TSM&O
Signal Upgrades in Rural Communities
October 2018

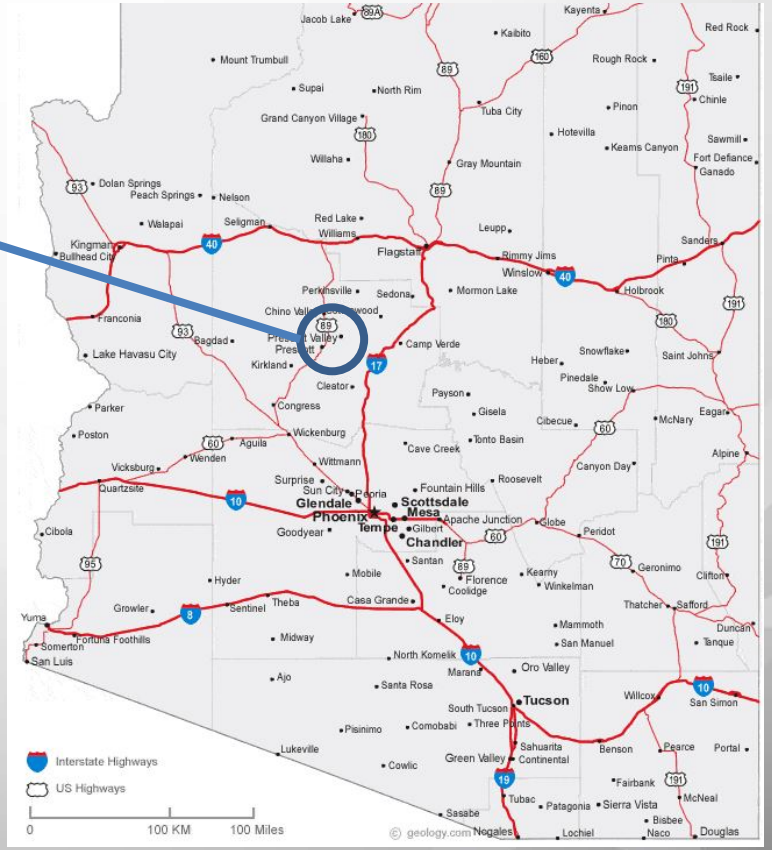
Rural Signals

Prescott and Prescott Valley
Semi-rural, isolated communities

- 30+ miles from major interstate
- Travel time of 40+ minutes

Population is growing

- Third largest in State behind Phoenix and Tucson
- 220,000 people (double 1990)



SR 69 Corridor

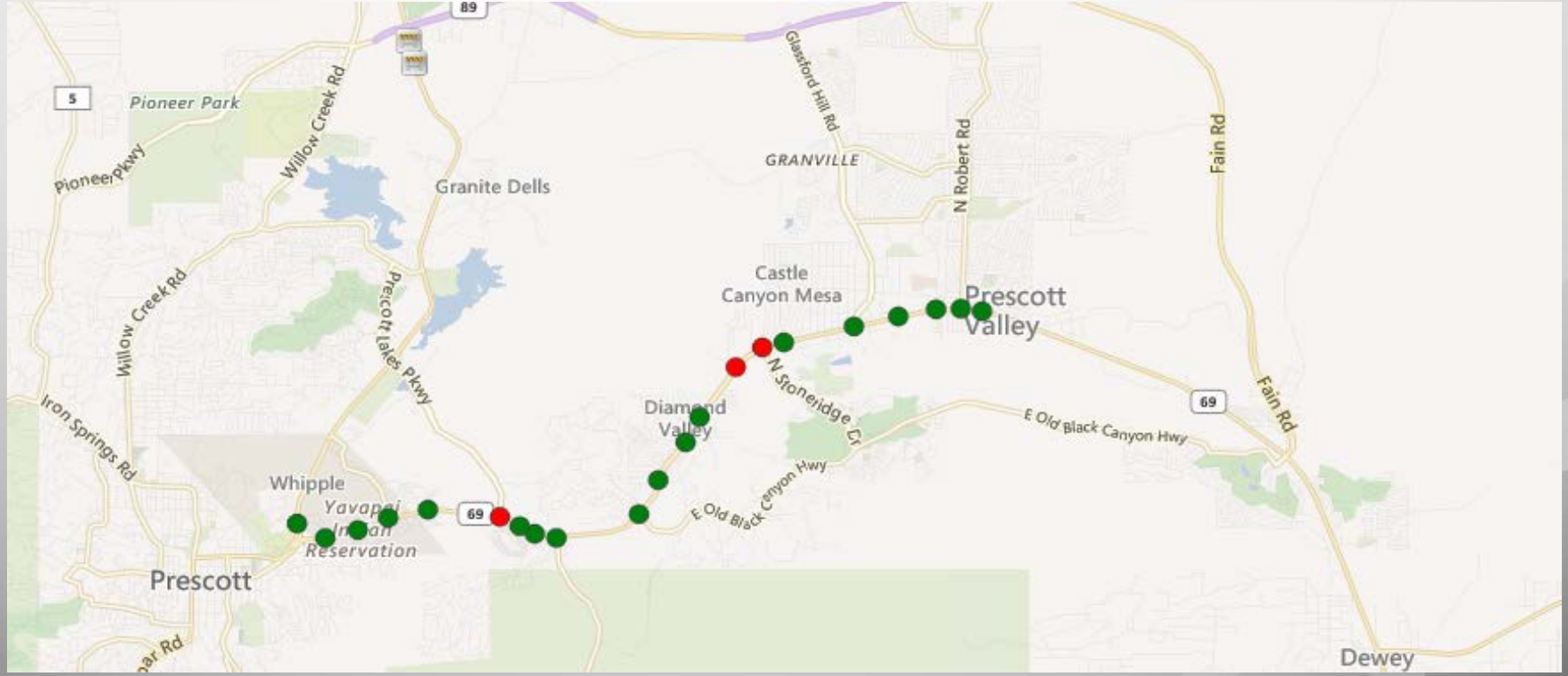
20 signals over 8.5 miles

- Average spacing: 0.45 mi
- Shortest spacing: 0.18 mi
- Longest spacing: 0.98 mi

25,000 – 40,000 ADT

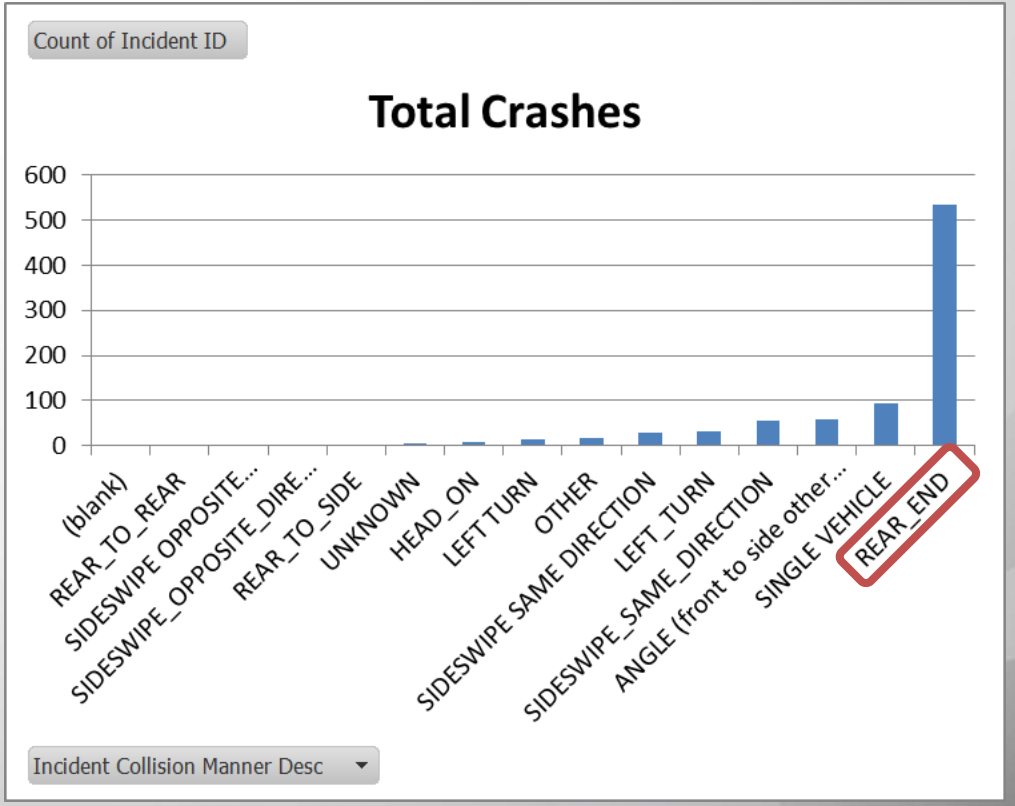
2 Lanes/direction: 5.5 mi (65%)
3 lanes/direction: 3.0 mi (35%)

SR 69 Corridor



Issues

- Significant queuing and back-ups
  - Travel time upwards of 25 min
  - Customer complaints
- Crashes increasing annually
  - 197 (2015) to 250 (2017)
  - 13% annualized increase
  - Majority (89%) are multi-vehicle

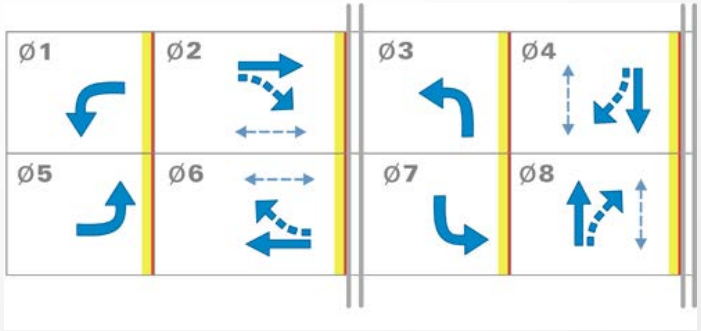


Causes

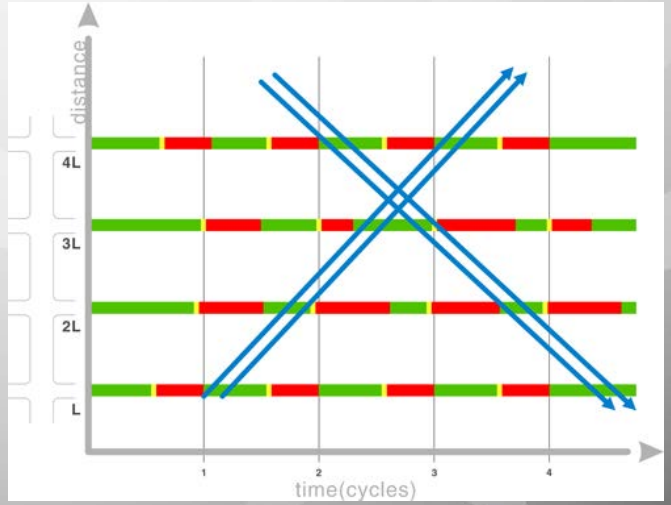
- Population growth
  - Increase in volumes, limited street network
- Older signal equipment
  - TS1 controllers, inductive loops
- Outdated coordination plans
  - 10-years old, clock-based
- Access control
- Driver behavior

Solution

Improve Individual Signals
- Upgrade controllers
- Replace detection



Improve Corridor Operations
- Interconnect signals
- Utilize traffic management software
- Improve timing plans



Measure Performance
- Install ARID devices
- Install PTZ cameras

Improve Individual Signals

Update controllers

- Replace TS1 controllers with TS2 controllers
  - Programmable features
  - Flexibility with future add-ons
- Continue use of existing TS1 cabinets
  - Cost savings

Replace detection

- Replace loops/video with radar
  - Increased flexibility
  - Presence and advanced detection

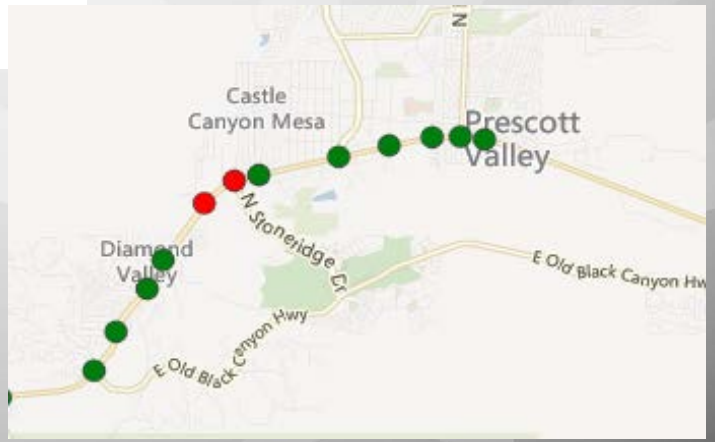
Improve Corridor Operations

Interconnect signals

- Direct connect fiber
  - 8 signals on east end
- Point-to-point radio
  - Three groups of 4 signals
  - Wireless modems to backhaul

Utilize traffic management software

- Centralized control
  - Online, accessible
- Manage remotely
  - Troubleshoot live or by record
- Systems approach on timing plans



Measure Performance

Install ARID devices

- 9 Wi-Fi locations
- Travel time and average speed
- Data for entire “trip”

Install PTZ cameras

- 6 cameras in corridor
  - Busiest intersections
- Visual verification

Installation

Internal forces
- Controllers
- Radios
- Fiber

Contractor
- Detection (radar)
- PTZ cameras

Total Cost = $1M

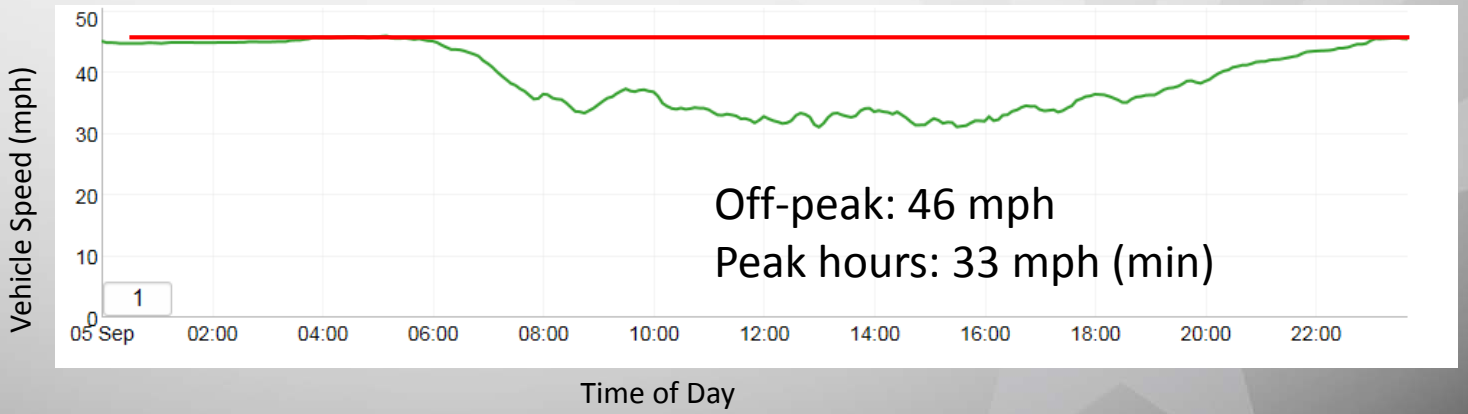
Work Item	Cost
Signal controllers	$ 90,000
Detection (radar)	$ 700,000
Cameras/radios	$ 97,000
ARID devices	$ 34,000
Software license	$ 21,000
Fiber, switches, etc	$ 14,000
Total Cost	**$ 956,000**

Results - Speed

Significant improvement

- Removal of queues
- Increased platoons
- No peak hour degradation

Driver behavior ++



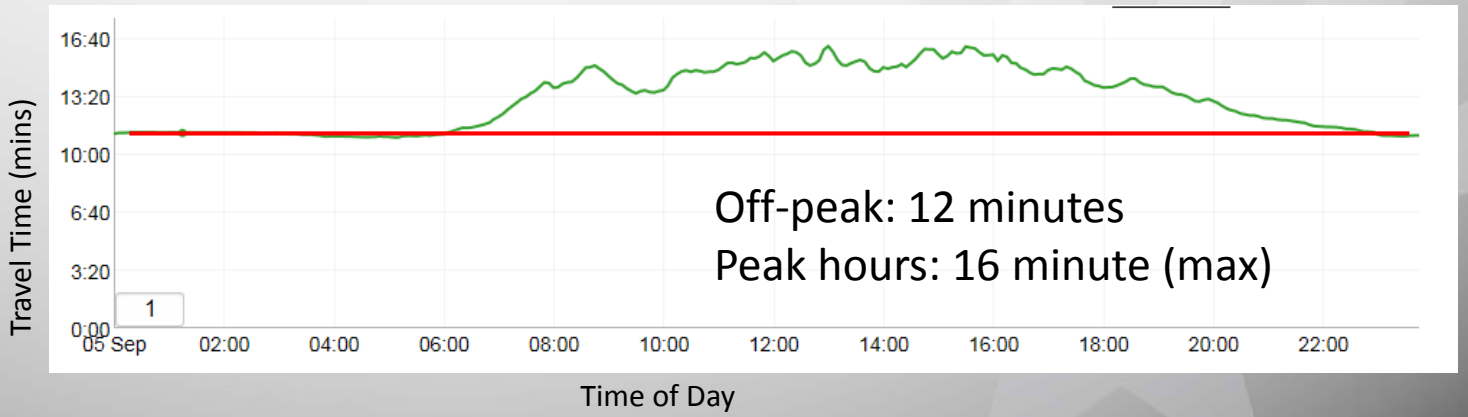
Results – Travel Time

Significant improvement

- 20-25 minute base condition
- 5-10 minute savings/direction

Time-value benefit = $13.5 M/year based on time savings

B/C of 70.5



Thank you