

Signal List

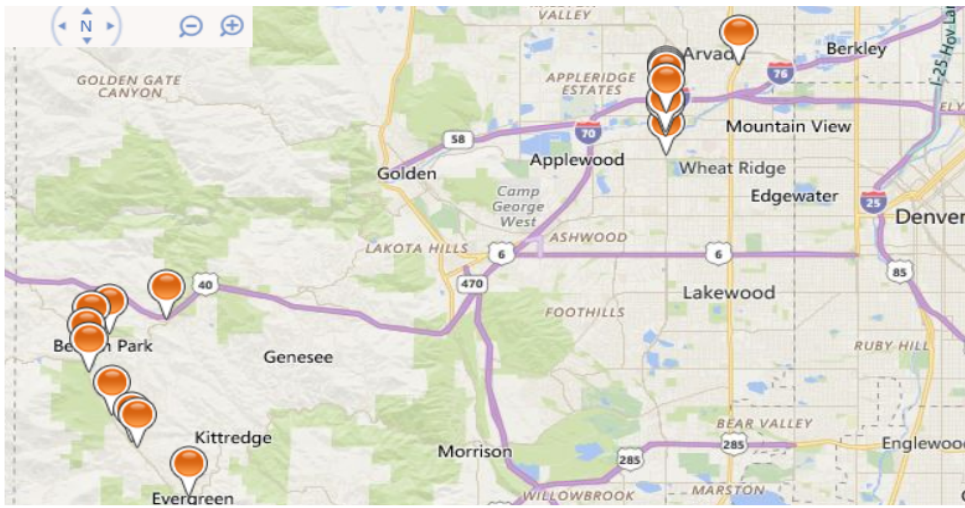
Signal Map

Region

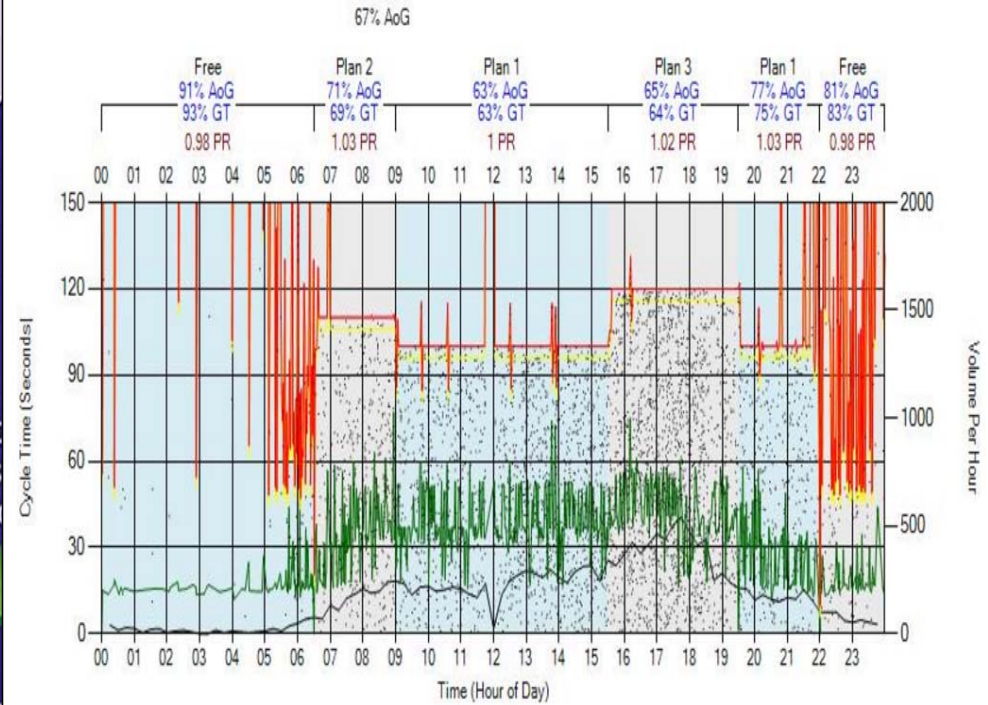
Metric Type

--Select Region--

--Select a Metric--



SH 74 @ El Rancho Signal 107400023 Phase: 6 Southbound
Thursday, March 30, 2017 12:00 AM - Thursday, March 30, 2017 11:59 PM



CDOT Automated Traffic Signal Performance Measures (ATSPMs)

2017 CO/WY ITE and ITS Rocky Mountain Joint Meeting

Trails

Team
Savvy

Running
Data Into
Intelligence

Roads

Cell
Phone
Policy

Leadership
Forum

National
Rankings

Winter
Operations

CDOT Statewide Traffic Signal Program



COLORADO
Department of Transportation

What is Automated Traffic Signal Performance Measures (ATSPMs)?

- FHWA Every Day Counts (EDC-4) Initiative.
- Traffic Signal Management and Data Analysis System.
- Uses High-Resolution Data Logs from Signal Controllers and other Probe Devices.
- No Central Signal Control System Required – access data from field controllers.
- Provides Real-Time Signalized Intersection Performance Monitoring and Measurement.
- More than a dozen Performance Measures for Targeted and Proactive Signal Maintenance.
- Approx. 26 agencies at both state and local levels are currently involved in implementing

ATSPMs

- CDOT and City of Lakewood in Colorado

CDOT Statewide Traffic Signal Program



COLORADO
Department of Transportation

ATSPM Basic Concept

Peaks

Reliable Communications



Technology

People

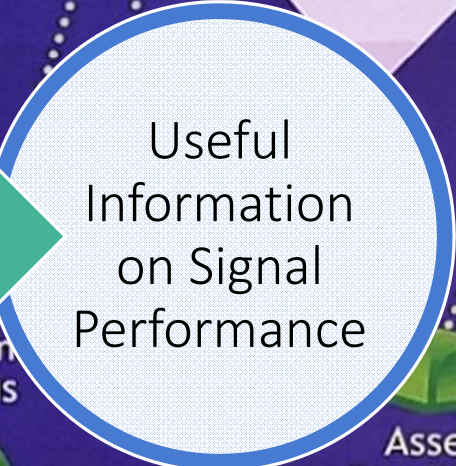
System



Automated Data Collection



ATSPM Server



Useful Information on Signal Performance

Improve Customer Experience

Base Camps

- Signal Controller
- Field Detectors
- Other Probe Devices

Big Data

- Data Archive
- Data Analysis

Com Focus

Asset Condition

- Signal
- Corridor
- System

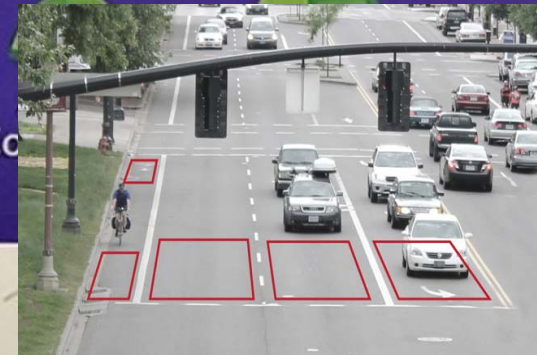
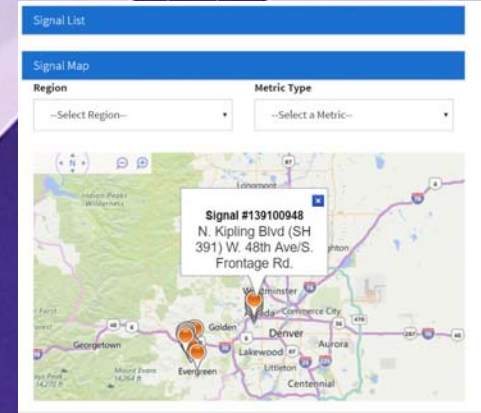
Trails

- Tech Savvy Team
- Turning Data Into Intelligence
- RoadX
- Cell Phone Policy
- Leadership Forum
- National Rankings
- Winter Operations



System Requirements for Implementing ATSPM

- ❑ High Resolution Controller (CDOT uses Intelight)
 - Ability to Log 1/10th of a second data
- ❑ Reliable communications
 - Fiber
 - Cell Modems
- ❑ Database Server*
- ❑ ATSPM Software*
- ❑ Detection Equipment



*For server requirements, software and installation manuals visit:

<https://www.usforge.net/index.php/community/explore-applications#/30/133>

CDOT Deployment Steps

Standardization of Detection

Unique numbering schema for controller IDs

Update the position of detection cards in the cabinet

ATC Controller Upgrade

Install High Resolution Controllers
Review and Upgrade Field Communications

Install UDOT ATSPM system

Deployment of ATSPM (v4.0.1) software (with support from UDOT)

Add signals to the system

Integrate controller and detection information in the ATSPM system

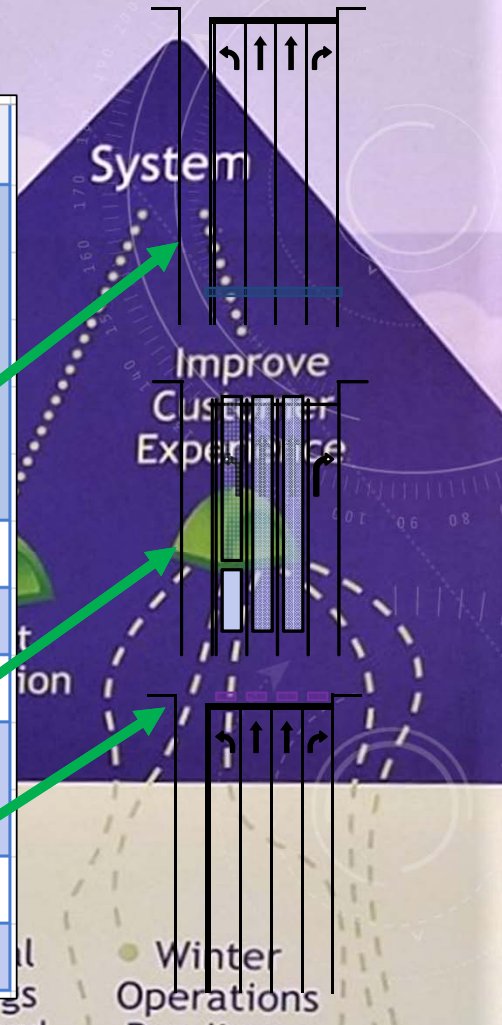
Monitor Performance Measures

Actionable information to deliver quality service to customers.

Address problems before they become complaints.

Types of Performance Metrics

Performance Metric	Type of Detection
Purdue Coordination Diagram	Advance Count Detection (350ft-400ft behind stop bar)
Purdue Link Pivot Offset Optimization	
Approach Volume	
Approach Speed	
Approach Delay	
Preemption Details	Preemption Devices (Opticom)
Pedestrian Delay	Pedestrian Push Buttons
Purdue Split Failure	Lane by Lane Presence Detection
Turning Movement Counts	Lane by Lane Stop Bar Count Detection
Yellow and Red Actuations	
Purdue Phase Termination	
Split Monitor	Stop Bar or Advance Detection



Team Intelligence Policy Program Trainings

Winter Operations

ATSPM Watch Dog

Sample Email from Watch Dog

Watch Dog Application Settings

Minimum Record Threshold (Low Detector Count Alarm)	<input type="text" value="500"/>
Consecutive Event Count (Max Out and Force Off Alarms)	<input type="text" value="3"/>
Min Phase Termination Threshold (Max Out and Force Off Alarms)	<input type="text" value="50"/>
Percent Threshold (Max Out and Force Off Alarms)	<input type="text" value="0.9"/>
Ped Actuations Threshold (Ped Alarm)	<input type="text" value="200"/>
Minimum Count Threshold (Low Detector Count Alarm)	<input type="text" value="50"/>
Current Day Evaluation Start Hour (Max Out, Force Off, & Ped Alarms)	<input type="text" value="1"/>
Current Day Evaluation End Hour (Max Out, Force Off, & Ped Alarms)	<input type="text" value="5"/>
Previous Day Evaluation Start Hour (Low Detector Count Alarm)	<input type="text" value="17"/>
Previous Day Evaluation End Hour (Low Detector Count Alarm)	<input type="text" value="18"/>
Weekday Only	<input type="checkbox"/>

ATSPM Alerts for 6/4/2017

CDOTATSPM@dot.state.co.us

Sent: Sun 6/4/2017 7:00 AM

To: mbrian.tennent@state.co.us; Vijay Sabawat; warren@kritek.org; warren@kritek.org

--No new missing record errors were found on 6/3/2017:

--No new force off errors were found between 1:00 and 5:00:

--The following signals had too many max out occurrences between 1:00 and 5:00:

107400534 - SH 74 & Stagecoach Rd. - Phase 1 (Max Outs 100%)
107400534 - SH 74 & Stagecoach Rd. - Phase 2 (Max Outs 100%)
107400534 - SH 74 & Stagecoach Rd. - Phase 5 (Max Outs 100%)
107400534 - SH 74 & Stagecoach Rd. - Phase 6 (Max Outs 100%)
107400534 - SH 74 & Stagecoach Rd. - Phase 8 (Max Outs 100%)

--The following signals had unusually low advanced detection counts on 6/3/2017 between 17:00 and 18:00:

107400296 - SH 74 & Squaw Pass - Phase 4 (Count: 28)
107400296 - SH 74 & Squaw Pass - Phase 8 (Count: 38)
107400444 - SH 74 & Lewis Ridge Rd. - Phase 4 (Count: 49)
107400444 - SH 74 & Lewis Ridge Rd. - Phase 8 (Count: 43)

--No new high pedestrian activation errors between 1:00 and 5:00:

Benefits of ATSPM Implementation

- ❑ Proactive operations and maintenance activities.
- ❑ Continuous monitoring of device and system health.
- ❑ Automated Notifications (watchdog emails).
- ❑ Before and After studies (why model what we can measure!).
- ❑ Efficient Allocating of Scarce Resources.
- ❑ Increased Safety (by a shift to proactive operations and maintenance practices).



Signal List

Signal Map

Region:

Metric Type:

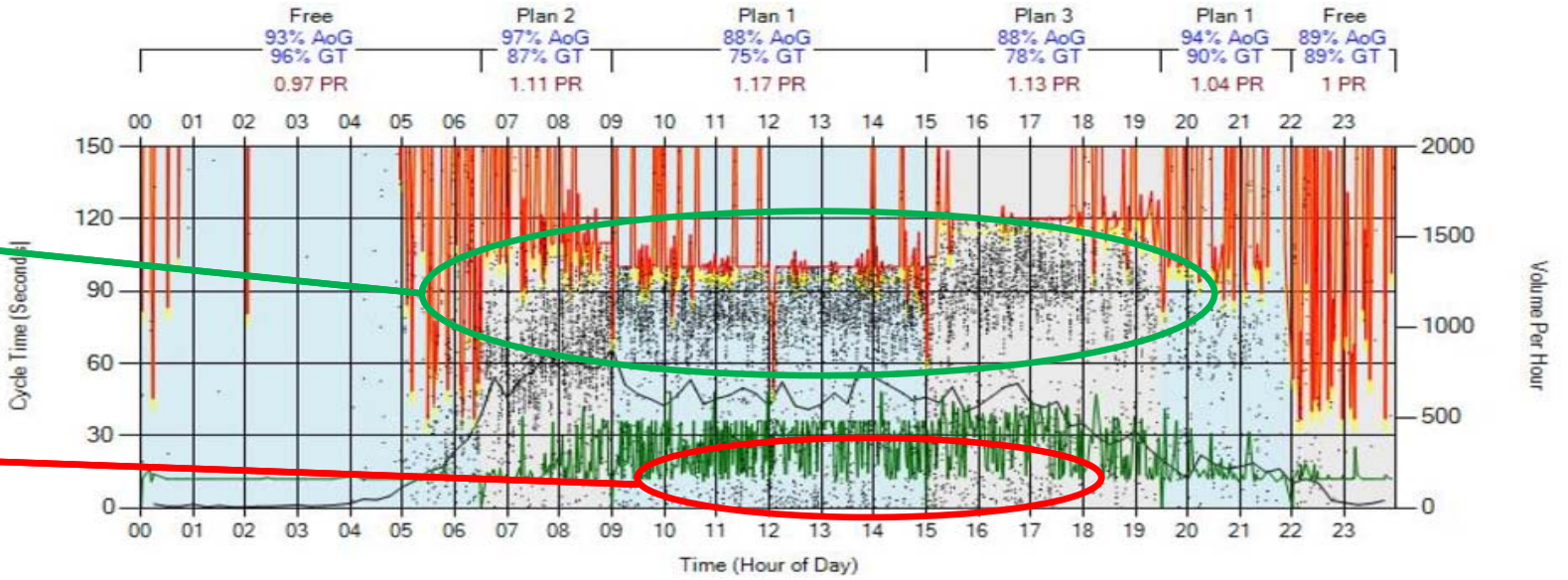
Signal #139100948
N. Kipling Blvd (SH 391) W. 48th Ave/S. Frontage Rd.

SH 74 @ North Bergan Parkway - SIG#107400190
 Wednesday, July 19, 2017 12:00 AM - Wednesday, July 19, 2017 11:59 PM
 Advanced detector located 182 ft. upstream of stop bar

Phase 2: Northbound

AoG = 91%

- Volume Per Hour
- Detector Activation
- Change to Green
- Change to Yellow
- Change to Red
- AoG - Arrival On Green
- GT - Green Time
- PR - Platoon Ratio



Arrival on Green

Arrival on Red

Plots vehicle arrivals during each phase and movement of each cycle

Use Case: Troubleshoot Coordination-Related Issues

Leadership Forum

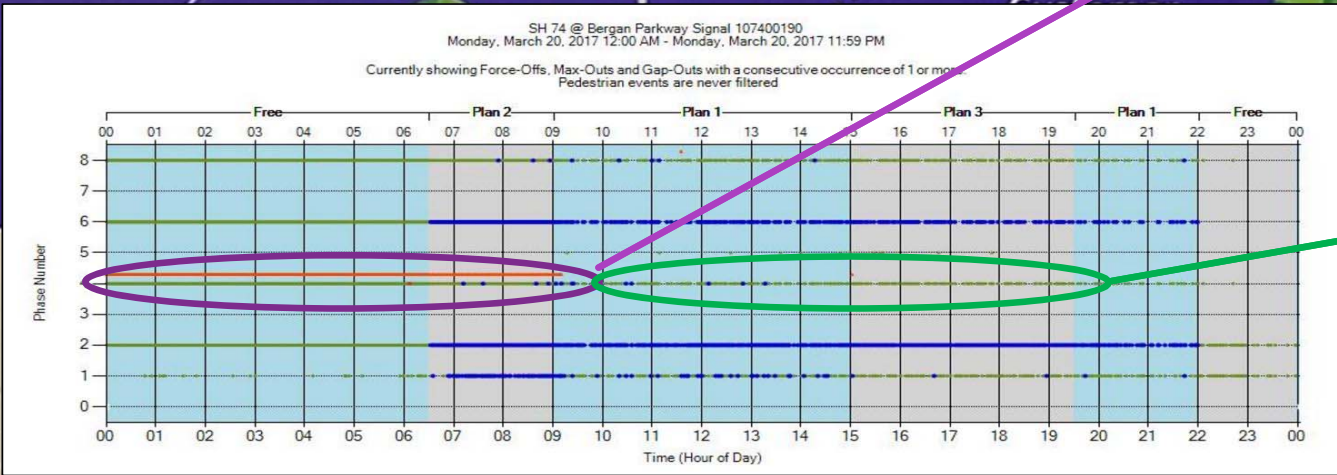
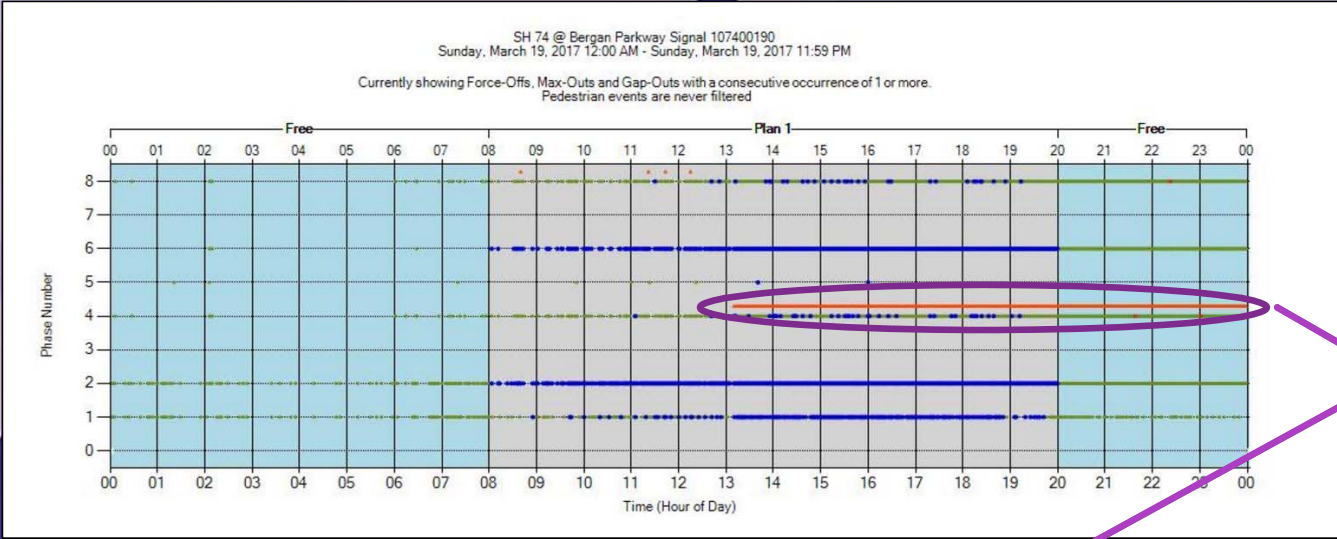
National Rankings

Winter Operations

CDOT ATSPM: Purdue Coordination Diagram (PCD)



COLORADO
 Department of Transportation



Use Case: Detection Failures
 (Constant Ped. Call)

Before: Continuous Ped Calls

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

After: Ped Button Repaired

SH 74 & Bergen Pkwy
 Intersection

Use Case: Detection Failures
(Constant Vehicle Call)

Before: Constant Veh. Call

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

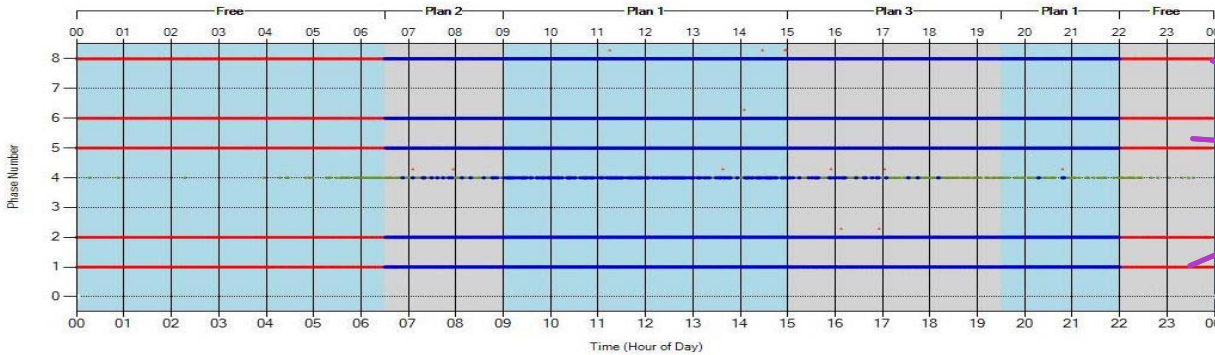
After: Detection Repaired

SH 74 & Stage Coach Rd.
Intersection

Purdue Phase Termination

SH 74 @ Stagecoach Rd. - SIG#107400534
Friday, June 9, 2017 12:00 AM - Friday, June 9, 2017 11:59 PM

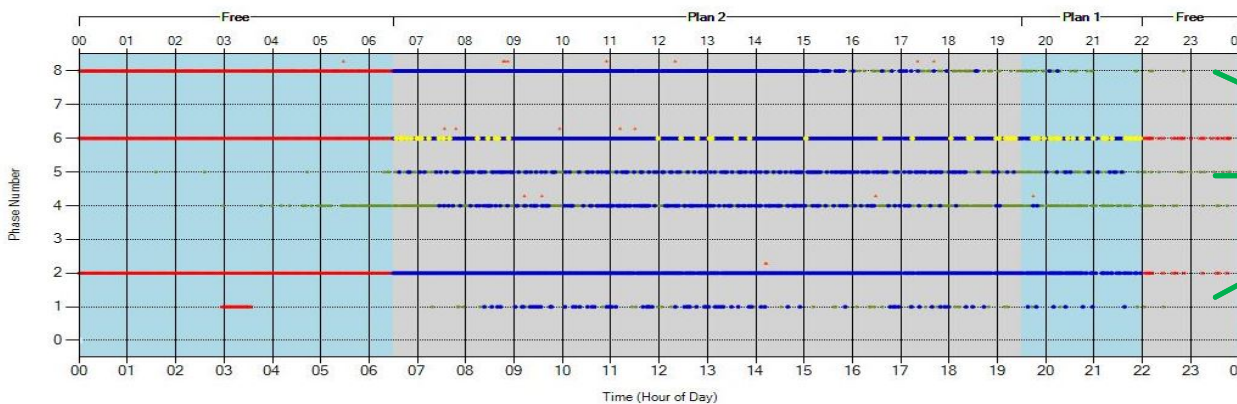
Currently showing Force-Offs, Max-Outs and Gap-Outs with a consecutive occurrence of 1 or more.
Pedestrian events are never filtered

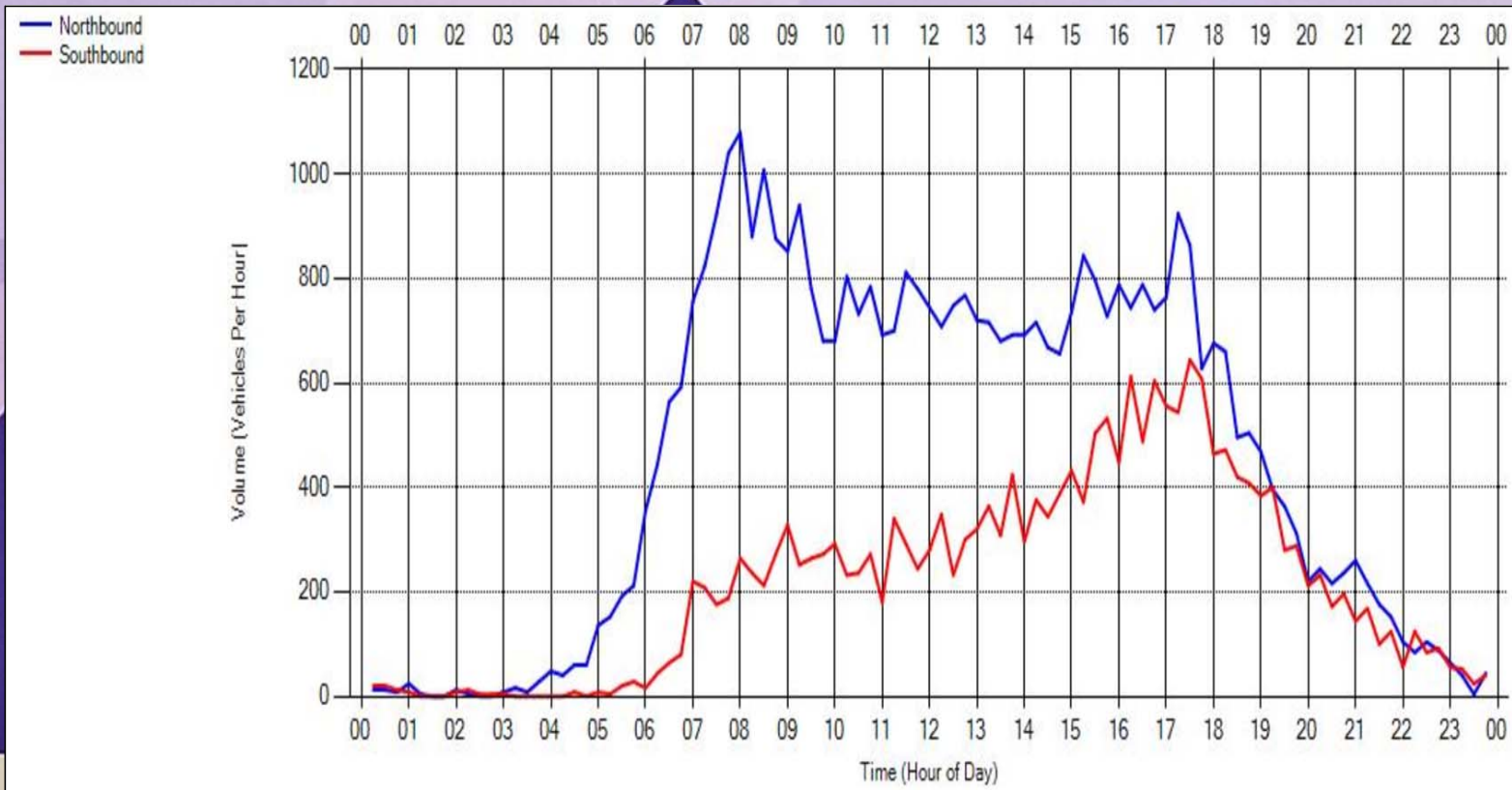


Purdue Phase Termination

SH 74 @ Stagecoach Rd. - SIG#107400534
Tuesday, June 13, 2017 12:00 AM - Tuesday, June 13, 2017 11:59 PM

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





Metric	Value
Peak Hour	9/21/2017 4:45:00 PM
Peak Hour Factor	0.351
Peak Hour Volume	5640
Peak Hour Factor	0.935
Total Volume	16064
Northbound Peak Hour	7:45 AM - 8:45 AM
Northbound Peak Hour D Value	0.225
Northbound Peak Hour K Value	0.368
Northbound Peak Hour Volume	4008
Northbound Peak Hour Factor	0.928
Northbound Total Volume	10899
Southbound Peak Hour	5:00 PM - 6:00 PM
Southbound Peak Hour D Value	1.35
Southbound Peak Hour K Value	0.455
Southbound Peak Hour Volume	2352
Southbound Peak Hour Factor	0.913
Southbound Total Volume	5165

Use Case: Analyze Traffic Demand, Retime or Optimize the Signal Plans

Trails

Tech Savvy Team

Turning Data Into Intelligence

RoadX

Cell Phone Policy

Leadership Forum

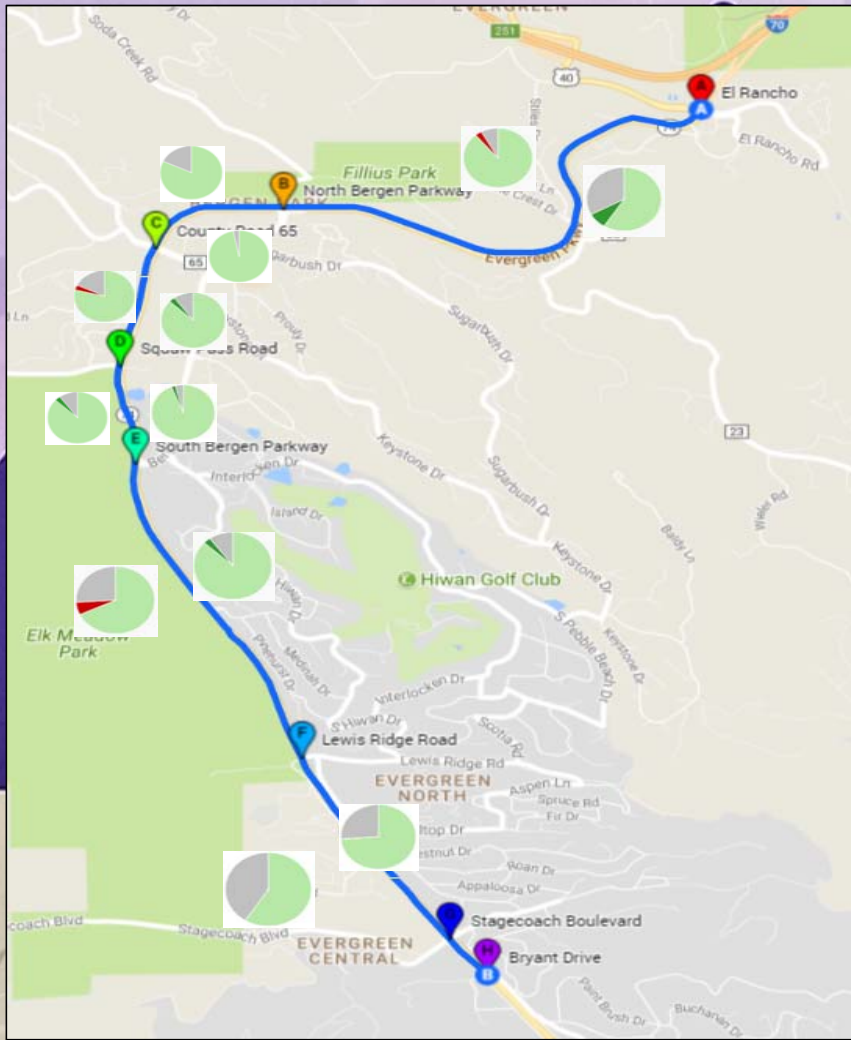
National Rankings

Winter Operations

CDOT ATSPM: Approach Volumes



COLORADO
Department of Transportation



Corridor Summary (Arrivals on Green)

	Northbound		Southbound	
	Before	After	Before	After
AM Peak (6:00 – 9:00)	83% (11,517)	85% (12,012)	77% (5,612)	75% (5,495)
Off Peak (9:00 – 15:30)	80% (18,922)	84% (19,688)	76% (15,485)	75% (15,371)
PM Peak (15:30 – 19:00)	77% (9,881)	79% (10,159)	84% (16,230)	86% (16,584)

Use Case: Troubleshoot Corridor Coordination issues or Offset Optimization

CDOT ATSPM Example: Link Pivot Analysis on SH74 Corridor

