ATSPM AND TRAVEL TIME ANALYSIS FOR STEVE PROJECT WITH CLARK COUNTY

PORTAL USER GROUP MEETING

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AGENDA

1 / KEY TAKEAWAY

- Subsection
- Subsection
- Subsection

2 / KEY TAKEAWAY

- Subsection
- Subsection
- Subsection

1 / KEY TAKEAWAY

- Subsection
- Subsection
- Subsection

2 / KEY TAKEAWAY

- Subsection
- Subsection
- Subsection

1

THE STEVE PROJECT

WHAT IS THE STEVE PROJECT?
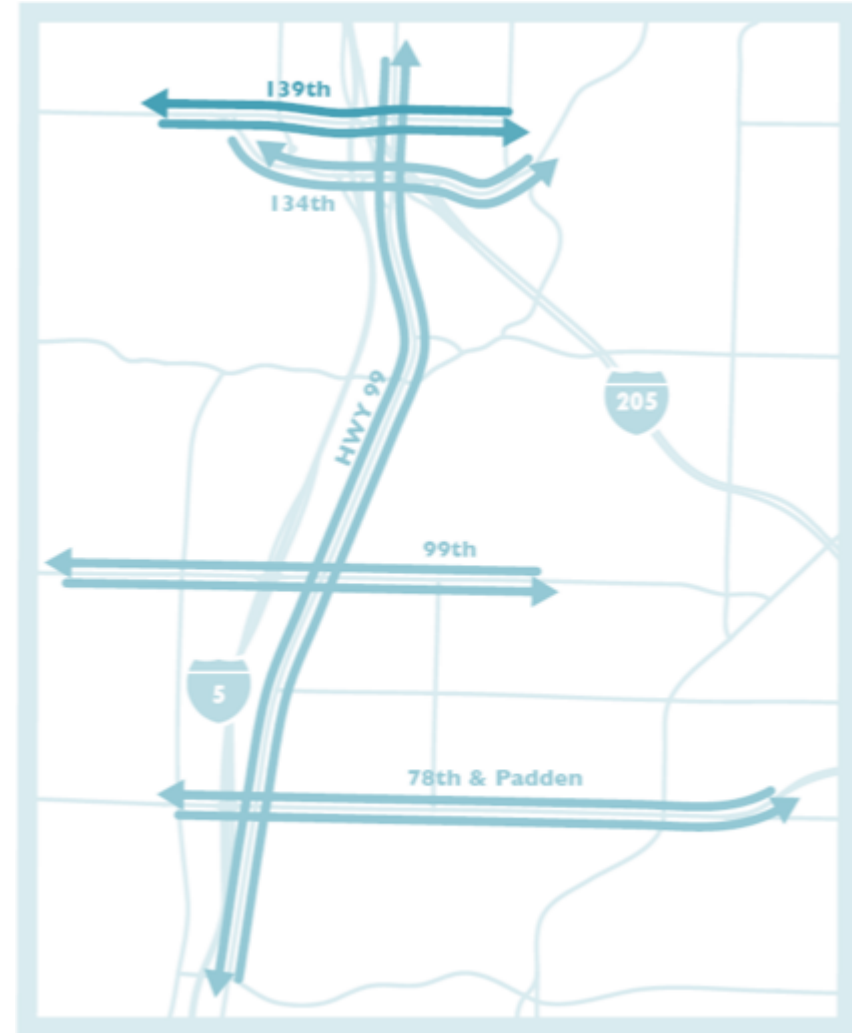
Signal Timing, Evaluation, Verification & Enhancement

- CLARK COUNTY WA
  - 2016 TO 2019
  - FIVE CORRIDORS
- KEY ELEMENTS OF PROJECT

Bluetooth design

Signal retiming
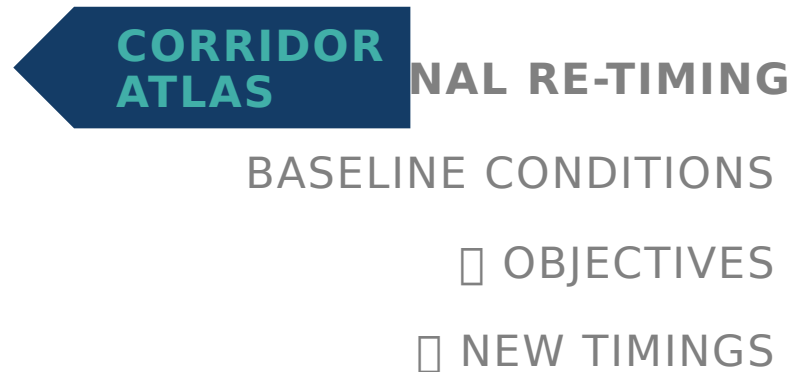
Framework for MOEs

Corridor before/after evaluation

WHAT IS THE STEVE PROJECT?

Installed BlueMAC units along corridors to collect travel time data

- **BLUETOOTH DESIGN**

CORRIDOR ATLAS NAL RE-TIMING

BASELINE CONDITIONS

 OBJECTIVES

 NEW TIMINGS

NE 78th Street / NE Padden Parkway

NE Hazel Dell Ave to NE 94th Ave

Corridor Overview

Length	4.8 mi
Functional classification	Other principal arterial
Typical cross section	4 lanes with turn lanes
Access management	Centerline barrier on Padden Pkwy
Transit routes	C-TRAN route 78
Bike facilities	Bike lanes in each direction on NE 78th St from NE 6th Ave to Padden Pkwy. Mixed-use path on south side of NE Padden Pkwy.
Signal Control	Traffic responsive. Adaptive coming in 2017.
Notes	Transit signal priority planned at NE Hwy 99 signal. Signals at NE Andresen Rd, I-205 SB, and I-205 NB to be annexed by City of Vancouver in near term.

## Corridor Operational Objectives

1. Progress traffic eastbound and westbound from NW 9th Ave to NE Hwy 99.
2. Manage eastbound queues from I-5 NB ramps to NE Hwy 99.
3. Minimize backups on I-5 NB off-ramp.
4. Manage westbound queues at NE 47th Ave.

Typical Signal Timing Cycle Lengths (sec)

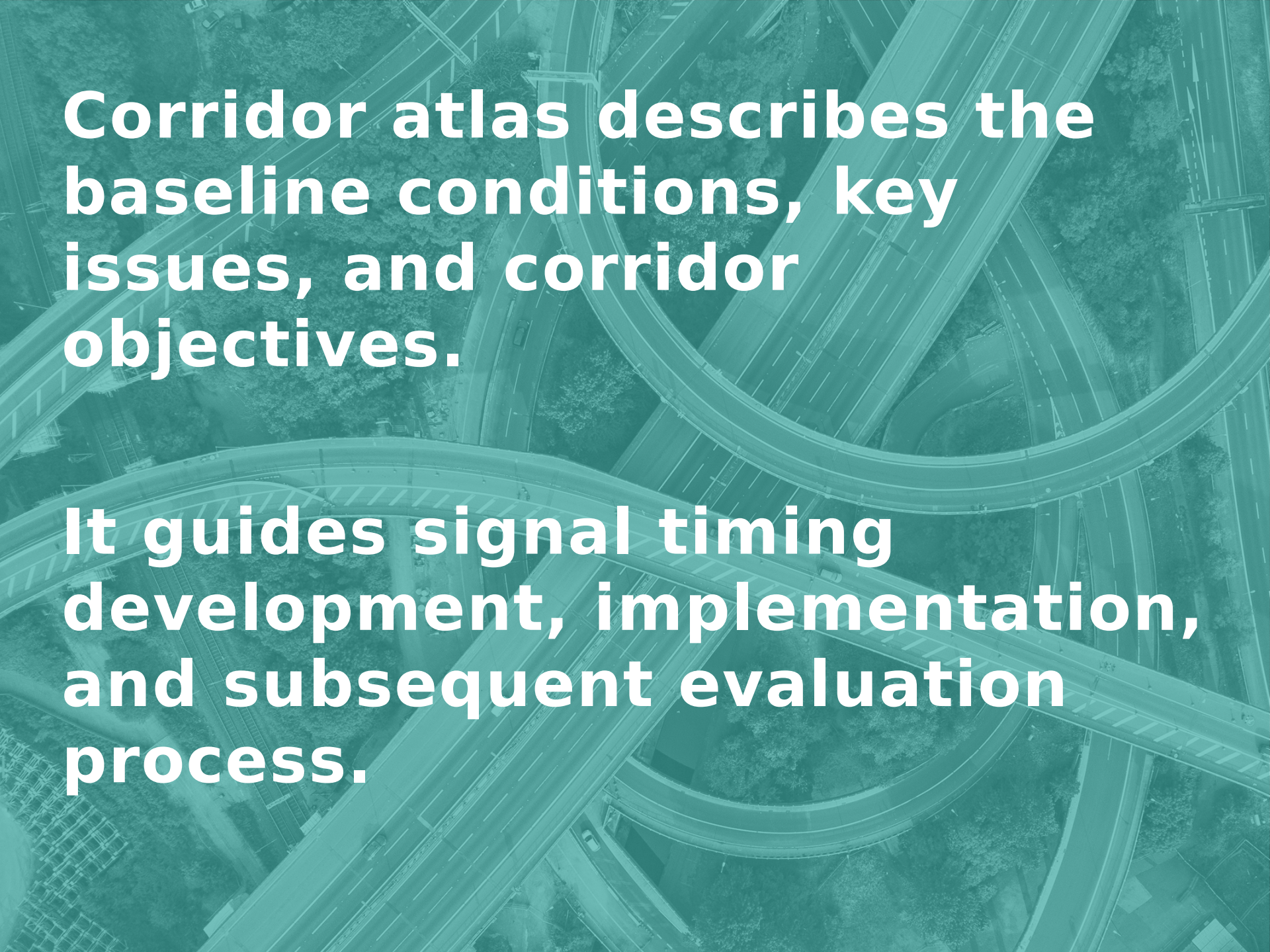| Coordination group	AM peak (7-9)	Midday (11-1)	PM peak (4-6)
NE 78th St	100-120	120-140	100
NE Padden Pkwy	110-140	120-140	120-140

April 2017
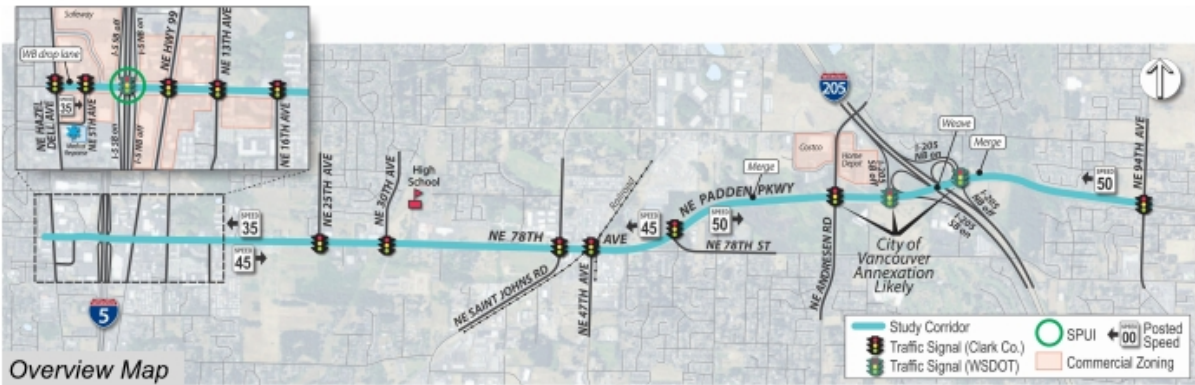
Overview Map

Key Issues Map

Key Issues

Ⓐ High pedestrian volumes at NE Hazel Dell Ave.

Ⓑ Frequent emergency preemption at NE 5th Ave disrupts signal coordination.

Ⓒ Heavy eastbound left turn movements. Queuing from northbound right turn movements backs onto I-5 off-ramp during the PM peak.

Ⓓ High crash rate and high pedestrian volumes at NE Hwy 99. Planned pedestrian hybrid beacon nearby may impact signal coordination.

Ⓔ Adaptive signal timing will be installed in late 2017.

Ⓕ High NB and SB volumes on NE Saint Johns Rd. Railroad preemption due to switching at Rye yard and Linde Gas stops vehicular movements at NE 47th Ave and NE Saint Johns Rd signals and causes delays on NE 78th St. Occasionally, westbound traffic backs up onto railroad tracks. NE 47th Ave signal programmed to clear westbound queue on railroad when preempted.

Ⓖ Signals operate as two separate systems. Signals from NW 9th Ave (west of the corridor) to NE 25th Ave are coordinated throughout the day. Signals from NE 25th Ave to NE 47th Ave join coordination typically during the PM peak.

Clark County Signal Timing Evaluation, Verification, and Enhancement Project CRP #352122 — Corridor Atlas

Page 1

78TH STREET-PADDEN PARKWAY CORRIDOR ATLAS

Corridor atlas describes the baseline conditions, key issues, and corridor objectives.

It guides signal timing development, implementation, and subsequent evaluation process.

WHAT IS THE STEVE PROJECT?

Installed BlueMAC units along corridors to collect **BLUETOOTH DESIGN** travel time data

-

Developed coordinated signal timing plans. **SIGNAL RETIMING** SynchroGreen adaptive system was implemented in 2019 on three of the corridors: 139th, Hwy 99, and 78th-Padden

-

- **HOW DO YOU EVALUATE THE EFFECTIVENESS OF THE NEW SYSTEM?**

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EVALUATION APPROACH

EVALUATION APPROACH

Review of typical MOEs

Regional Goals

FRAMEWORK OF MOES

→ *Corridor* Objectives

 Shortlist of Potential MOEs

EVALUATION APPROACH

OPERATIONAL OBJECTIVE	PERFORMANCE MEASURE			
	Travel Time	Travel Time Reliability	ROR5/ GOR (split failure)	Percent Arrival on Green
Progress directional traffic flow between specific origin and destination	●	●		●
Queue management of specific movement at specific location			●	
Minimize queue length or spill back	●	●		●
Maximize throughput	●	●	●	●
Maximize green utilization	●		●	●

SHORT LIST OF MOES FOR ARTERIAL OPERATIONS

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CORRIDOR EVALUATION

78TH STREET AND PADDEN PARKWAY

SYNCHROGREEN

ADAPTIVE

RAILROAD CROSSING

I-5 INTERCHANGE

CROSSES HWY 99

Corridor Objectives 🛈 Measures

Potential MOES 🛈

Individual

Performance Measures For 78th-Padden Before/After Evaluation

Operational Objective	Performance Measures
Corridor: NE 78th Street / NE Padden Parkway (NE Hazel Dell Ave to NE 94th Ave)	
1. Progress traffic eastbound and westbound from NW 9th Ave to NE Hwy 99.	• **Travel time** and • **Travel time reliability** (EB and WB from NW 9th Ave to Hwy 99)
2. Manage eastbound queues from I-5 NB ramps to NE Hwy 99.	• **Percent arrival on green** (EB between I-5 ramps and Hwy 99 during PM peak) • Split failure diagram
3. Manage westbound queues at NE 47th Ave.	• **Percent arrival on green** (WB between Saint Johns Rd and 47th Ave) • Travel time and travel time reliability* • Split failure diagram
4. Minimize queues on I-5 NB off-ramp.	• **Split failure diagram** (I-5 NB off ramp)

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78TH ST-PADDEN PARKWAY CORRIDOR EVALUATION

TRAVEL TIME & TTR

Overview Map
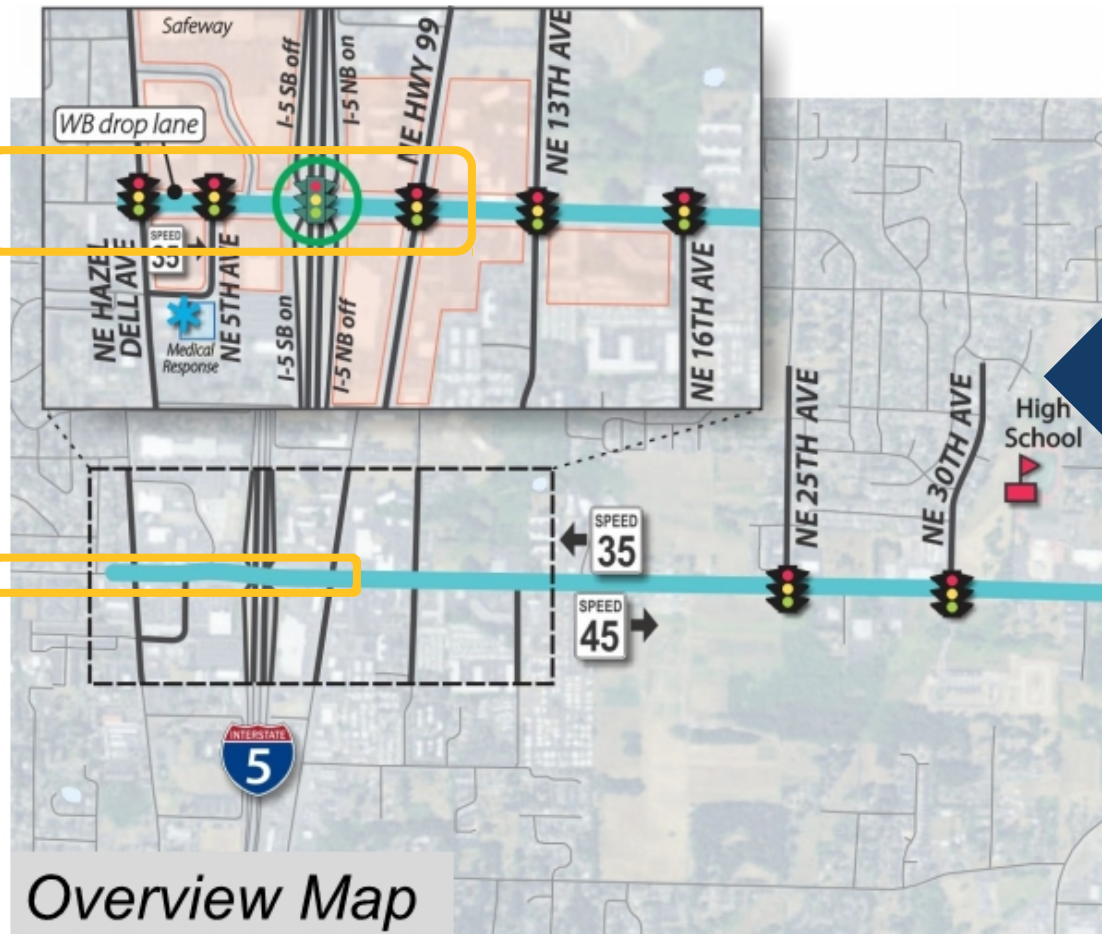
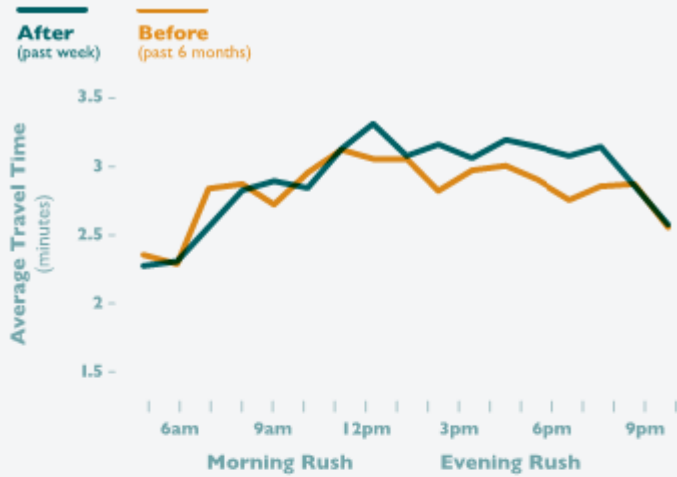**Use travel time and travel time reliability to assess *traffic progression***

Obj. 1

Progress EB and WB traffic between 9th Ave and Hwy 99

PERFORMANCE METRIC USED:

TT AND TTR BETWEEN 9TH AVE AND HWY 99

TRAVEL TIME: (WB) HWY 99 TO NW 9TH AVE

TRAVEL TIME: (EB) NW 9TH AVE TO HWY 99

IS **HOURLY** AVERAGE TRAVEL TIME BETTER?

NOT REALLY.

BEFORE: 4/25 - 5/24, 2019
AFTER: 9/8 - 9/28, 2019

Period	Mean Travel Time (mm:ss)	Standard Deviation (mm:ss)	5th Percentile Travel Time (mm:ss)	95th Percentile Travel Time (mm:ss)	Planning Time Index*
Before	3:49	1:56	1:18	7:14	3.81
After	2:58	1:59	1:18	7:34	3.98

WESTBOUND

IS OVERALL AVERAGE TRAVEL TIME BETTER?

MAYBE.

EASTBOUND

Period	Mean Travel Time (mm:ss)	Standard Deviation (mm:ss)	5th Percentile Travel Time (mm:ss)	95th Percentile Travel Time (mm:ss)	Planning Time Index*
Before	3:24	2:02	1:33	8:12	4.32
After	3:31	1:49	1:46	7:11	3.79

*Planning time index is the ratio of 95th percentile travel time to the free-flow travel time.

BEFORE: 4/25 - 5/24, 2019
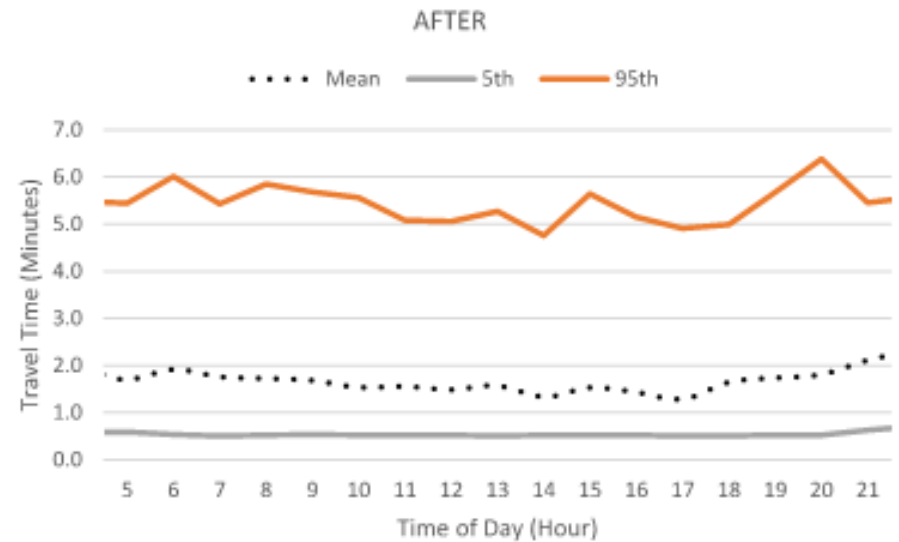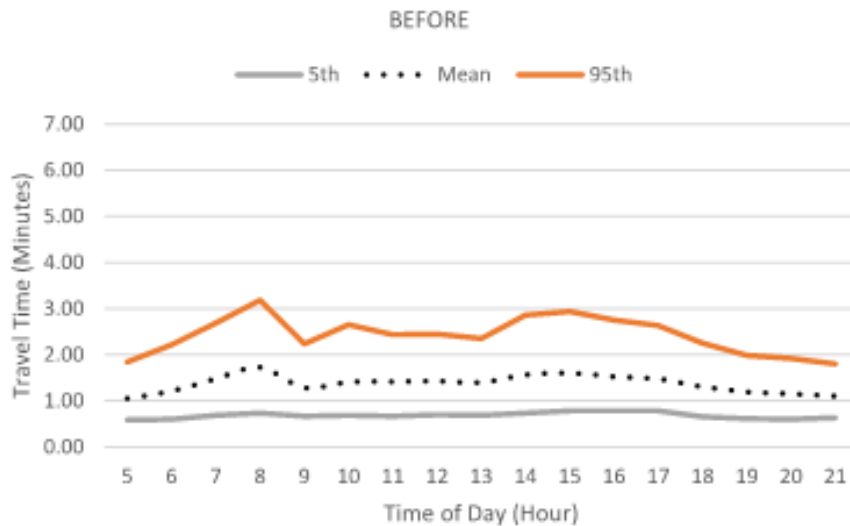**AFTER:** 9/8 - 9/28, 2019

Period	Mean Travel Time (mm:ss)	Standard Deviation (mm:ss)	5th Percentile Travel Time (mm:ss)	95th Percentile Travel Time (mm:ss)	Planning Time Index*
Before	3:49	1:56	1:18	7:14	3.81
After	2:58	1:59	1:18	7:34	3.98

WESTBOUND

SO WAS RELIABILITY BETTER?

YES FOR EASTBOUND.
NOT SO MUCH FOR WB.

EASTBOUND

Period	Mean Travel Time (mm:ss)	Standard Deviation (mm:ss)	5th Percentile Travel Time (mm:ss)	95th Percentile Travel Time (mm:ss)	Planning Time Index*
Before	3:24	2:02	1:33	8:12	4.32
After	3:31	1:49	1:46	7:11	3.79

*Planning time index is the ratio of 95th percentile travel time to the free-flow travel time.

BEFORE: 4/25 - 5/24, 2019
AFTER: 9/8 - 9/28, 2019

TRAVEL TIME & TTR

Use travel time and travel time reliability to assess *queue management*

Obj. 3

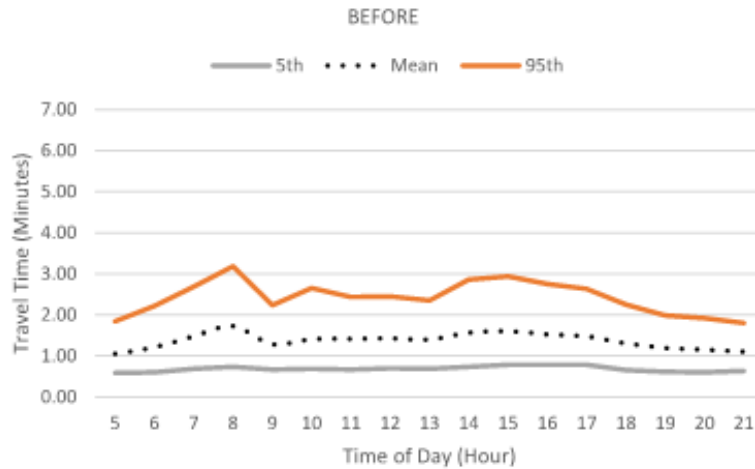Manage WB queues at 47th Ave (near railroad crossing).

BEFORE

AFTER

WHAT DOES THE DATA SHOW?

CONDITIONS WERE WORSE IN THE AFTER PERIOD.
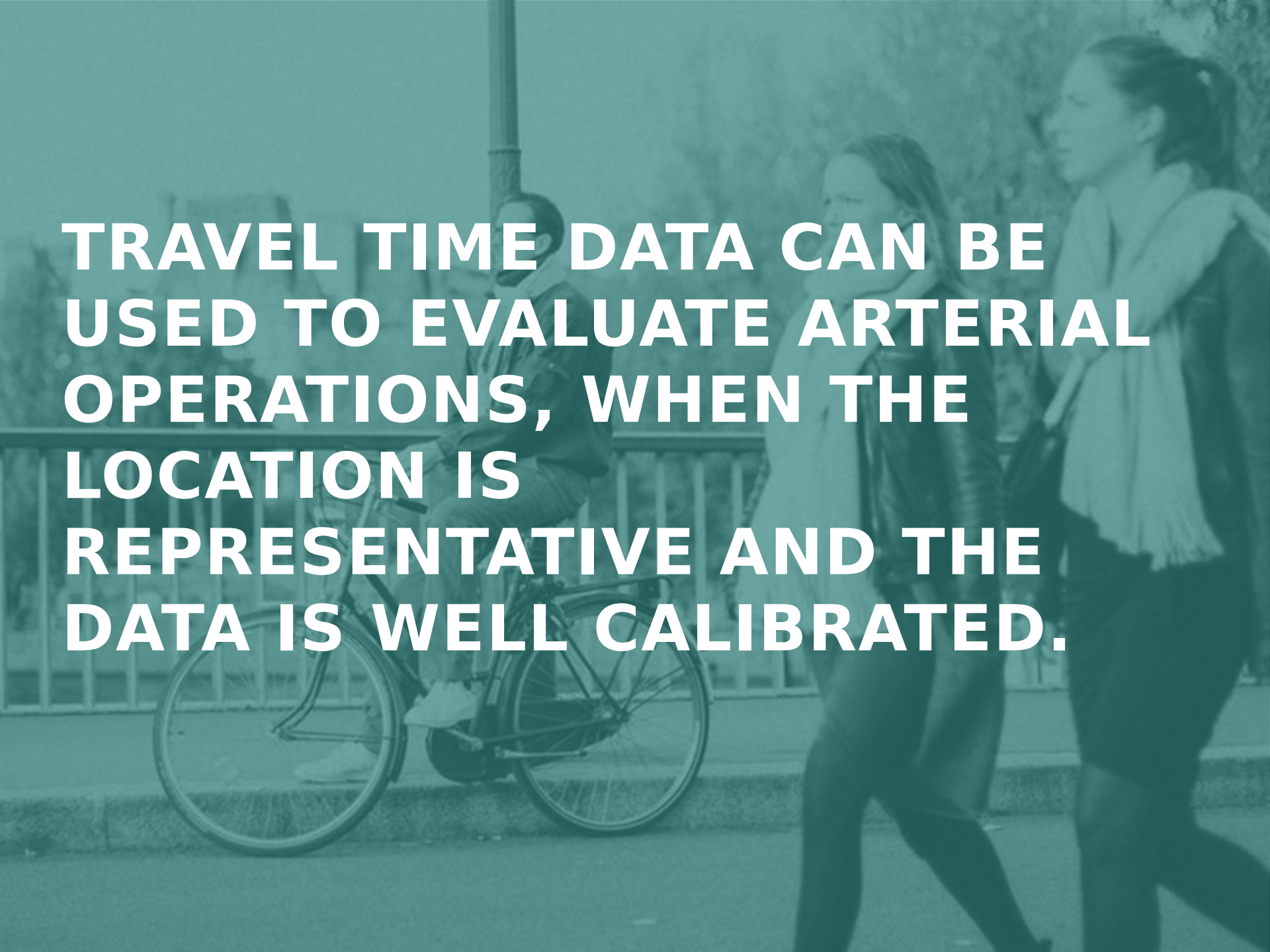- THE ADAPTIVE SYSTEM DIDN'T WORK AS IT SHOULD?

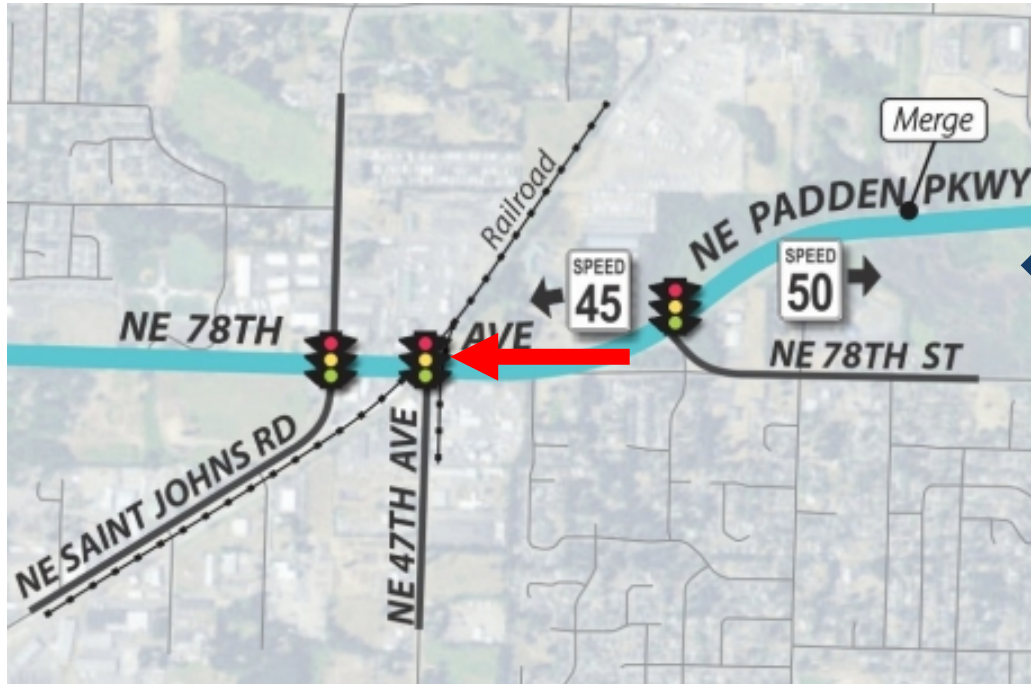**BEFORE:** 4/25 - 5/24, 2019
AFTER: 9/8 - 9/28, 2019

BEFORE

AFTER
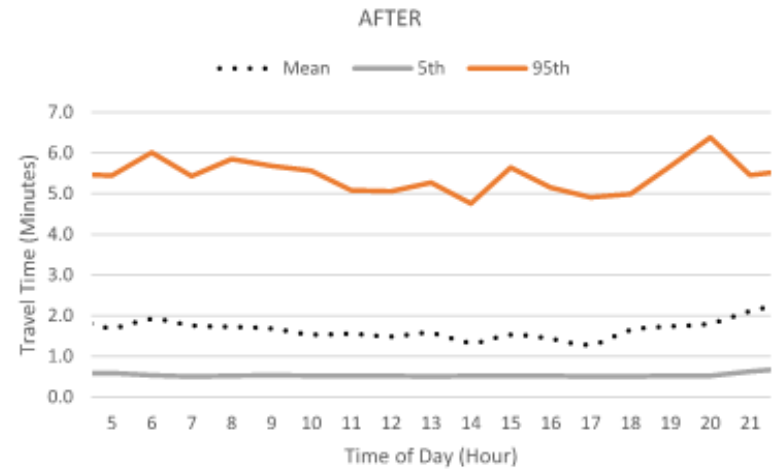
WHAT MAY HAVE HAPPENED?

1. ARE B...
2. ARE THE...
3. WERE ADAPTIVE ...
4. DID SIGNALS DR...
5. WHAT DOES TH...

EVENTUALLY, IT WAS DETERMINED THIS WAS A DATA ISSUE.

TRAVEL TIME DATA CAN BE USED TO EVALUATE ARTERIAL OPERATIONS, WHEN THE LOCATION IS REPRESENTATIVE AND THE DATA IS WELL CALIBRATED.

PERCENT ARRIVAL ON GREEN

Obj. 3

Manage WB queues at 47th Ave (near railroad crossing).

Use percent arrival on green to assess *queue management*

PERCENT ARRIVAL ON GREEN

WHAT DOES A PERCENT ARRIVAL ON GREEN DIAGRAM LOOK LIKE?

Bangerter & 5400 S, NB (3/21/2013)
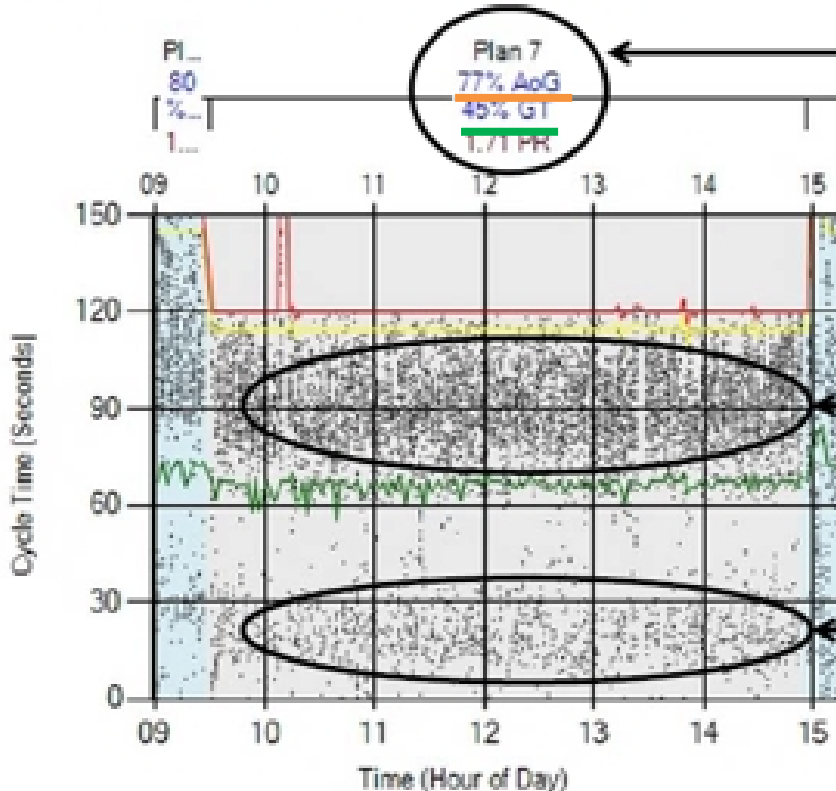
This movement receives 45% of the green time in pattern 7 and 77% of vehicles arrive on green.

Vehicles arriving on green

Vehicles arriving on red (upstream left turns?)

PERCENT ARRIVAL ON GREEN

Purdue Coordination Diagram

Controller: 3386 CCPW - NE 78th St at NE 47th Av - Std 8 FYA

Coord Phase/Overlap: PH2

Phases: 2

Detectors: 47,48

Overlaps: [Nothing]

Start Color: Red

Time: 09/11/2019 6:00:00

09/11/2019 5:59:59

Trafficware provides a diagram and a metrics table for a given day.

Vehicles arriving on green

Vehicles arriving on red

Percent arrival on green   Metrics   Percent of green time

Name	From	To	Pattern	PoG%	PG%	PR
PH2	06:00:01	06:16:06	254	72.09	47.40	1.52
PH2	06:16:06	12:00:03	20	87.85	79.43	1.11
PH2	12:00:03	17:59:47	20	87.68	77.93	1.13

SOURCE: CLARK COUNTY TRAFFICWARE ATMS.NOW SYSTEM

PERCENT ARRIVAL ON GREEN

PROJECT OBJECTIVE ③

Manage westbound queues at NE 47th Ave.

RELEVANT PERFORMANCE MEASURE

Westbound between Saint Johns Rd and 47th Ave: Percent arrival on green

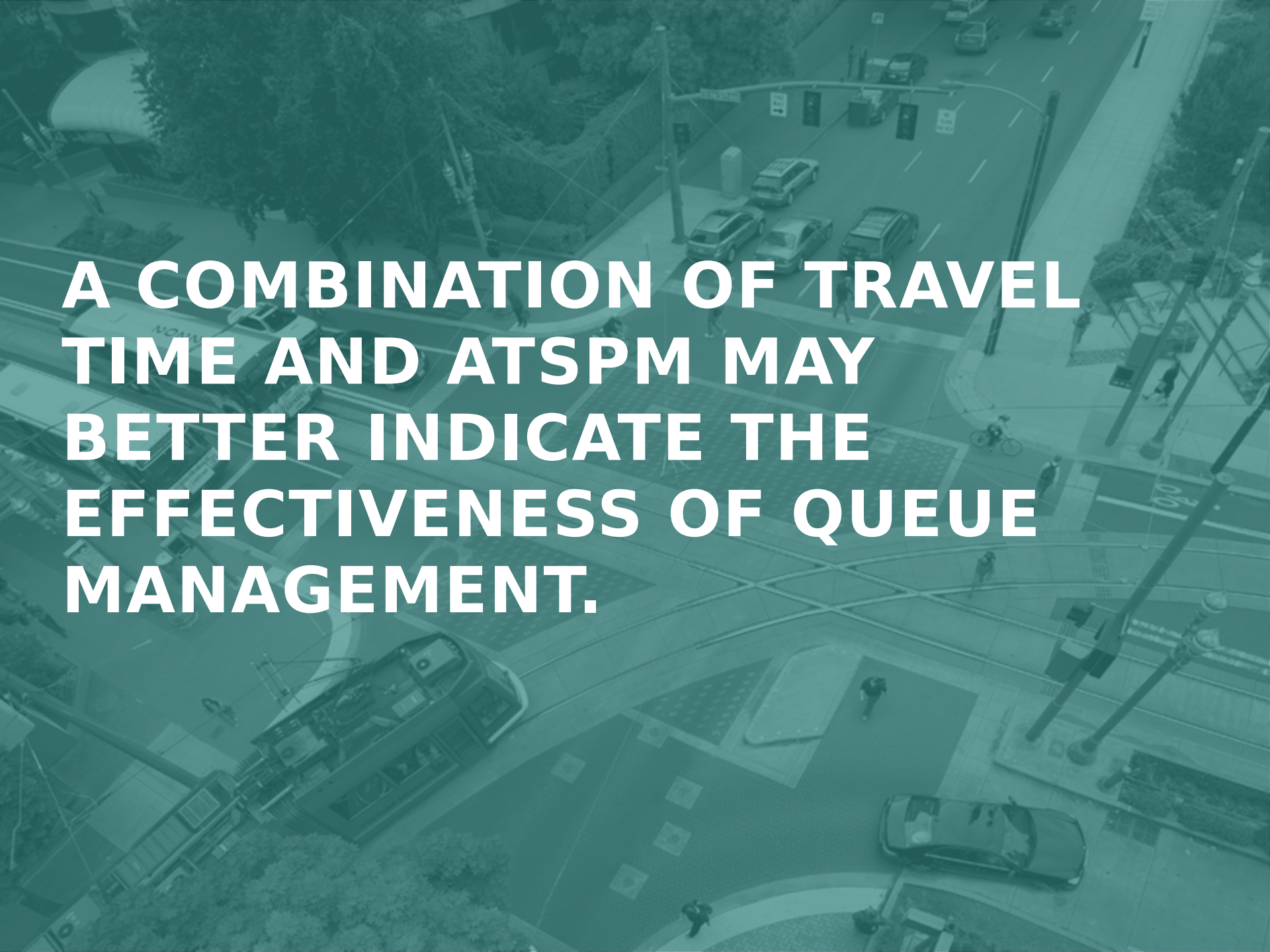% ARRIVAL ON GREEN: WB ST JOHNS RD

72-83% BEFORE

88% AFTER
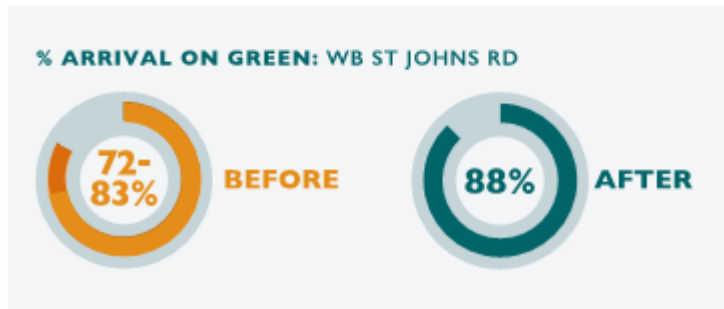
Better arrival on green in "after" period.

Shorter effective cycle lengths in "after" period.

SUMMARY:

- **Westbound traffic at 78th St/47th Ave experienced _better progression_ in "after" period**

- **(Indirectly) Queuing conditions _may_ be better in "after" period.**

A COMBINATION OF TRAVEL TIME AND ATSPM MAY BETTER INDICATE THE EFFECTIVENESS OF QUEUE MANAGEMENT.
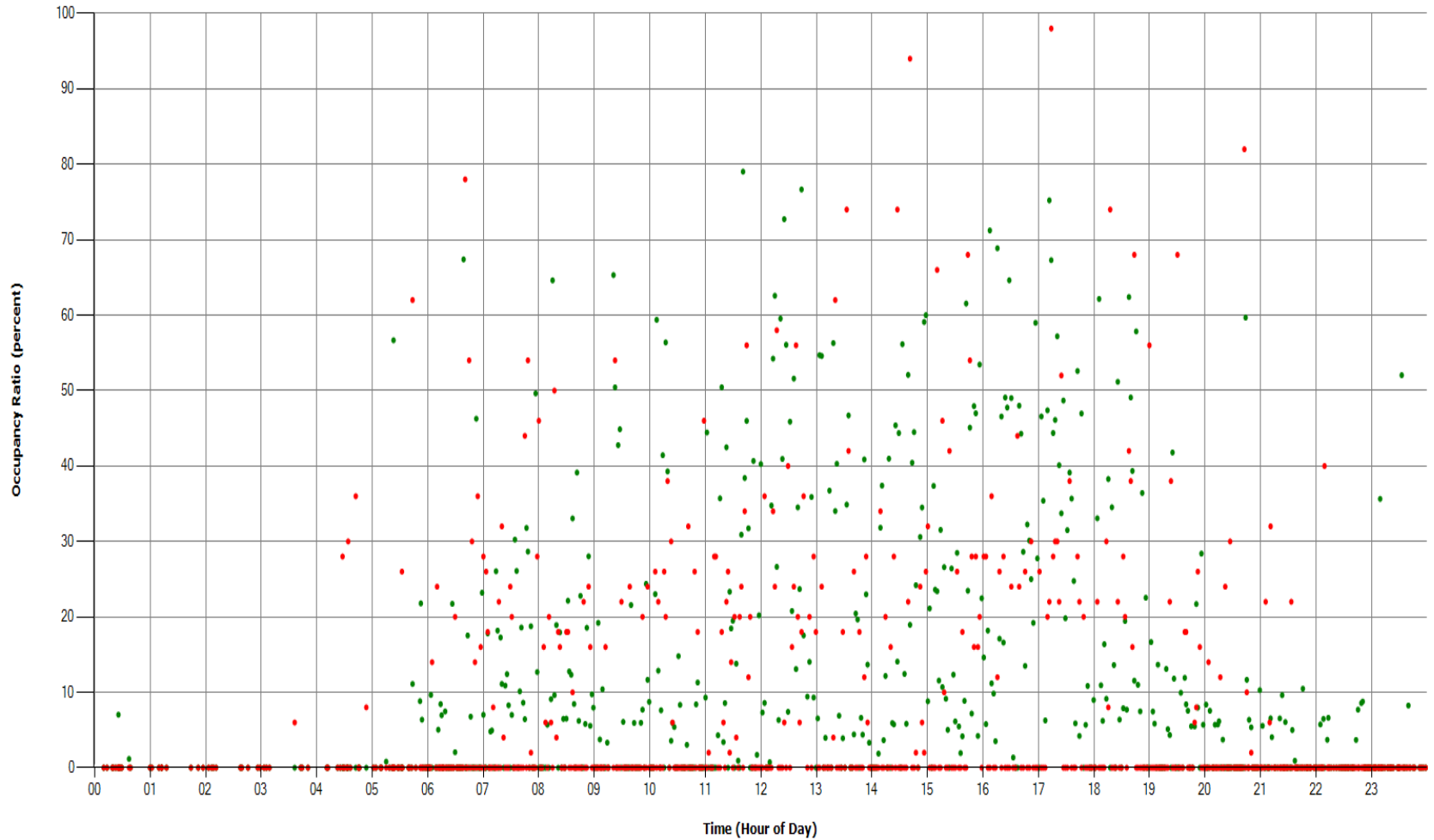
SPLIT FAILURE (ROR5/GOR)

Overview Map

Obj. 4

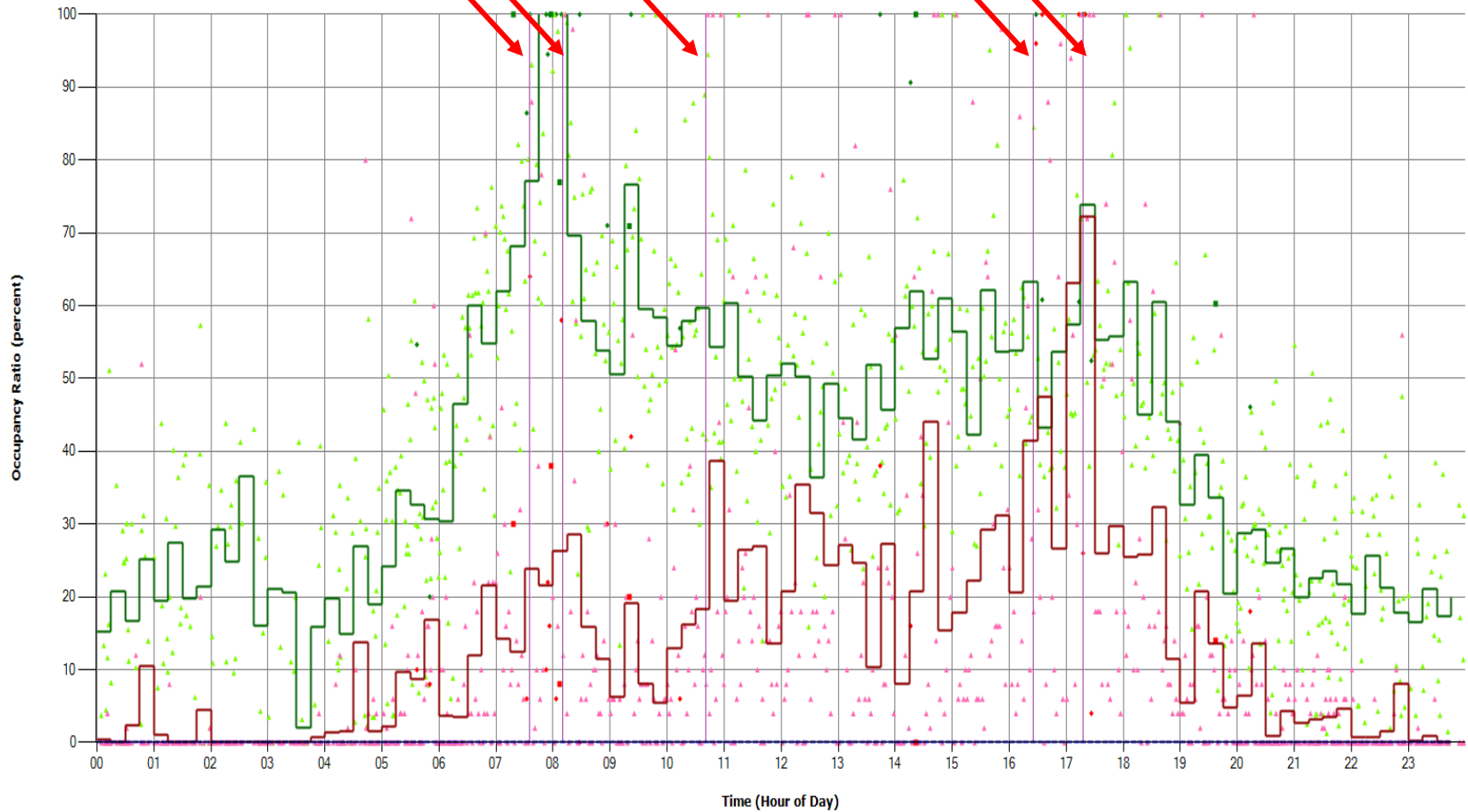Minimize queues on I-5 northbound off ramp

SPLIT FAILURE (ROR5/GOR)

WSDOT - NE 78th St at I-5 SPUI Signal 03340 Overlap: 6 Northbound
Wednesday, September 25, 2019 12:00 AM - Wednesday, September 25, 2019 11:59 PM

SPLIT FAILURE (ROR5/GOR)

WSDOT - NE 78th St at I-5 SPUI Signal 03340 Phase: 7 Northbound
Wednesday, September 25, 2019 12:00 AM - Wednesday, September 25, 2019 11:59 PM
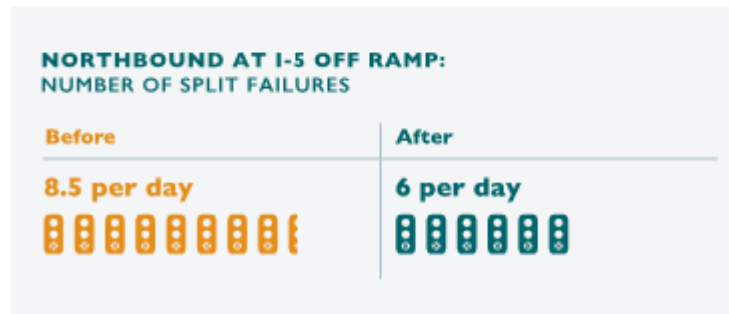
SPLIT FAILURE (ROR5/GOR)

PROJECT OBJECTIVE 4

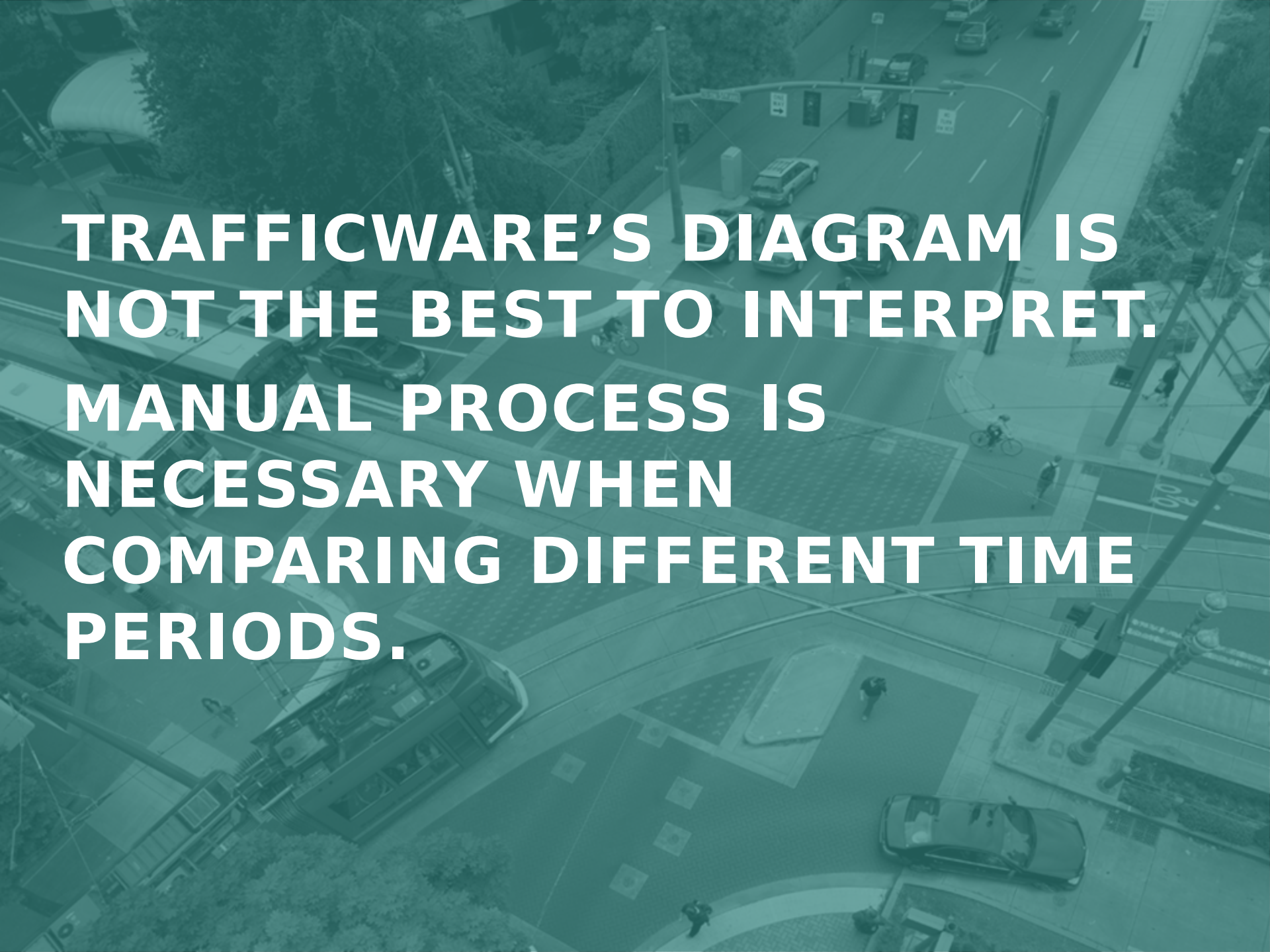## Minimize backups on I-5 northbound off-ramp.

RELEVANT PERFORMANCE MEASURE

Northbound at I-5 off ramp:
Number of split failures per day

NORTHBOUND AT I-5 OFF RAMP:
NUMBER OF SPLIT FAILURES

Before	After
8.5 per day	6 per day

IS QUEUE BETTER?

BASED ON TWO DAYS OF DATA, EACH PERIOD.

TRAFFICWARE'S DIAGRAM IS NOT THE BEST TO INTERPRET.

MANUAL PROCESS IS NECESSARY WHEN COMPARING DIFFERENT TIME PERIODS.

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KEY TAKEAWAYS & LESSONS LEARNED

KEY TAKEAWAYS

- verify signal patterns
  - Verifies signal operations mode (TOD Coord/TR/Adaptive) and TOD patterns
  - Determines the right "before" and "after" periods
  - Ensures apples-to-apples comparison
- Travel Time is a 3rd party data
  - Exhaust multiple resources when investigating suspicious data
- reading ATSPM data
  - Each graphic shows a single day – No aggregation
  - Good visual, but not easy for comparison (e.g. split failure)
  - Can't superimpose

THANK YOU