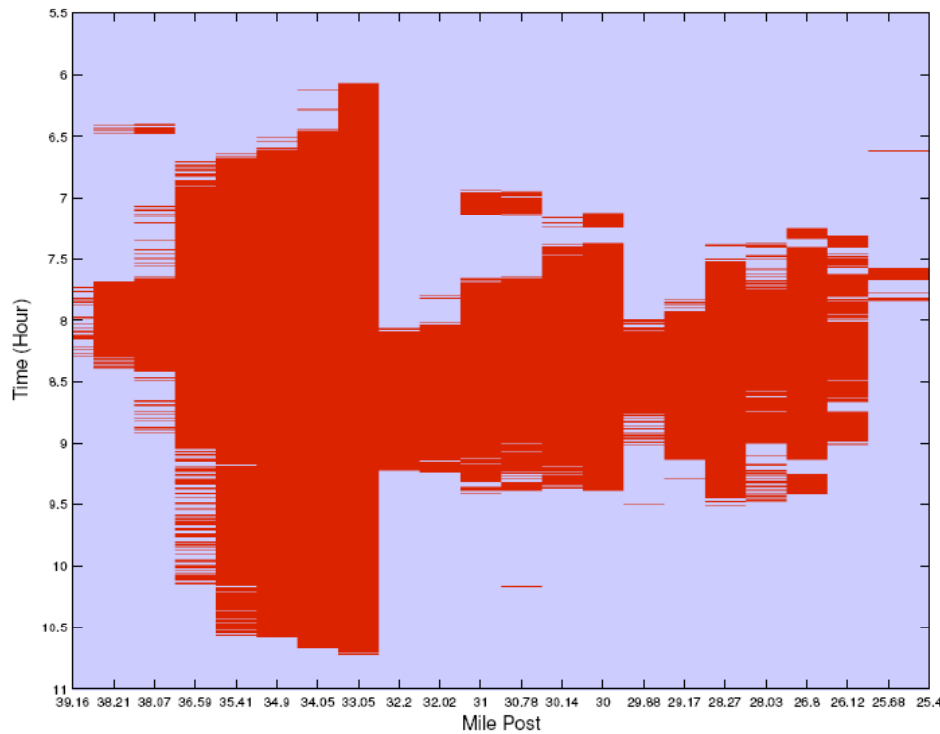


- **I-210 West in Pasadena, CA (Los Angeles– D7)**
- **14 miles long**
 - 20 controlled on-ramps
 - 1 uncontrolled freeway connector (I-605N)
 - 18 off-ramps
- **Heavy Congestion in commute hours**

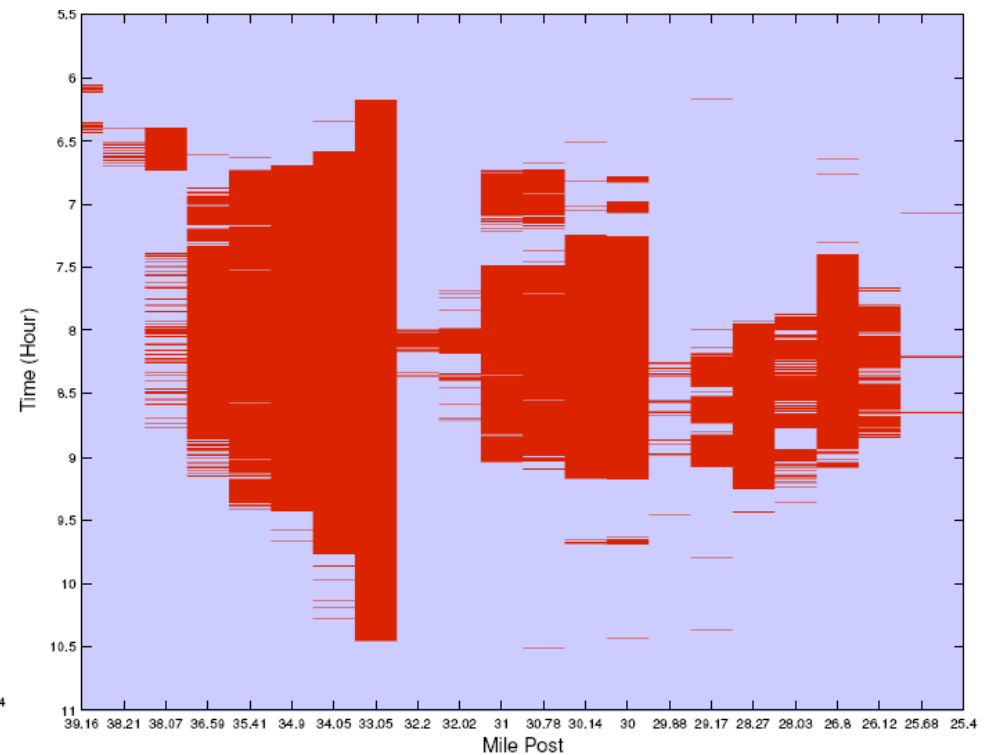


Ramp Metering: I-210W (2)

Existing



Proposed



Improvements:

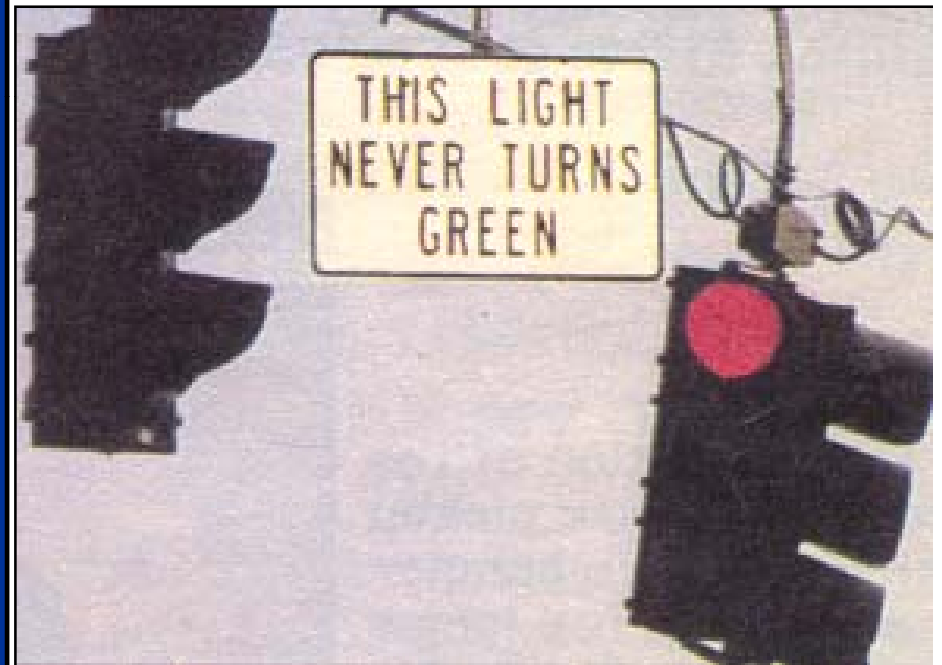
- 6% Travel Time
- 16% Delay Reduction



Signal Systems: State of Practice

National Traffic Signal REPORT CARD 2007

Management	D-
Signal Operation at Isolated Intersections	C
Signal Operation in coordinated systems	D
Signal Timing Practices	C-
Traffic Monitoring and Data Collection	F
Maintenance	C-
OVERALL	D





Problem Statement

Need

- **Performance measurement on arterials**
Travel times, delays, queue lengths
- **Data**
Signal status & settings (cycle, length, splits, offsets)
Counts & occupancy (density) from detectors
- **Low computational requirements**

Approach

- **Travel time estimation model**
Modeling of traffic dynamics
Consider effect of signal coordination
- **Develop APeMS (arterial performance measurement system)**



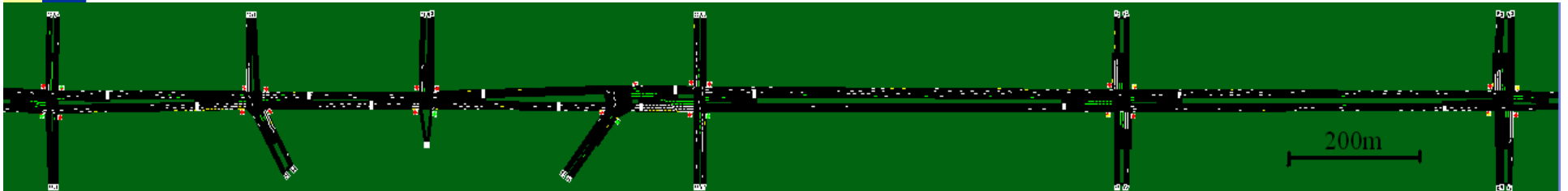
Model Application (1)

Lincoln Avenue, Los Angeles

- Traffic data (*counts, occupancy*) from midblock loop detectors part of the LADOT ATSCAC system
- Multiphase traffic responsive signal operation (C=100-150sec)

Data Collection:

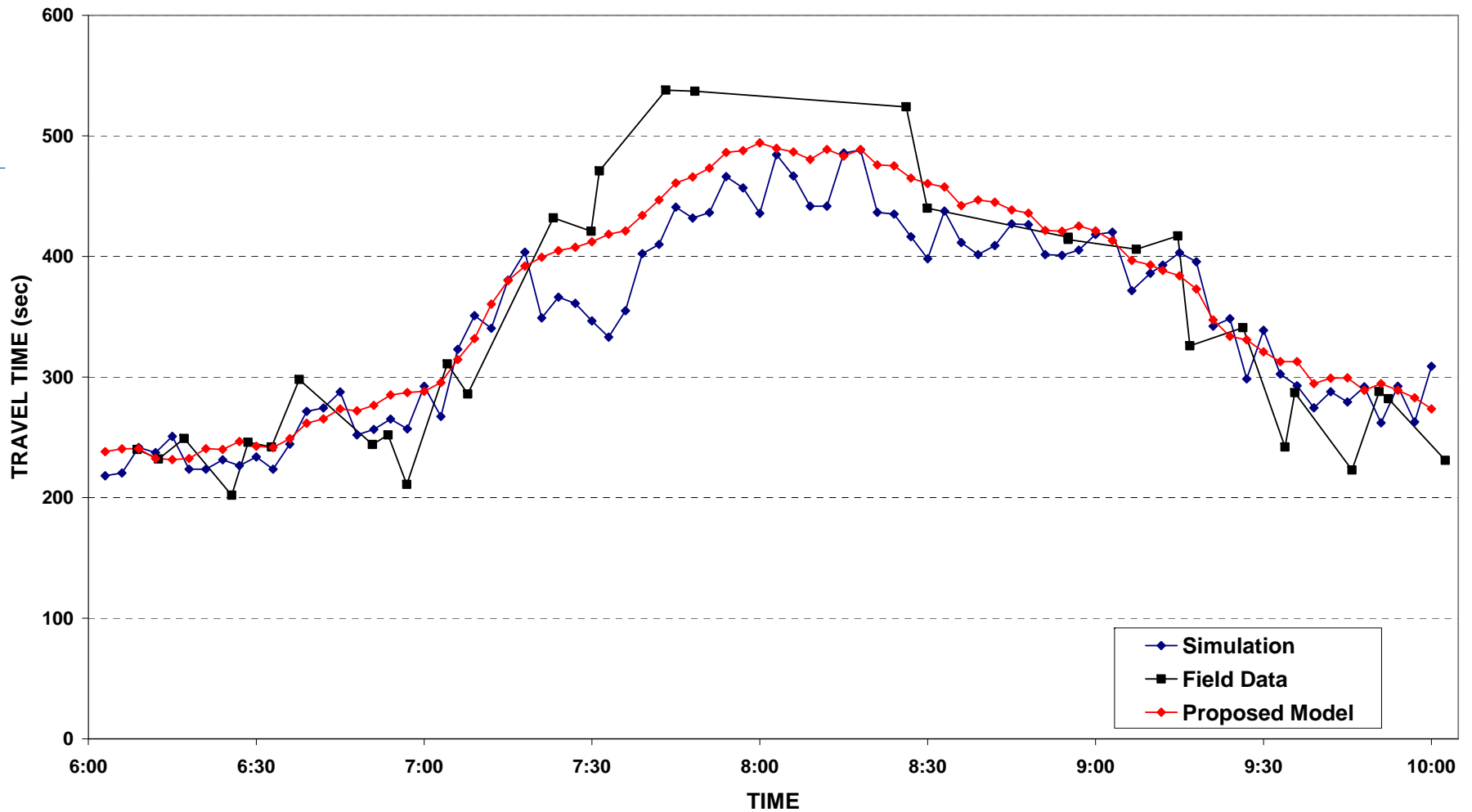
- Turning movement counts (6-10 am)
- Probe vehicle travel times (at 7 min headways)





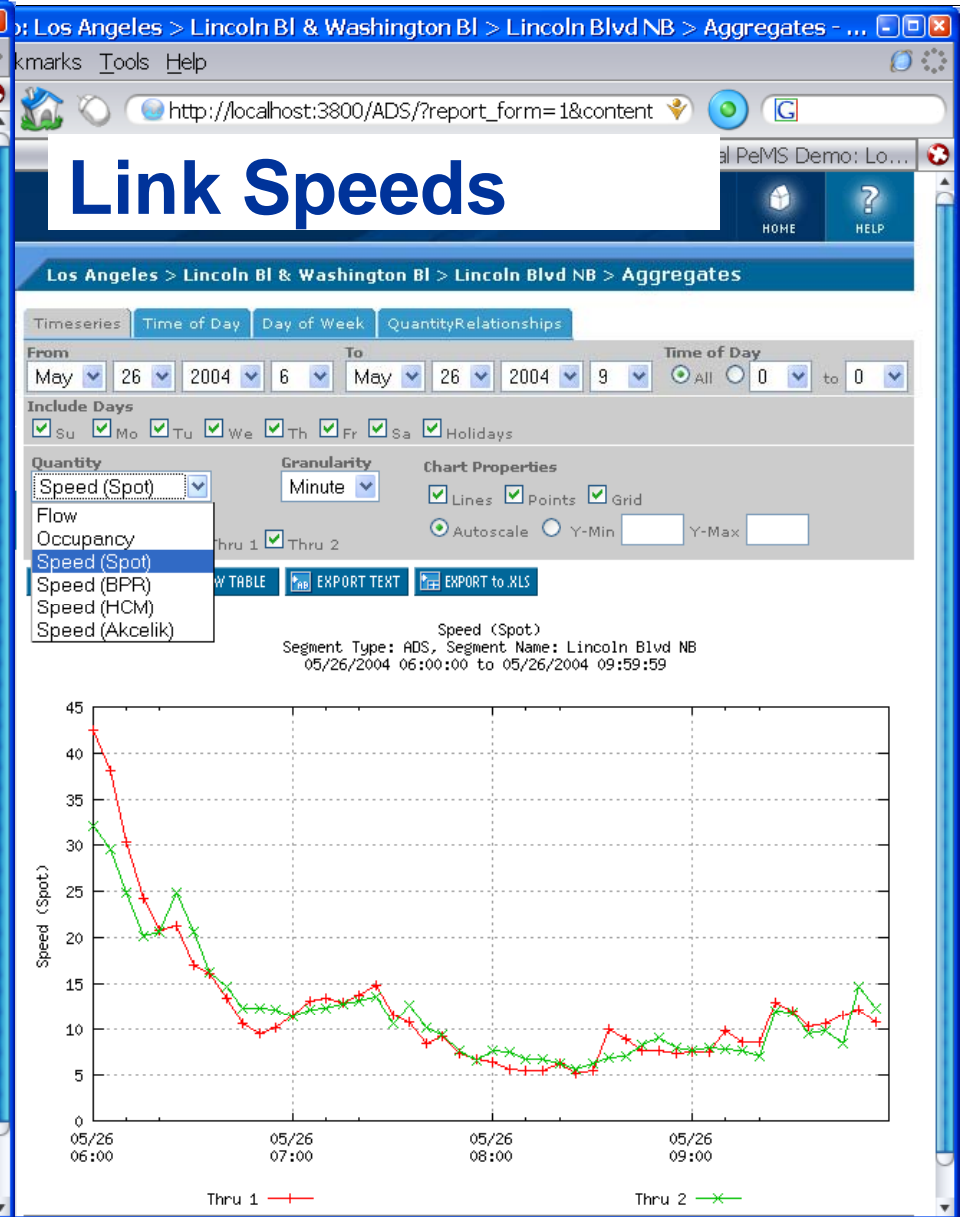
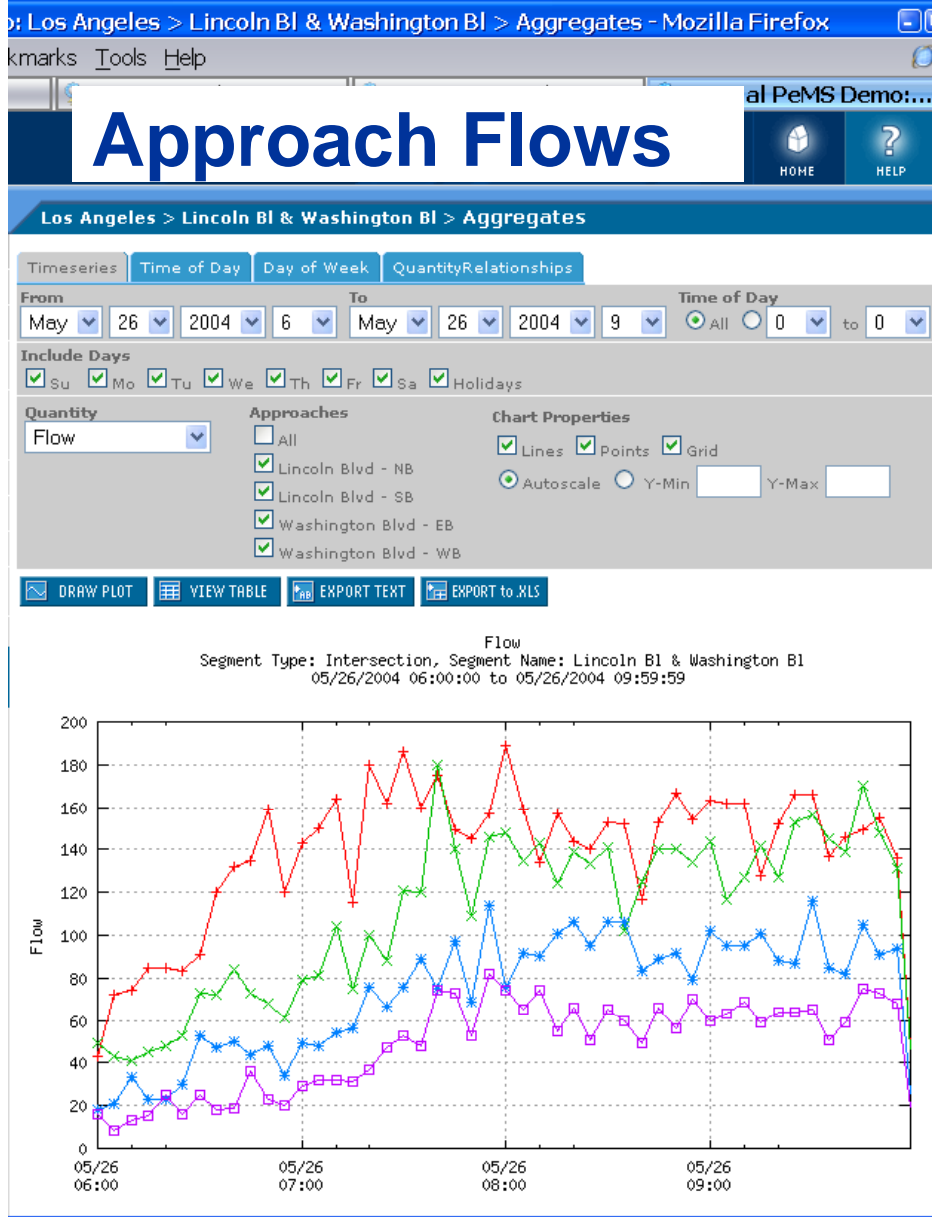
Model Application (2)

Lincoln Avenue: Travel Times NB Direction





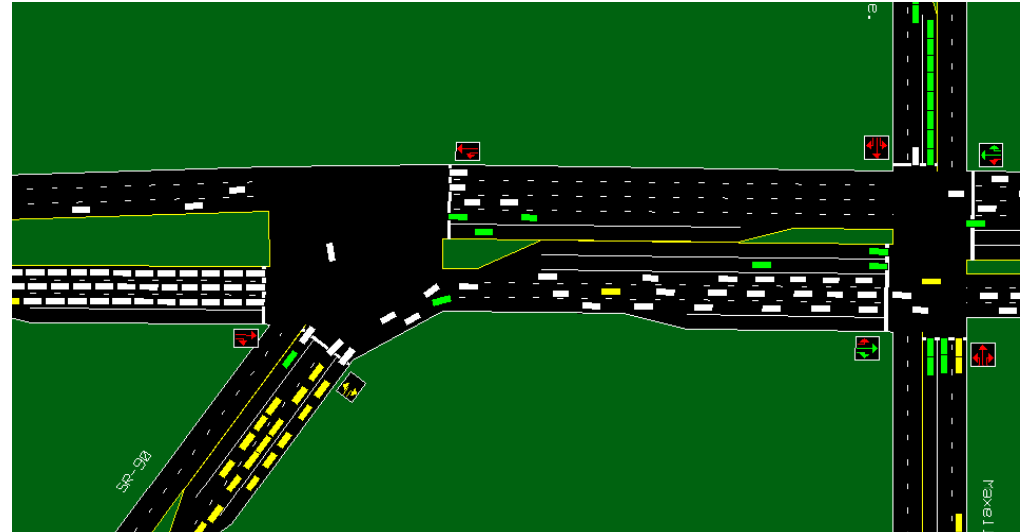
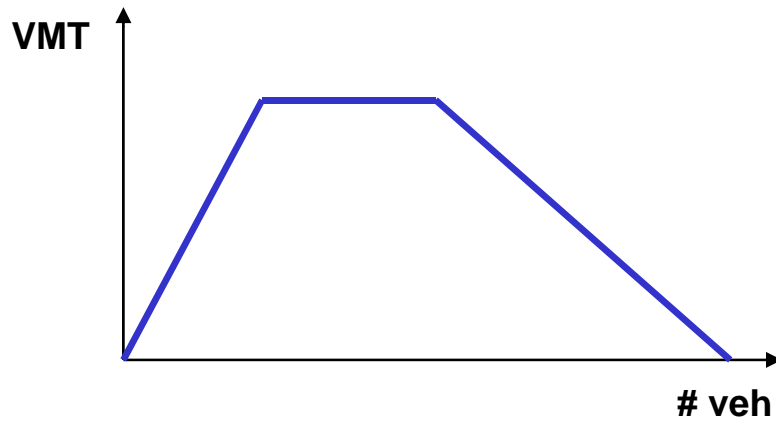
APeMS Pilot Implementation





Fundamental Diagram: Single Link

- Accumulation: # veh
- Travel Production: VMT
- Output (vehs/hr)



Flow Regimes

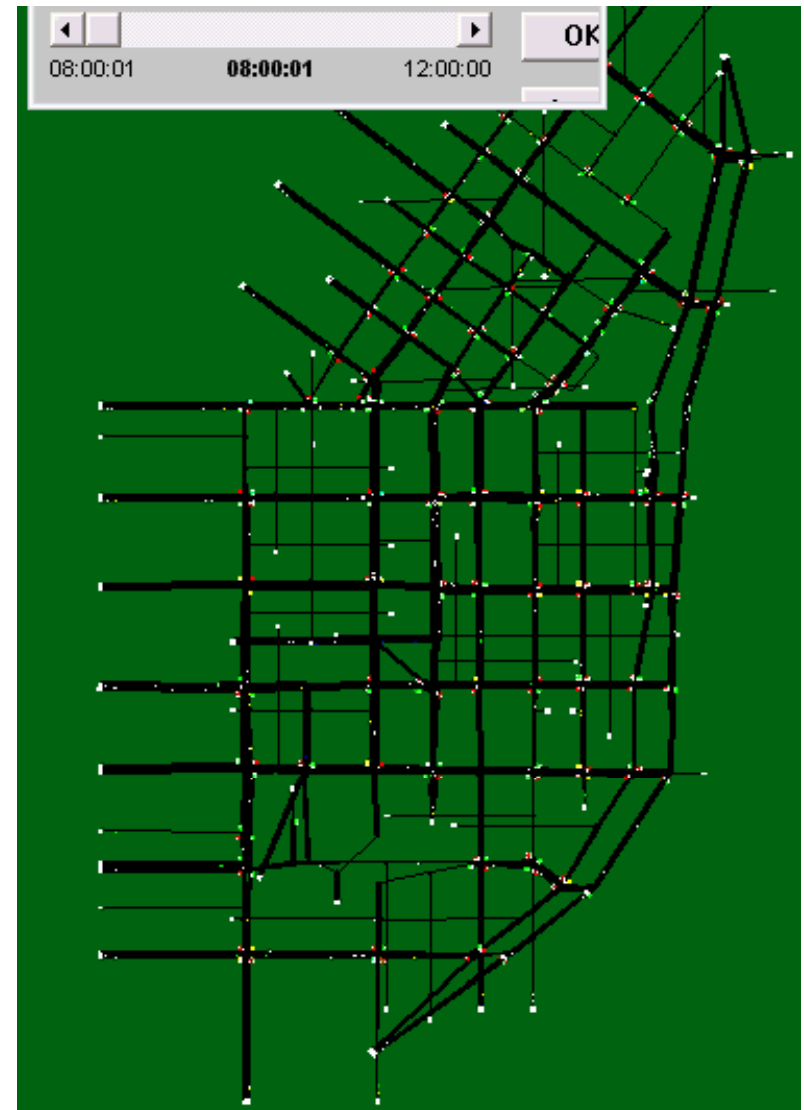
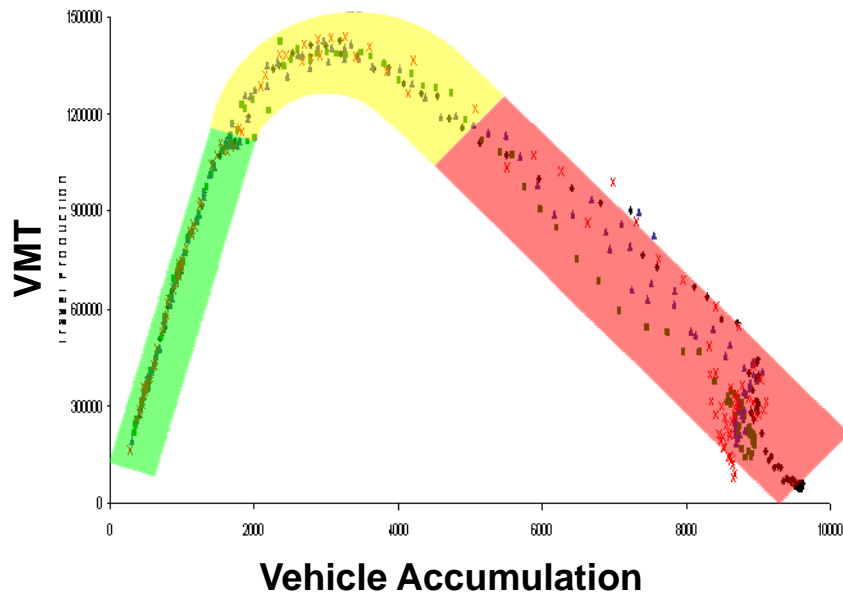
Undersaturated

Efficient

Oversaturated: Queue spillbacks



Fundamental Diagram: Network

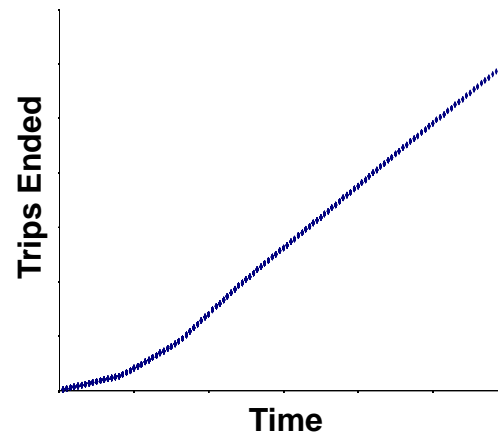
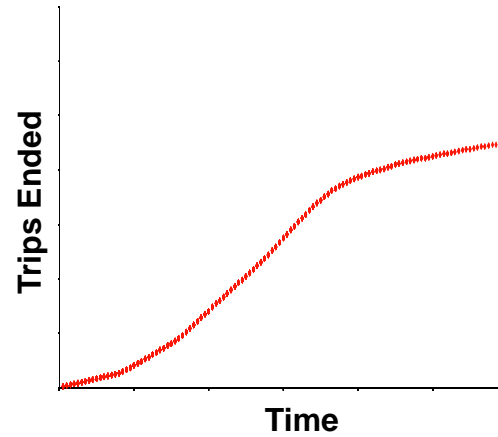
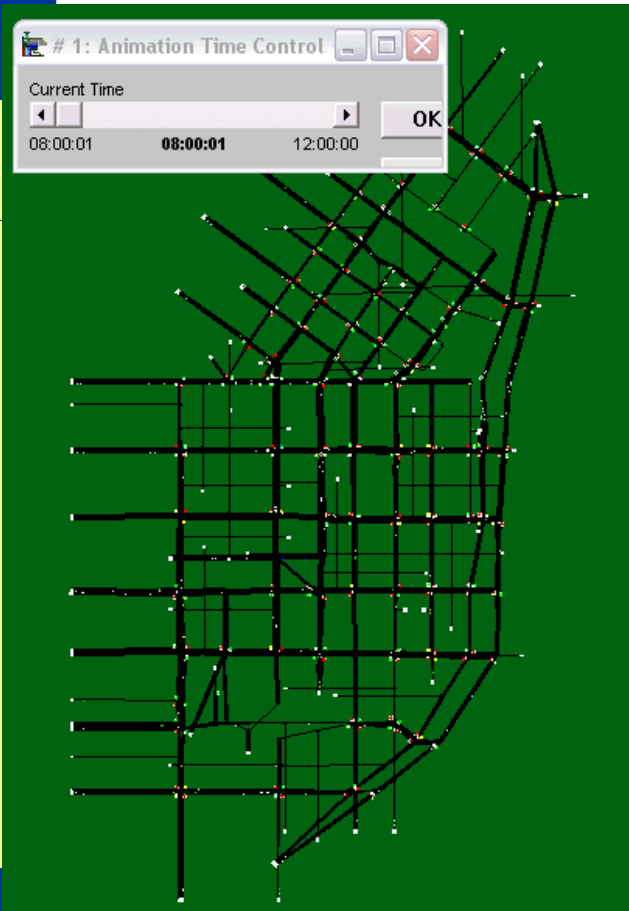




Effect of Perimeter Control (Gating)

No Control

With Control





Management Options: Control

