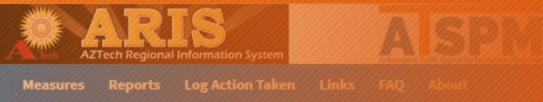


ATSPM Rural Applications - Arizona Experiences



Signal

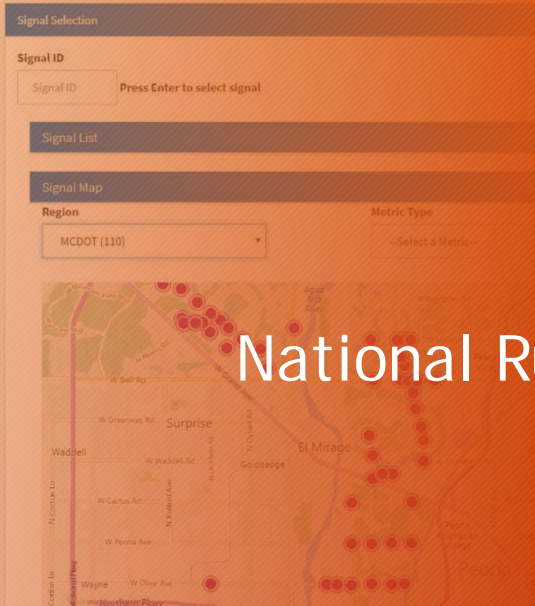
Jeff Jenq, Ph.D.
OZ Engineering

April Wire, P.E., P.T.O.E.
Maricopa County DOT

National Rural ITS and ITS Arizona Annual Conference

October 23, 2018

Phoenix, Arizona



Outline

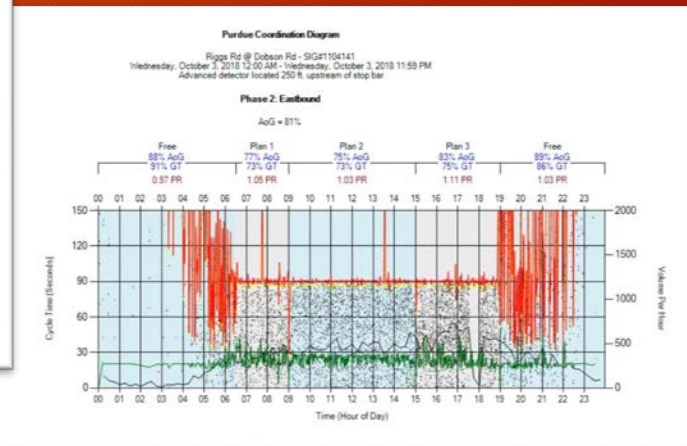
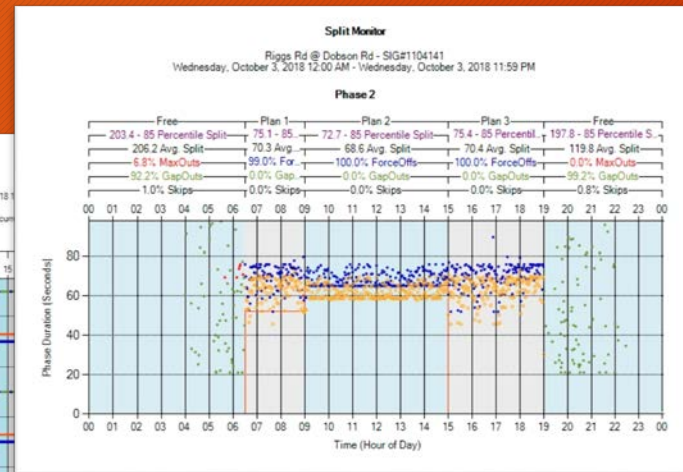
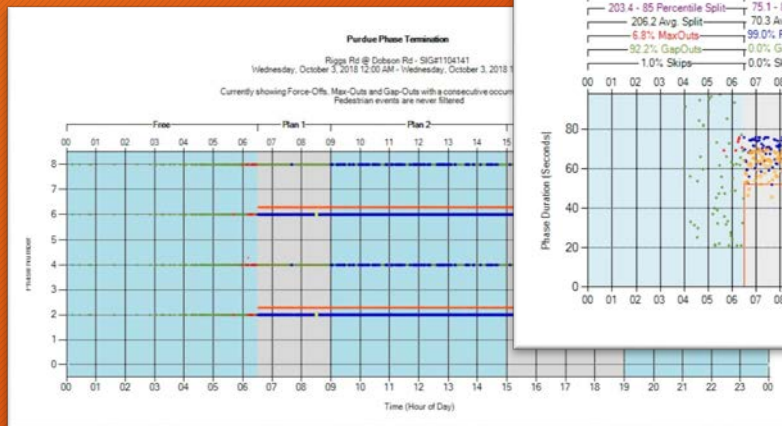


- Regional ATSPM Deployment in Greater Phoenix Area (Jeff Jenq)
- Maricopa County Department of Transportation (MCDOT) rural ATSPM applications (April Wire)

Performance of a Traffic Signal



Describe inadequate signal timing...



Automated Traffic Signal Performance Measures (ATSPM)



Collects high-resolution data



Compatible Controllers:

- Econolite Cobalt: Any Version
- Econolite ASC3 NEMA: V. 2.50+ & OS 1.14.03+
- Econolite 2070 with 1C CPU Module: V. 32.50+
- Intelight Maxtime: V. 1.7.0+
- Peek ATC Greenwave 03.05.0528+
- Trafficware 980ATC V. 76.10+
- Siemens M50 Linux & M60 ATC
 - ECOM V. 3.52+
 - NTCIP V. 4.53+

Event Code	Event Descriptor	Parameter	Description
Active Phase Events:			
0	Phase On	Phase # (1-16)	Set when NEMA Phase On becomes active, either upon start of green or walk interval, whichever occurs first.
1	Phase Begin Green	Phase # (1-16)	Set when either solid or flashing green indication has begun. Do not set repeatedly during flashing operation.
2	Phase Check	Phase # (1-16)	Set when a conflicting call is registered against the active phase. (Marks beginning of MAX timing)
3	Phase Min Complete	Phase # (1-16)	Set when phase min timer expires.
4	Phase Gap Out	Phase # (1-16)	Set when phase gaps out, but may not necessarily occur upon phase termination. Event may be set multiple times within a single green under simultaneous gap out.
5	Phase Max Out	Phase # (1-16)	Set when phase MAX timer expires, but may not necessarily occur upon phase termination due to last car passage or other features.
6	Phase Force Off	Phase # (1-16)	Set when phase force off is applied to the active green phase.
7	Phase Green Termination	Phase # (1-16)	Set when phase green indications are terminated into either yellow clearance or permissive (FYA) movement.

UDOT ATSPM



Maricopa County Regional Deployment/AZTech:

- UDOT ATSPM V4.0 (2016)
- Open Source available on USDOT OSADP, GitHub

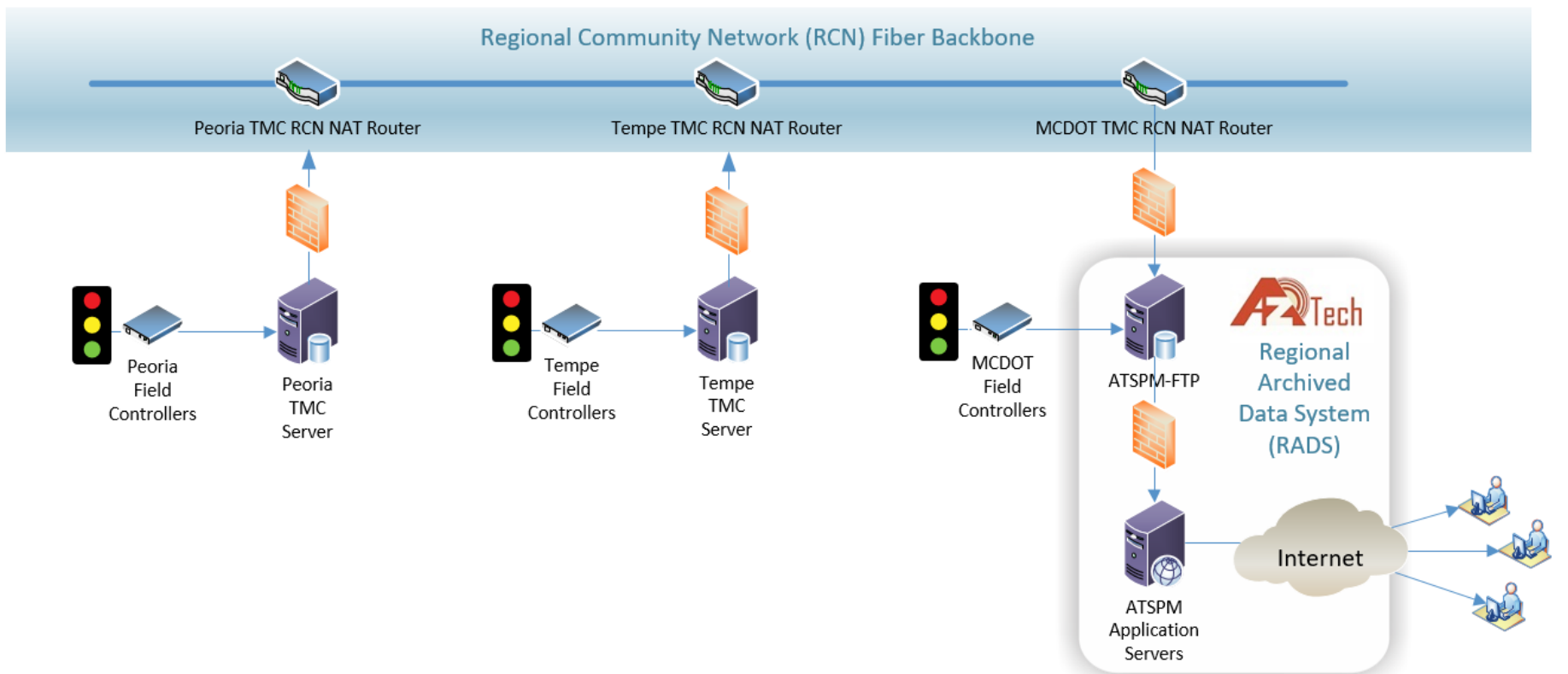
Other ATSPM solutions

- ATSPM software products that work with ATSPM compatible controllers
- Solution to legacy controllers

Regionally Shared ATSPM



AZTech RADS ATSPM Multi-Jurisdiction Configuration



Participating Jurisdictions



Jurisdictions	Controller Type	No. of Signals
Maricopa County	ASC/3, Cobalt	115
Tempe	ASC/3	108
Peoria	ASC/3, Intelight Maxtime	10
Gilbert	ASC/3	10
Scottsdale	ASC/3, Cobalt	10
Mesa	ASC/3, Cobalt	10
ADOT	Cobalt	10

Maricopa County, AZ Quick Facts



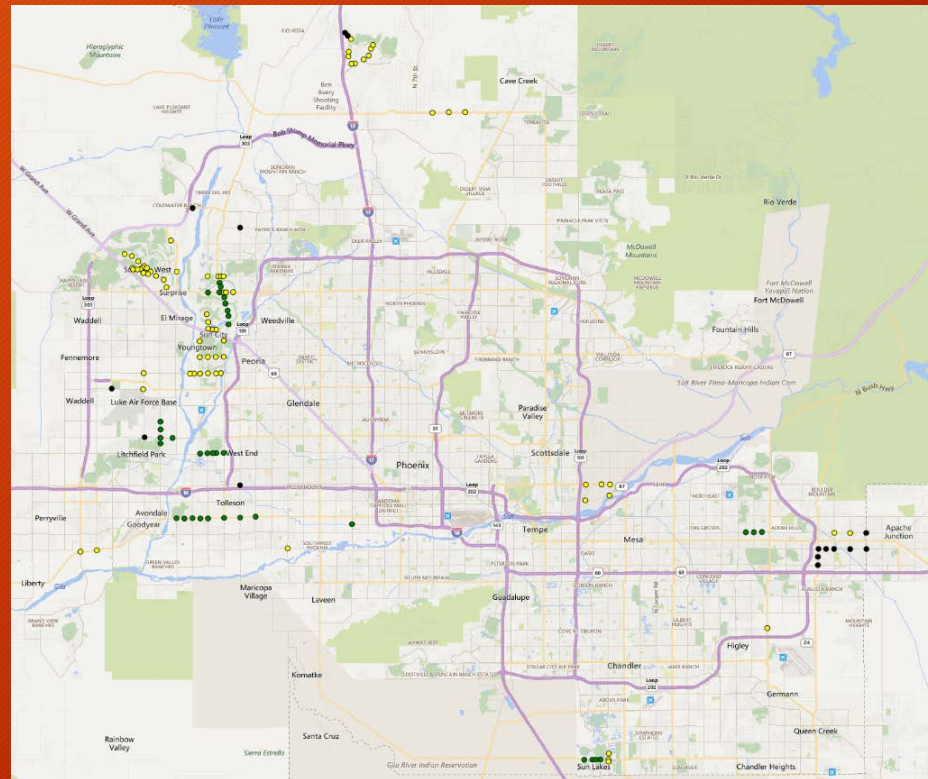
- 4th largest county by population
- Population of 4.2 million people
- 9,224 sq. miles
- 27 cities and towns within the County boundaries
- Larger than some states



Traffic Signal Infrastructure



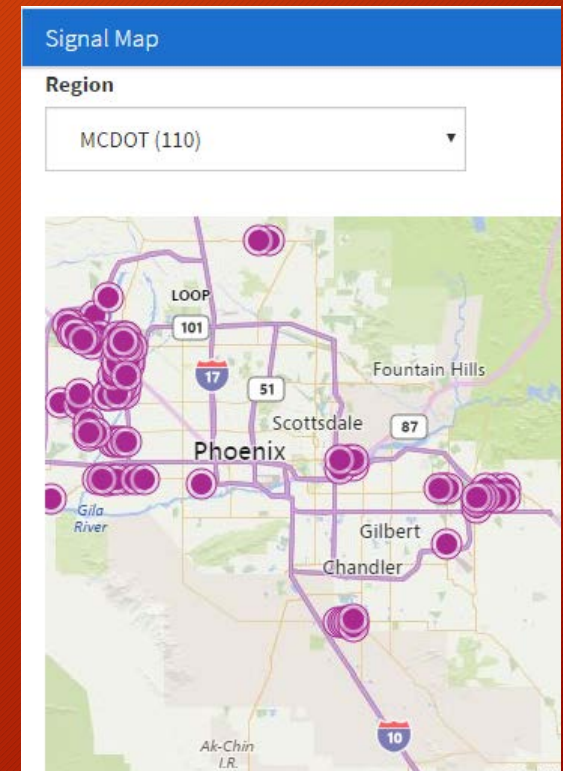
- Traffic signals are scattered throughout the County
- Few concentrated areas
- Most on the outer limits of urban areas
- Suburban or rural areas



Traffic Signal Infrastructure



- About 170 signalized intersections
- 122 controllers (70%) have communications
 - Fiber
 - Radio
 - Telephone lines (T1)
 - Cell Modem
- 115 collecting High Resolution Data (HRD) and integrated into the ATSPM system



Signal Operations



- Urban settings - faster identification of signal issues
 - More reliable communications infrastructure
- Rural settings - slower identification of signal issues and longer response/resolution time
 - Less reliable/no communications network
 - Longer distances to travel
- Urban & Rural - Without a tool agencies rarely revisit signal timing



Current Uses of ATSPM



- Identify detection failures
- Addressing citizen concerns
 - Split adjustments
 - Adjustments of TOD plans
- Justification for retiming projects
 - Review ATSPMs before starting the projects and data collection
- Monitoring Adaptive Signal Control Technology system performance

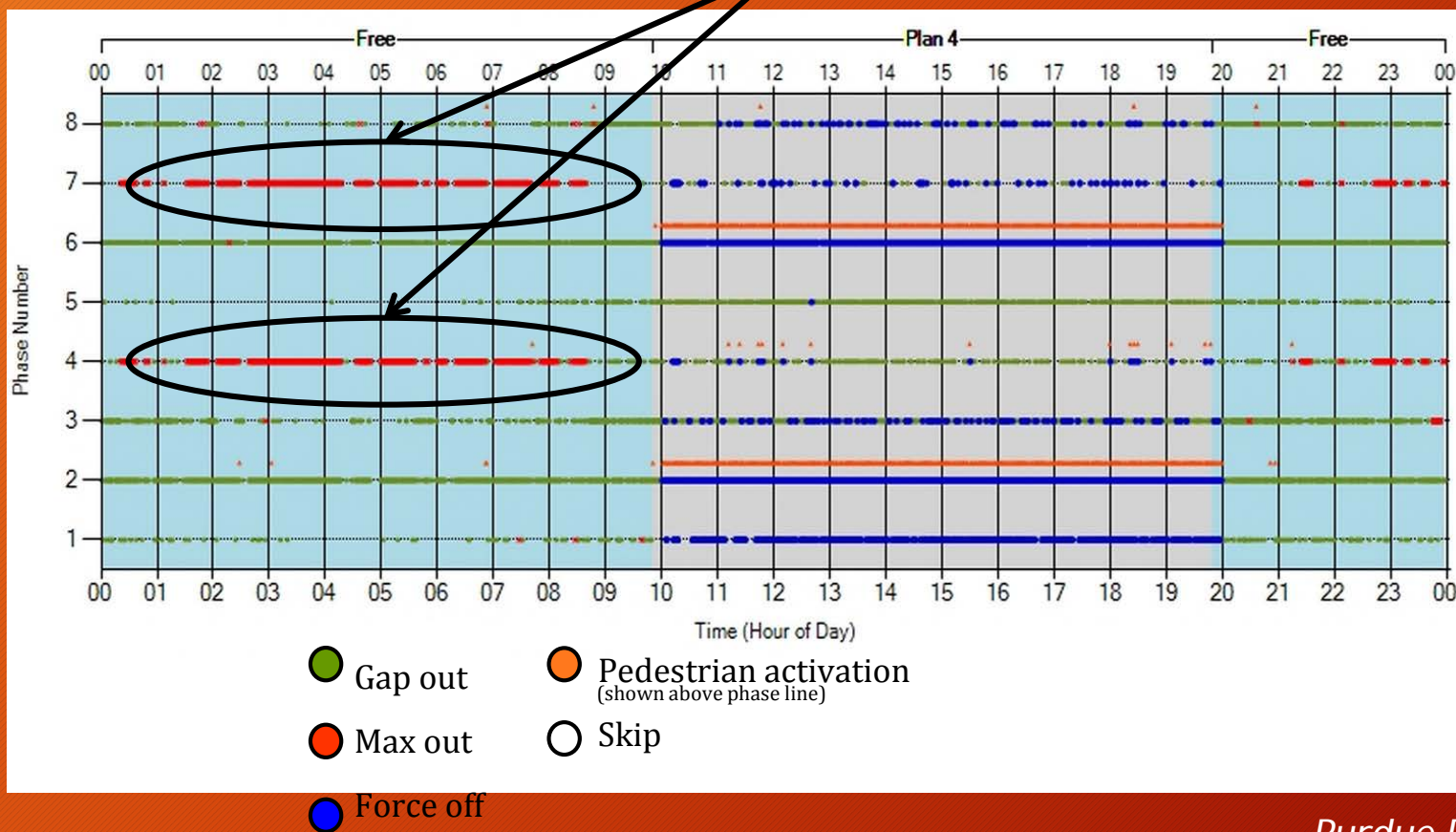


Detection Failures

BEFORE: Video detection not working at night



Minor street through & left turn max out at night only

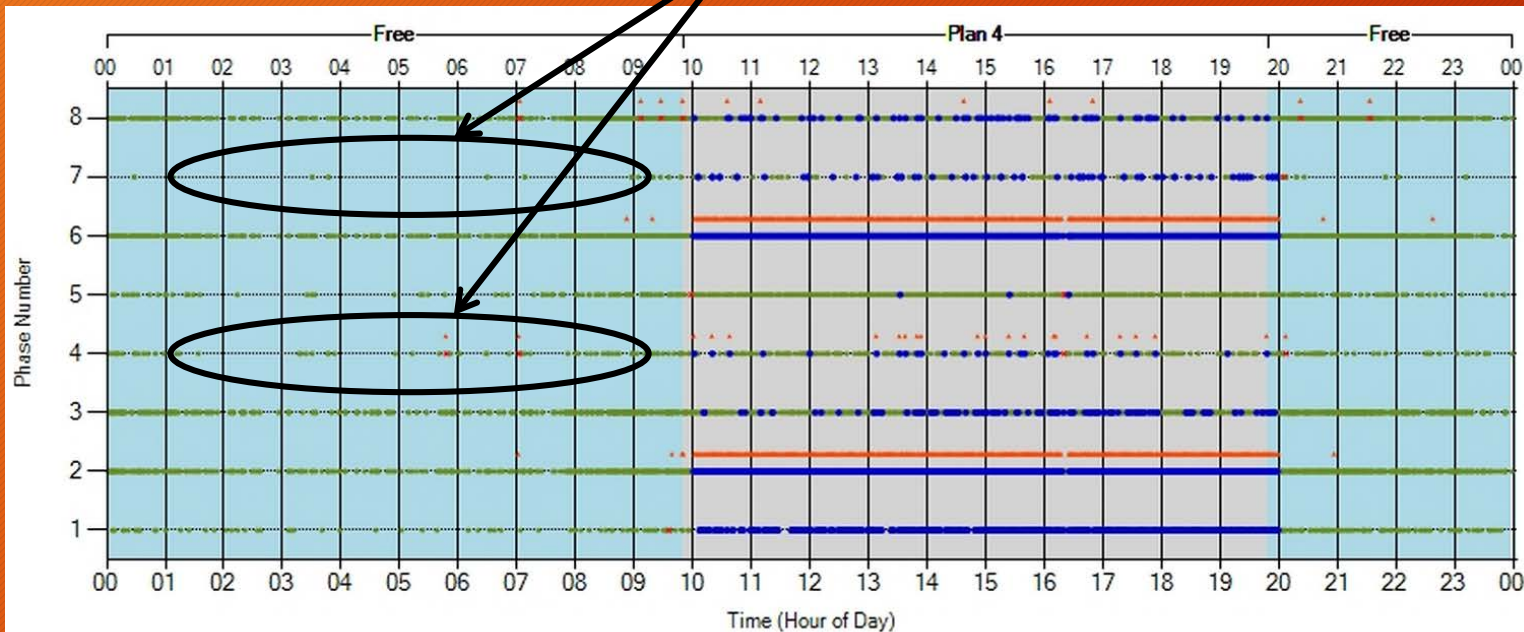


Detection Failures

AFTER: Detection repaired



Minor street through & left turn max out at night only



- Gap out
- Pedestrian activation (shown above phase line)
- Max out
- Skip
- Force off

Split Adjustments



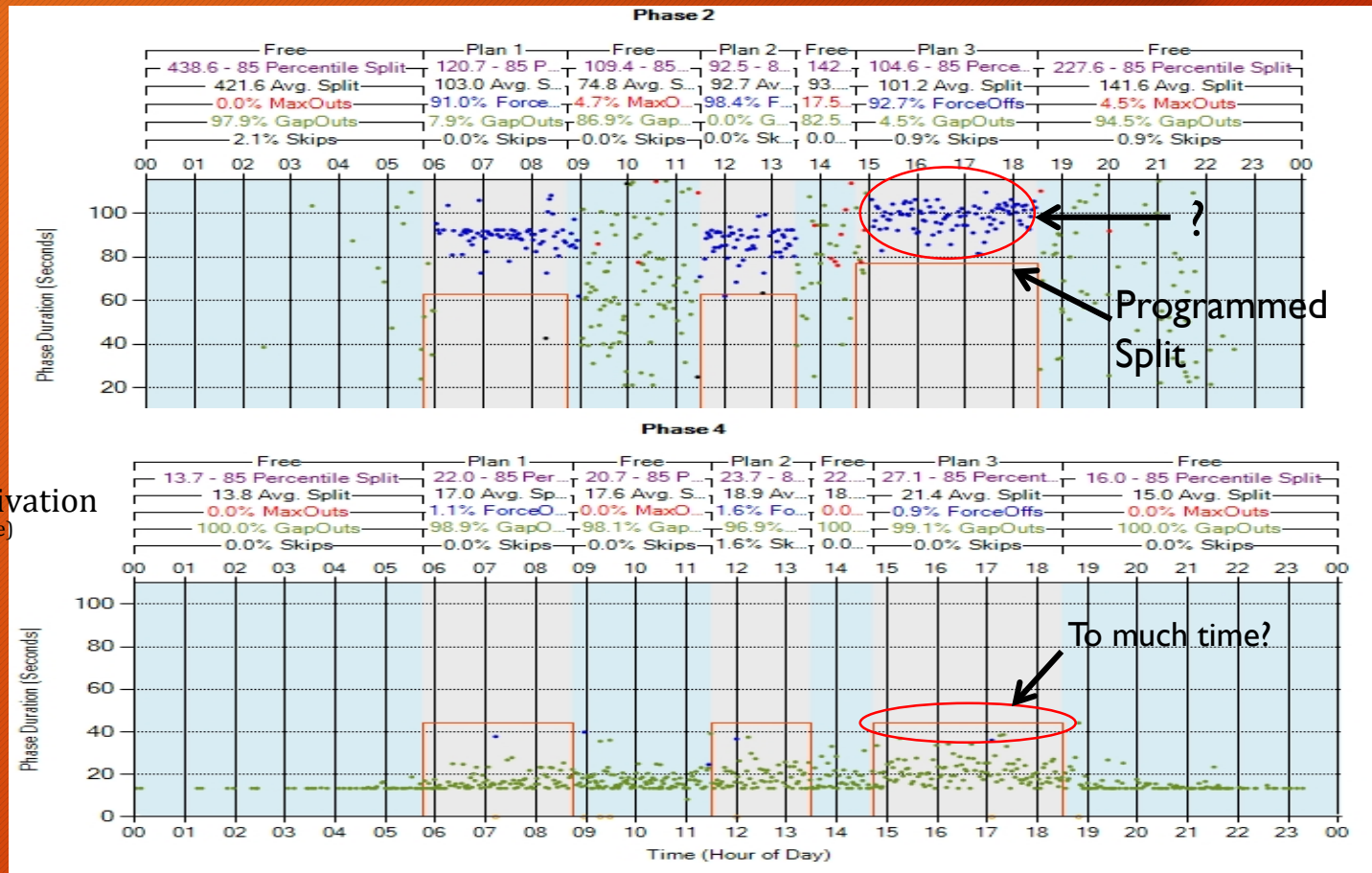
- Gap out
- Max out
- Force off
- Pedestrian activation (shown above phase line)
- Skip

Left-turns maxing out

Split Adjustments



- Gap out
- Max out
- Force off
- Pedestrian activation
(shown above phase line)
- Skip



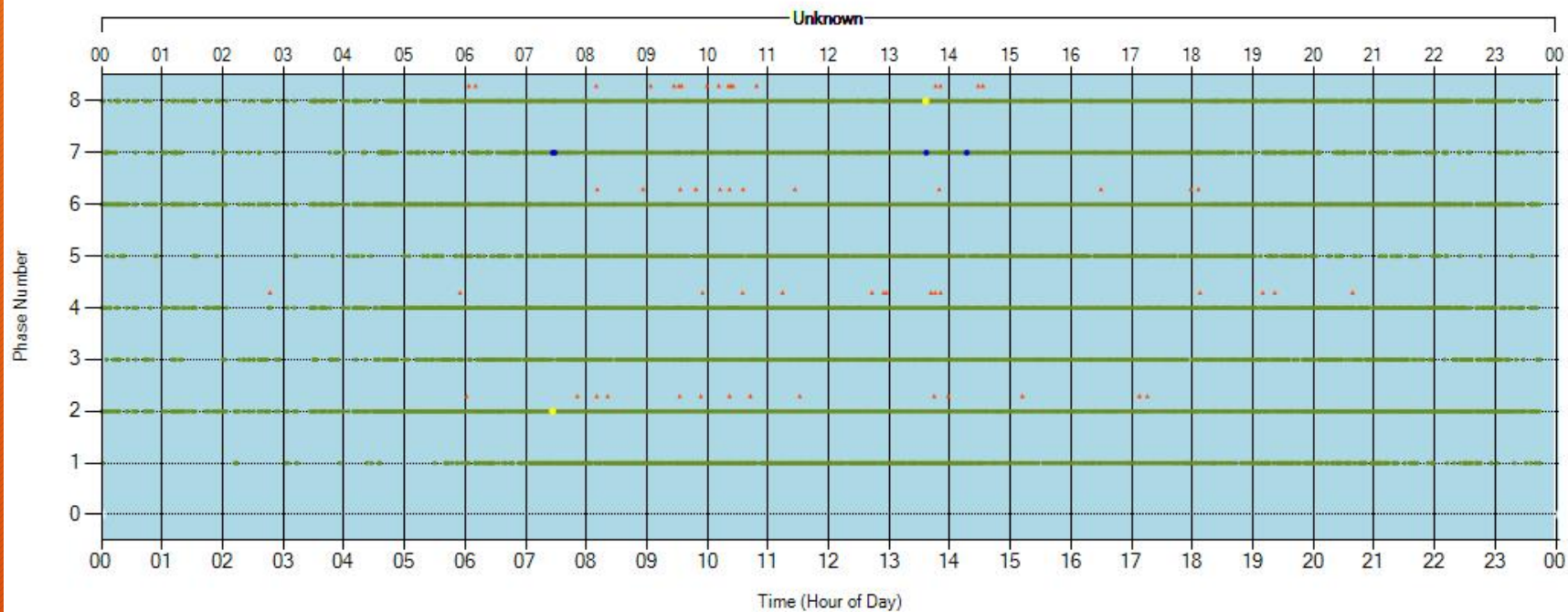
Adaptive Signal Control Technology System Performance



Purdue Phase Termination

Bell Rd @ 99th Ave - SIG#1101119
Wednesday, October 10, 2018 12:00 AM - Wednesday, October 10, 2018 11:59 PM

Currently showing Force-Outs, Max-Outs and Gap-Outs with a consecutive occurrence of 1 or more.
Pedestrian events are never filtered



Outcomes of ATSPM



- Identified need for more robust vehicle detection system
- Justification of need signal retiming projects & performance validation

MCDOT TRAFFIC SIGNAL IMPROVEMENTS

Project Scope and Goals
 Maricopa County Department of Transportation completed a project to improve traffic flow and traffic signal performance along the three corridors listed below.
 Corridor 1: Camelback Road, from Littlefield Road to Wigwam Creek Boulevard
 Corridor 2: Dysart Road, from Bettyanne Howe Road to Sonoma Drive
 Corridor 3: Indian School Road, from 12100 Avenue to 9900 Avenue

The goals of the project were to:
 • Improve traffic flow
 • Improve traffic signal performance
 • Decrease travel time

Travel Time Charts
 Camelback Road Corridor

ATSPM Data: Camelback Road @ Dysart Road

Travel Time Delay has Decreased

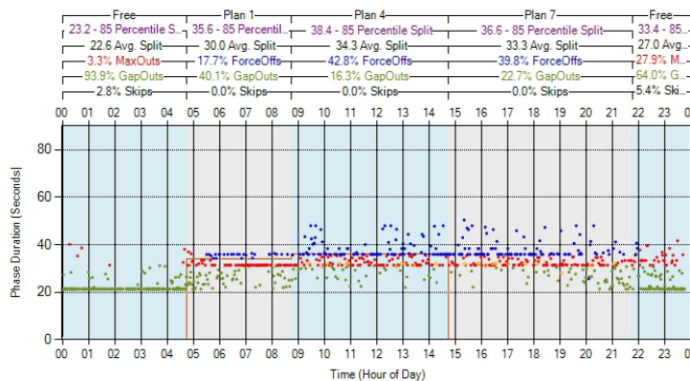
Study Corridor	Delay Before (sec)	Delay After (sec)	Percent Red
Camelback Road	74	47	30
Dysart Road	52	38	28
Indian School Road	64	48	30
Dysart	63	44	30

June 2018 Maricopa County Department of Transportation
 Manager Transportation Systems Area

ATSPM Data: Camelback Road @ Dysart Road

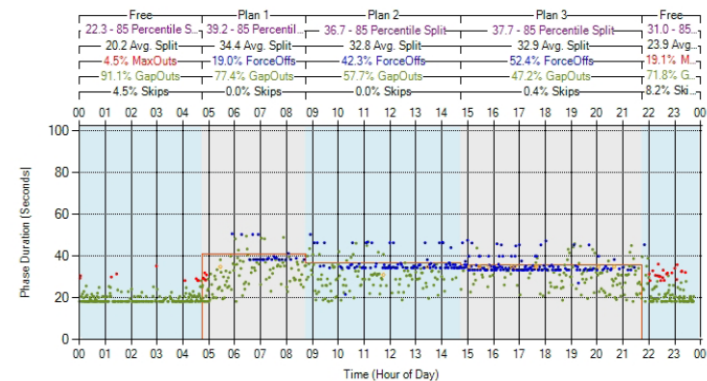
BEFORE

More red dots, known as Max-Outs, indicate times when vehicles got stopped due to red light



AFTER

More green dots, known as Gap-Outs, indicate times when vehicles made it through the green light



Lessons Learned Applicable to Rural Settings



- Retrieval of data through cell modems and wireless radios or manually (Raspberry Pi device)
- Signal Technicians spend less time commuting to intersections
 - ATSPMs helped confirm if the issue is real or perceived
 - Less time troubleshooting issues
 - Have appropriate equipment on truck to resolve concern
- Helps determine if budget should be spent on retiming projects or other competing priorities
- Web-base application accessible through any device
 - Signal Central System is not web-based nor accessible on all devices

Contacts



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