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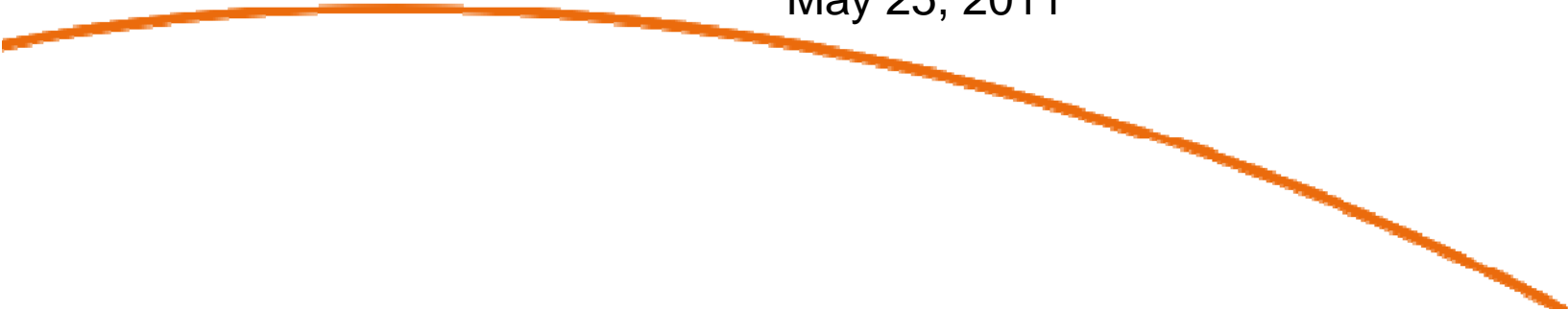
OPAC Adaptive Engine Pinellas County Deployment

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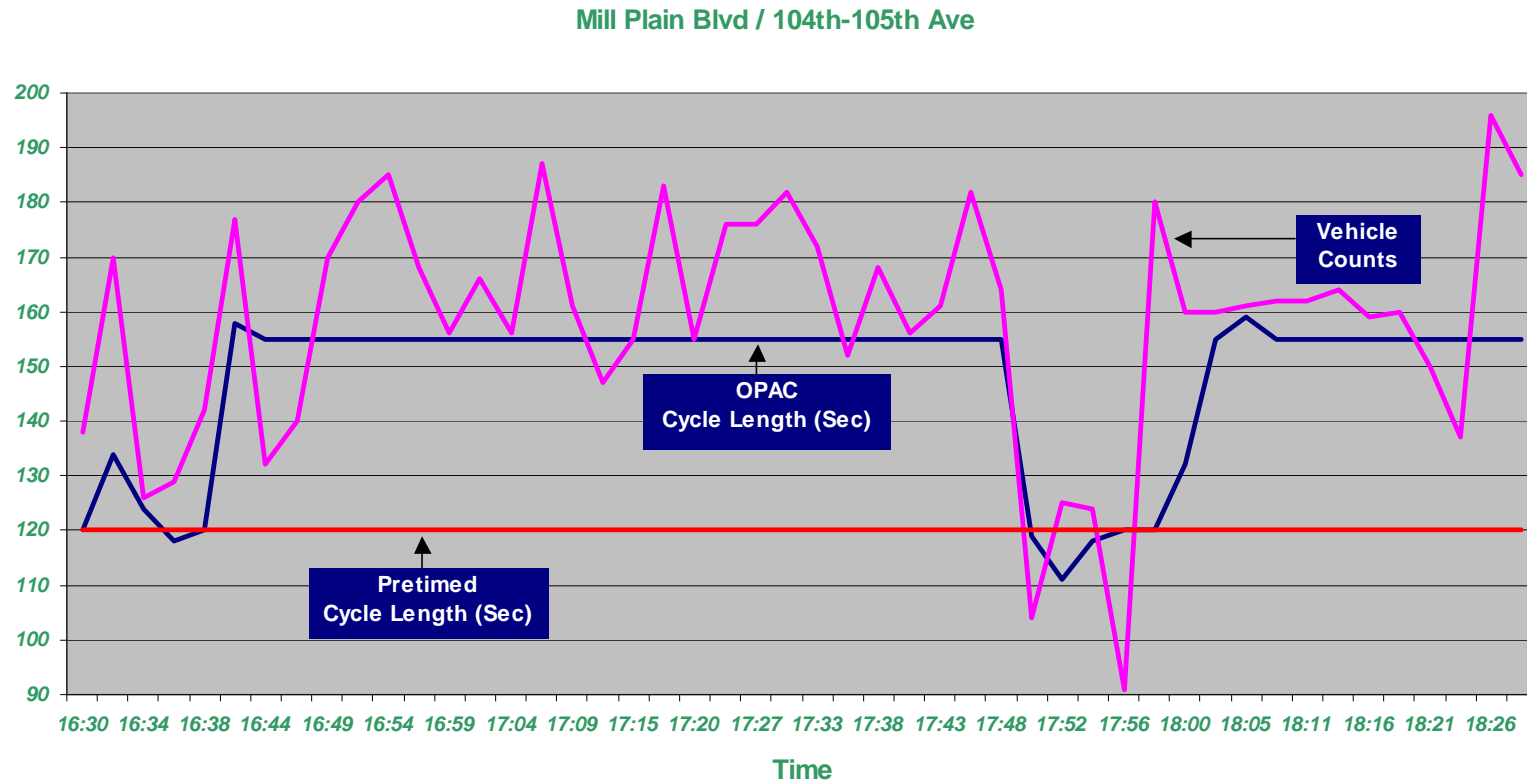
Presentation Agenda

- Adaptive control systems - expected benefits
- An overview of OPAC
- Case Study – Pinellas County Project

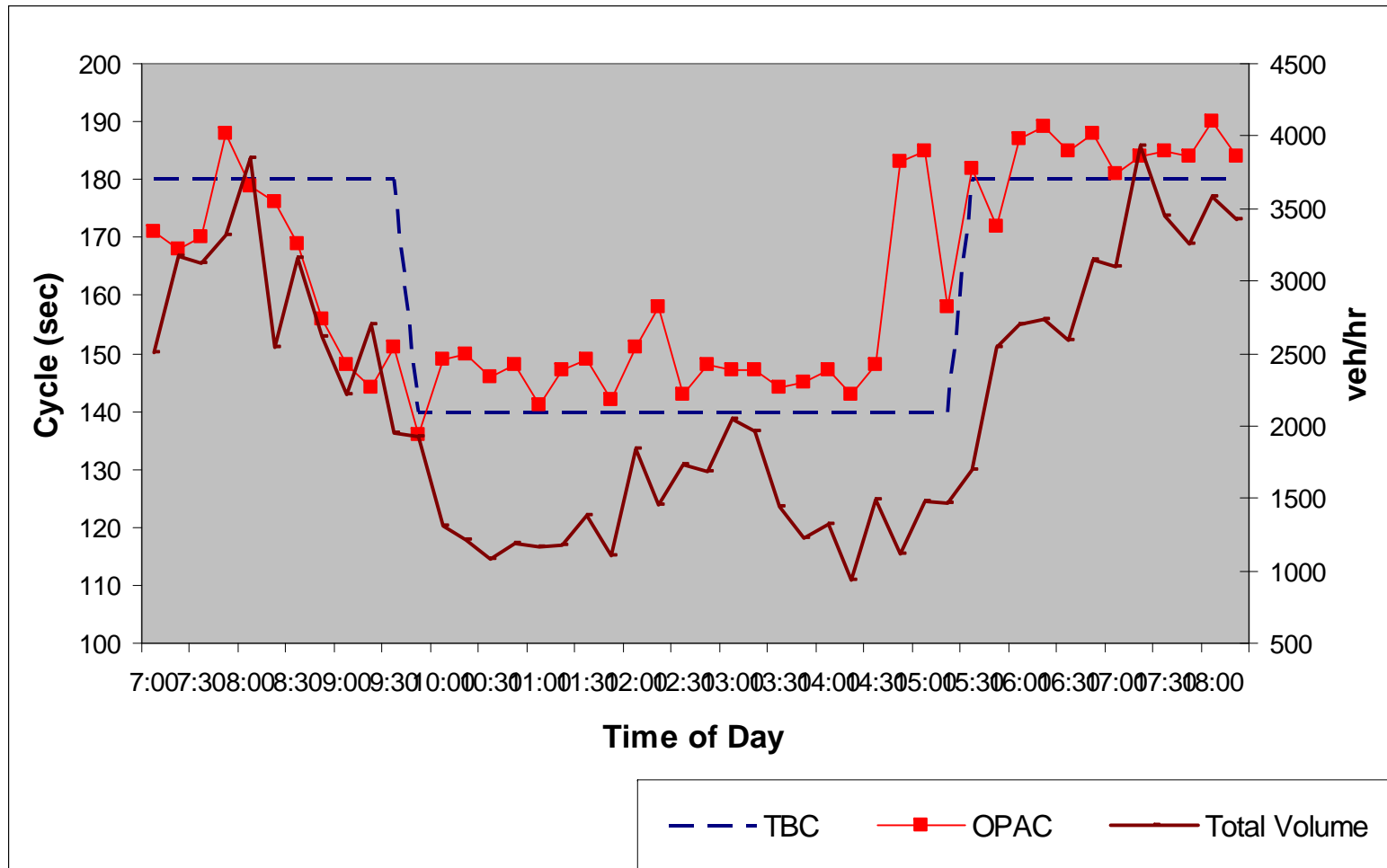
Expected Benefits

- **Mitigate effects of the capacity reduction through efficient use of the existing capacity (Proactive traffic management)**
- **Adjusts to traffic fluctuations and surges**
- **Continuously adjust signal timing parameters**
- **Reduce stops/delay, fuel consumption, and emissions**

Adaptability - Cycle Optimization



Adaptability - Cycle Optimization



Adaptive Control Systems Design

- Fully Adaptive vs. Partially Adaptive
- Centralized vs. Distributed
- Proactive vs. Reactive

Traffic Responsive (TRSP) is not an adaptive system

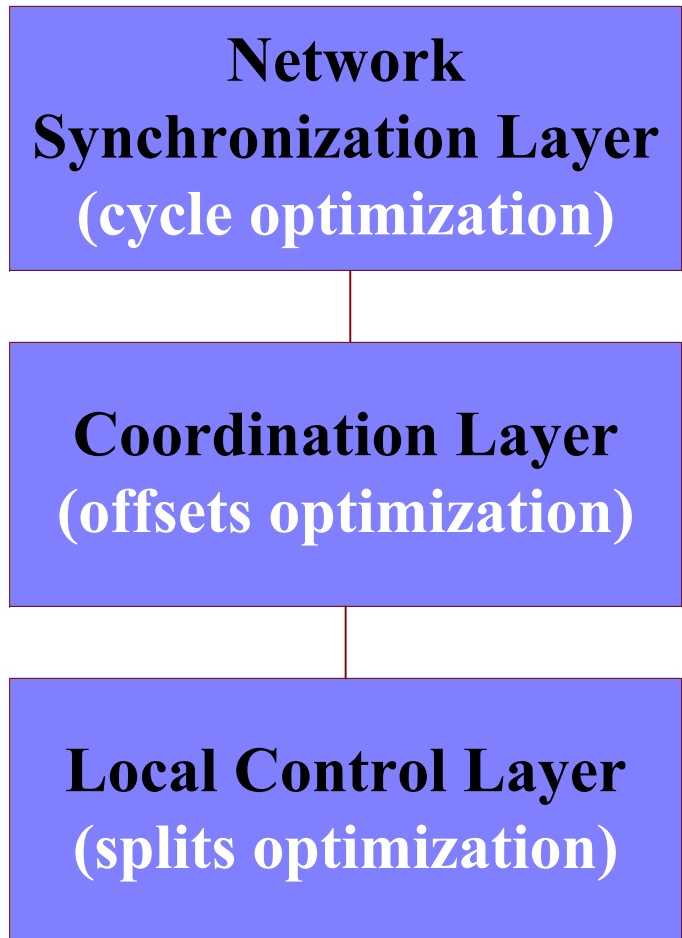
OPAC Adaptive Control

- **Optimized Policies for Adaptive Control (OPAC)**
- **A fully adaptive, proactive, and distributed real time traffic control system**
- **Deployed as part of FHWA 1992-1995 RT-TRACS program**

OPAC Fundamental Features

- Optimization of any or all phase splits designed to minimize total intersection delay and/or stops
- Support for phase skipping in the absence of demand
- Multiple sets of configuration parameters for customizing the resulting timing to weight certain movements for special circumstances or by time of day
- Configurable to respond to changes in left turn lead/ lag phasing by time of day
- Special considerations for phase timing in the presence of congestion (high detector occupancy)

Control Layers in OPAC



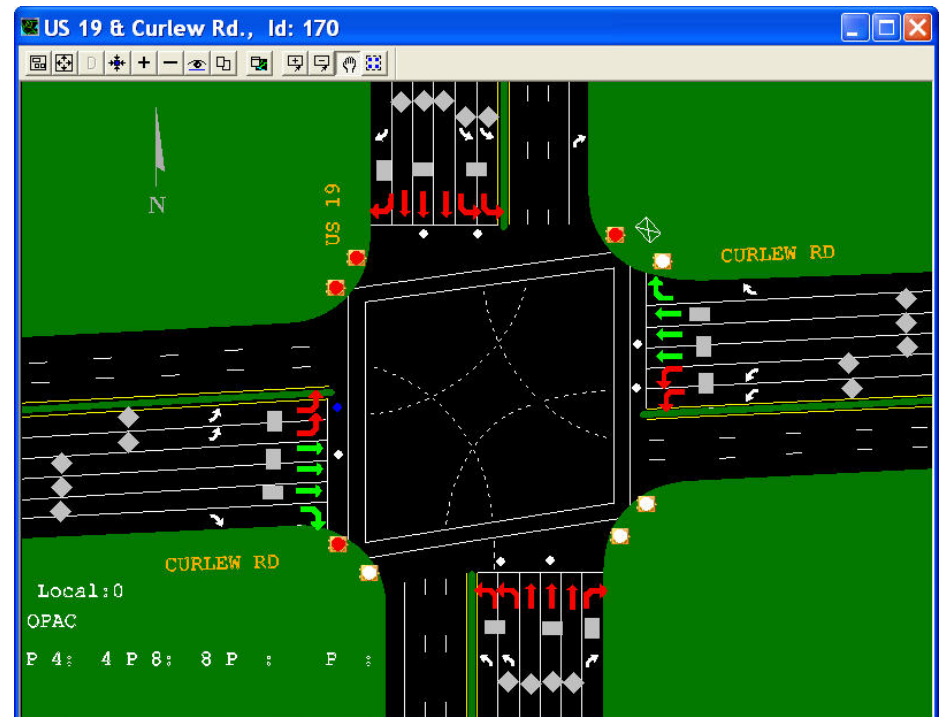
- Split – Distributed to each intersection
- Offset – Distributed to each intersection
- Cycle Length – Section-wide; calculated at central
 - Background cycle (Dominant intersections)

Performance Measures

- Real-time estimates of phase-specific parameters such as queue length, speed, travel-time from detectors to standing queues, delay and stops
- Logged measures of effectiveness, including average cycle lengths, vehicle counts by phase, and average phase green times and estimated speeds.

Data Requirements

- Upstream detectors on each lane
- Once/sec vehicle count and occupancy data



Hardware Requirement

- Advanced traffic controllers, NTCIP (e.g., 2070 or NEMA TS-2)
- Communication media: copper, fiber, wireless
- Serial or Ethernet communications
- Local processor board (Distributed system)

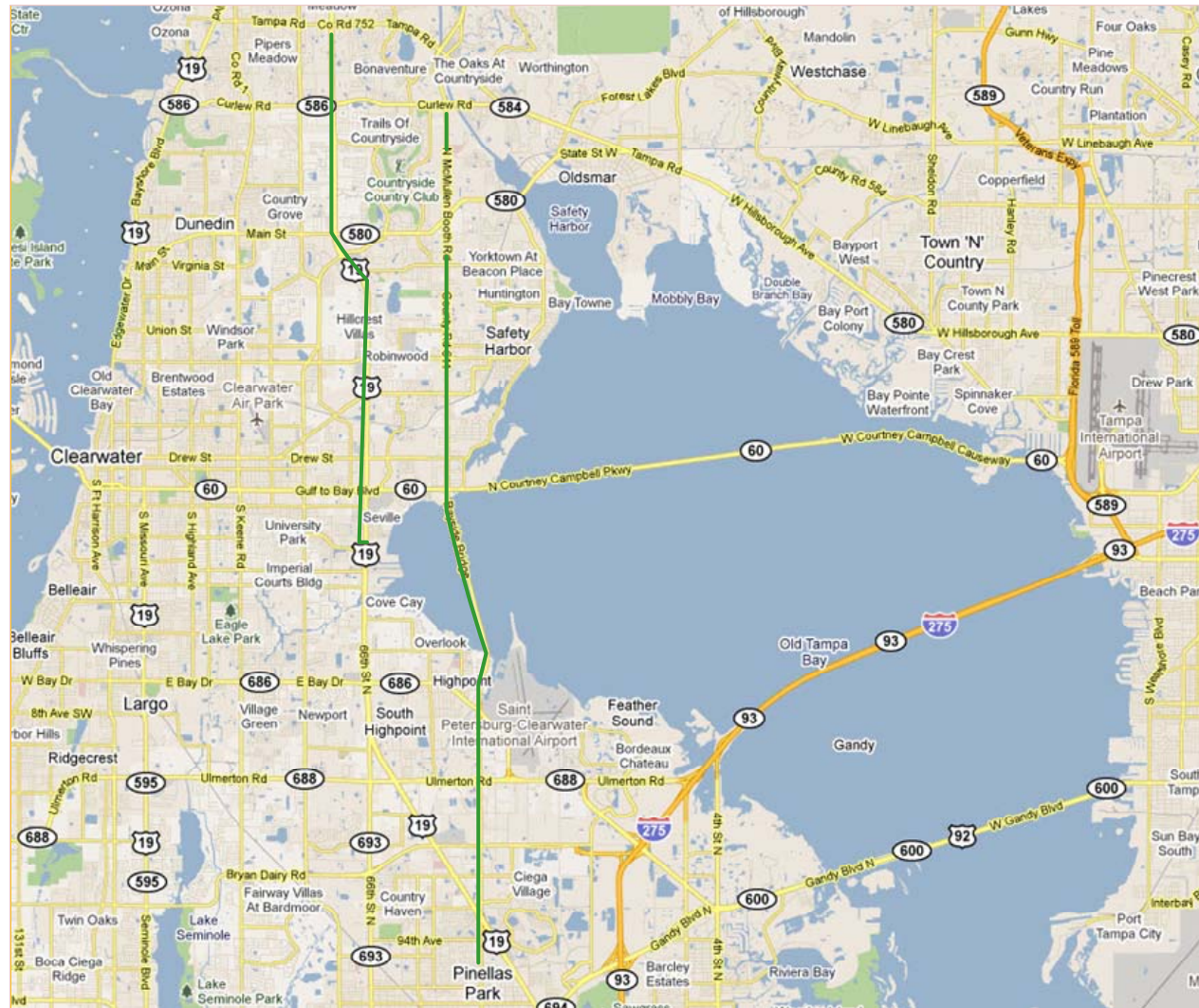


Integration with Current Infrastructure – Traffic Management System

The screenshot displays the MIST Operator Interface software. The 'Signal Control' menu is open, showing a path to 'OPAC' > 'Coordinated' > 'Site'. The 'Signal Control Navigator' sidebar is visible on the left, and a table of signal sections is shown at the bottom.

Section...	Channel...	Channel Addr...	Region...	
102 Main Blvd / Brooke Rd	1	101	2	1
201 Richmond Hwy / Huntington Ave	2	200	1	1
202 Richmond Hwy / Buckman Rd	2	200	2	1
301 Dale Blvd / First Ave	3	300	1	1
302 Dale Blvd / Second St	3	300	2	1
401 Mill Plain Blvd / Heather Blvd	4	850	1	1
402 Mill Plain Blvd / Olympia Ave	4	400	1	1
404 Mill Plain Blvd / 104th Ave	4	450	52	1
405 Chkalov Ave / 120th Ave	4	450	53	1

Project Area



Communications

- **Communications**
 - Initial deployment: serial comm
 - Communication media: fiber
 - Converted to Ethernet based comm since 2010
- **Detections Technologies:**
 - Magnetic loops, RTMS, Sensys
- **Signal System Platform**
 - MIST traffic management platform
 - 2070 controllers with Econolite ASC/3-2070 firmware

Success of the system *

- Independent before/after study to determine the RT-TRACS software operation versus traditional time-of-day signal plans started October 2006 and was completed in 2007
- Study determined that OPAC US19 travel times were reduced by an average of 7.5%, with peak travel times dropping 25%
- The results determined there was over \$1 million in annual fuel savings alone as a result of the new system, and a benefit/cost ratio of approximately 7:1

* Courtesy of Pinellas County Public Works

Success of the system * (don't stop there!)

- 2008 changes to adaptive parameters resulted in an additional reduction of 10%, on average, to the travel times across the corridors

- What about safety?
 - Total accidents are down by 30%, pre-adaptive year crash data vs. post-adaptive year crash data
 - ▶ Rear-end accidents decreased by 18%
 - ▶ Serious injuries have been reduced by 40%

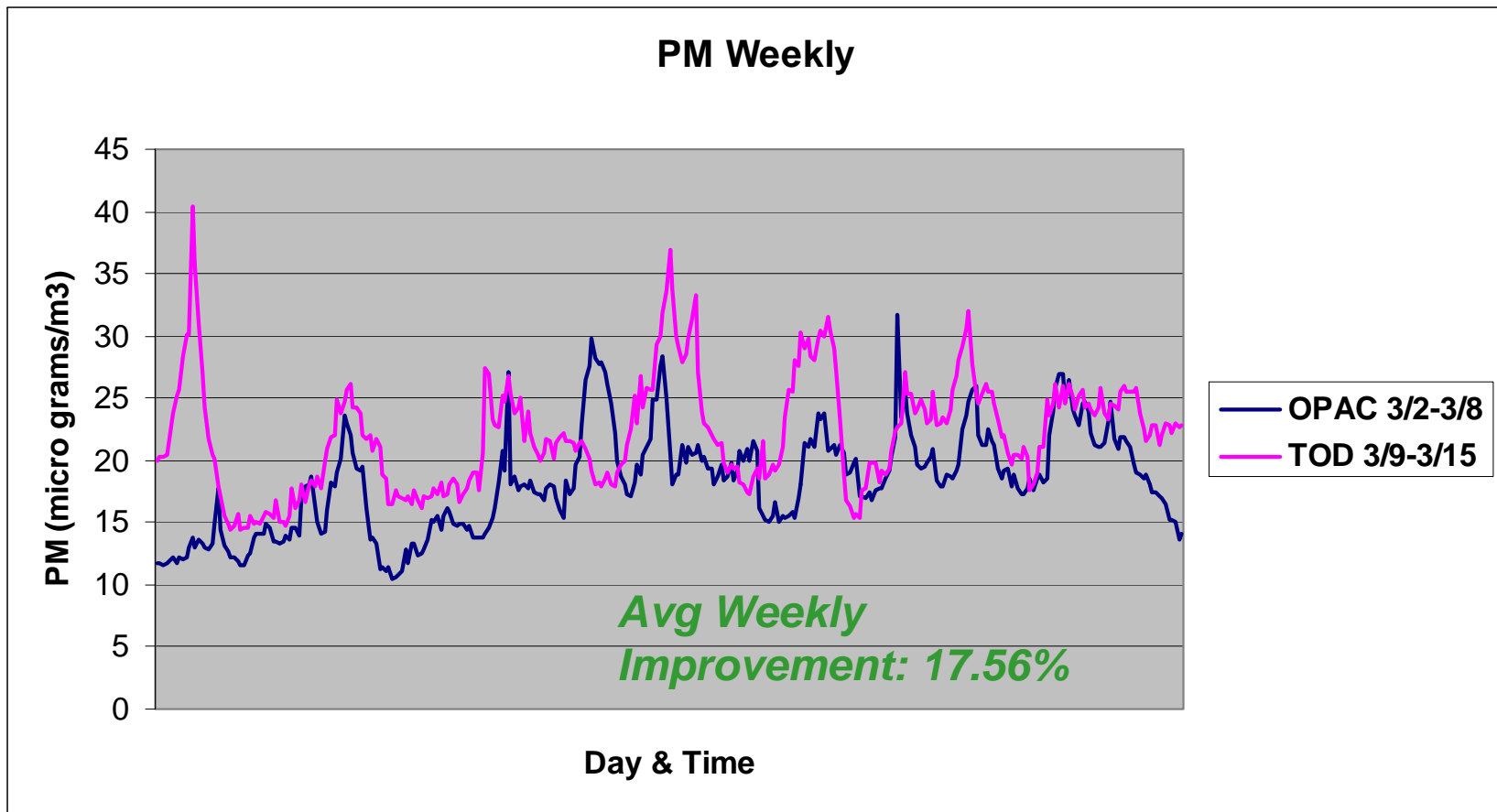
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Green Corridors: Adaptive Control and Air Quality

- Traditional approach: travel time & stops/delays
- Environmental evaluation: Air quality parameters

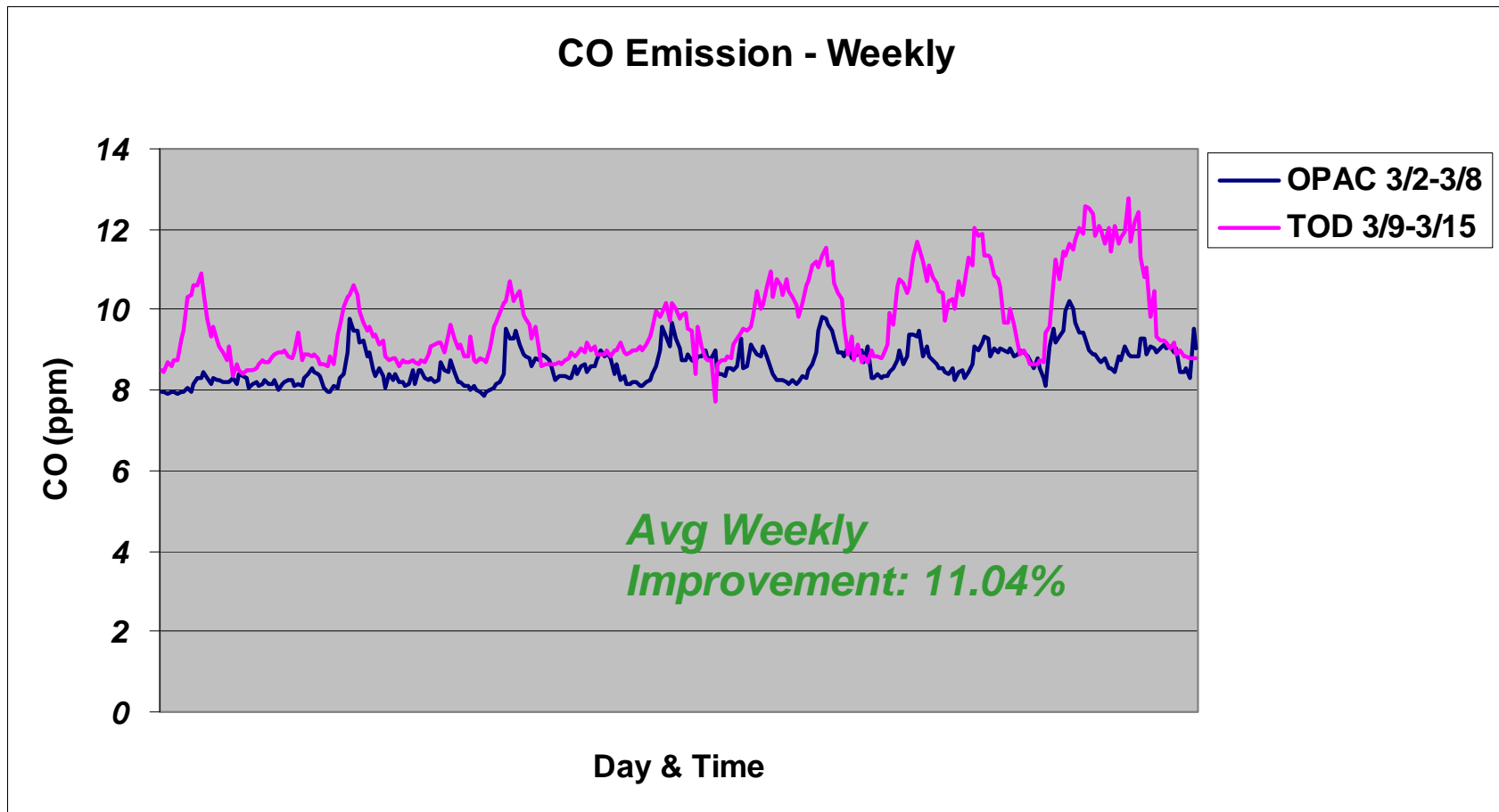


Initial Results: OPAC Adaptive vs. TOD Particulate Matter (PM)



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Initial Results: OPAC Adaptive vs. TOD Carbon Monoxide (CO)



Conclusions

- Growing interest in deployment of adaptive signal systems
- Proven technologies for effective arterial corridor management
- Enhanced features utilizing on going advancements in communication systems, detection technologies and traffic control devices
- “Given the appropriate technical staff and an eagerness to learn, one cannot deny the benefits adaptive signal control software can provide.”

Pinellas County Public Works



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Thank You

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