How Will Technologies Change our Way of Doing Signal Timing and Coordination

Zong Z. Tian, Ph.D., P.E.
Center for Advanced Transportation Education and Research (CATER)
University of Nevada, Reno (UNR)
and
Shaun Quayle, P.E.
Washington County, Oregon

May 2018

Outline

- Introducing the TranSync Tool
  - Commonly asked questions in signal coordination
  - How is TranSync different from others

TranSync
Nonstop Innovation

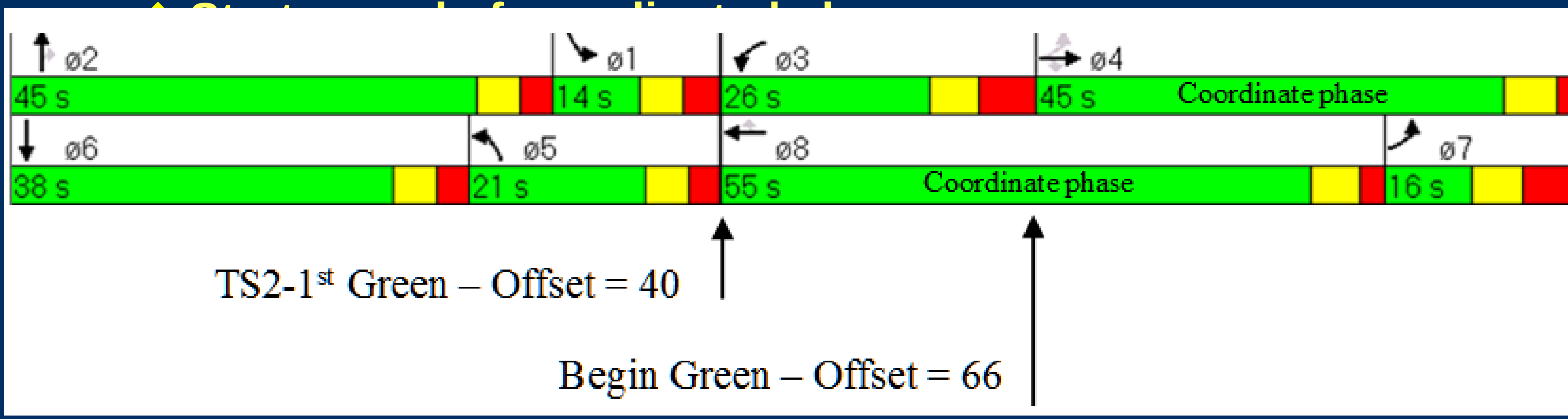
- Washington County Case Demo

Commonly Asked Questions

- How to quickly find out if the field timing does not match the designed one?
- How to develop optimized timing plan without traffic volumes?
- How to know if we have done the best coordination possible?
- How to explain a signal coordination plan to elected officials or the public?

Common Timing Challenges

- Early releases
- Wrong offset reference



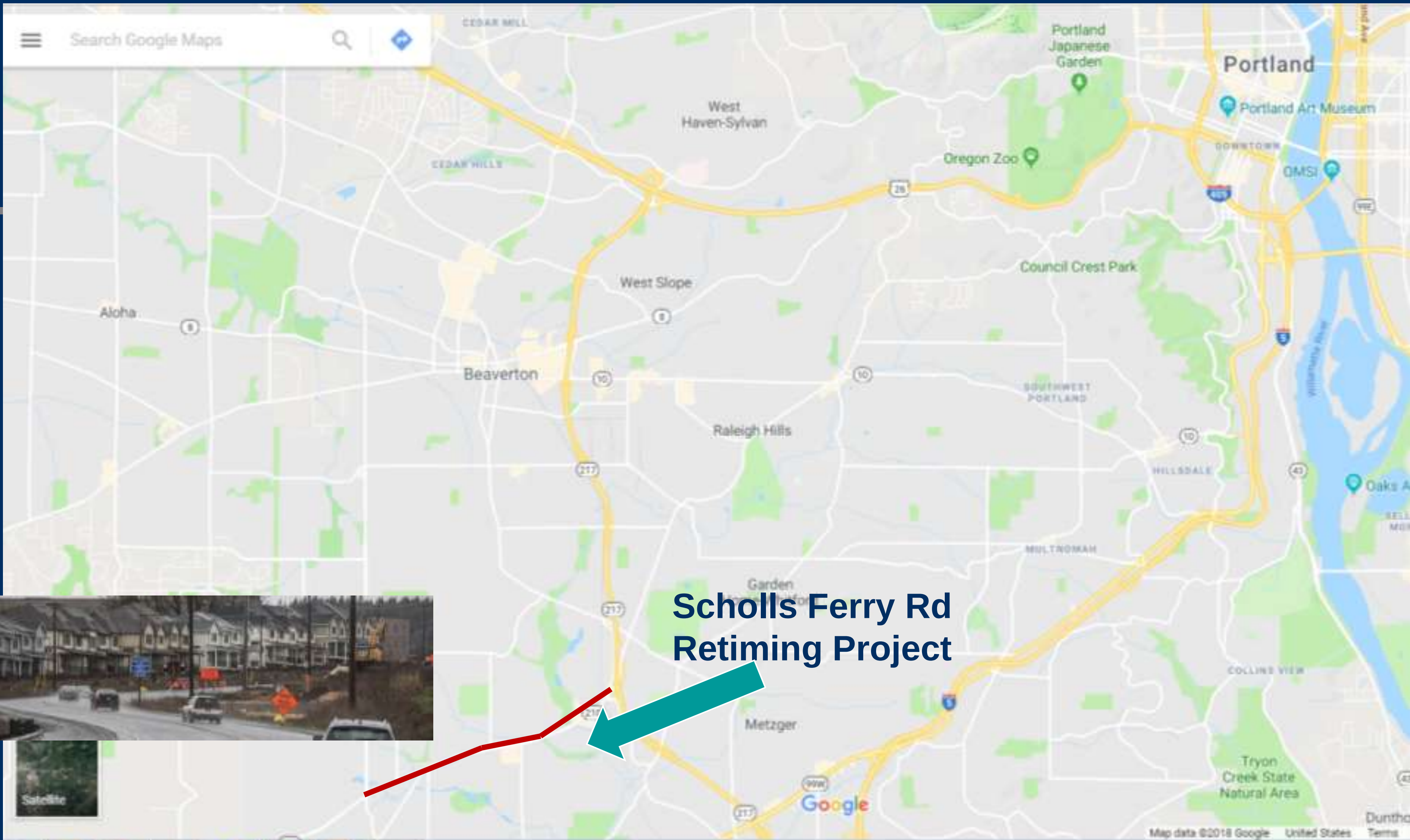
- Clock drifts

TranSync vs. Synchro

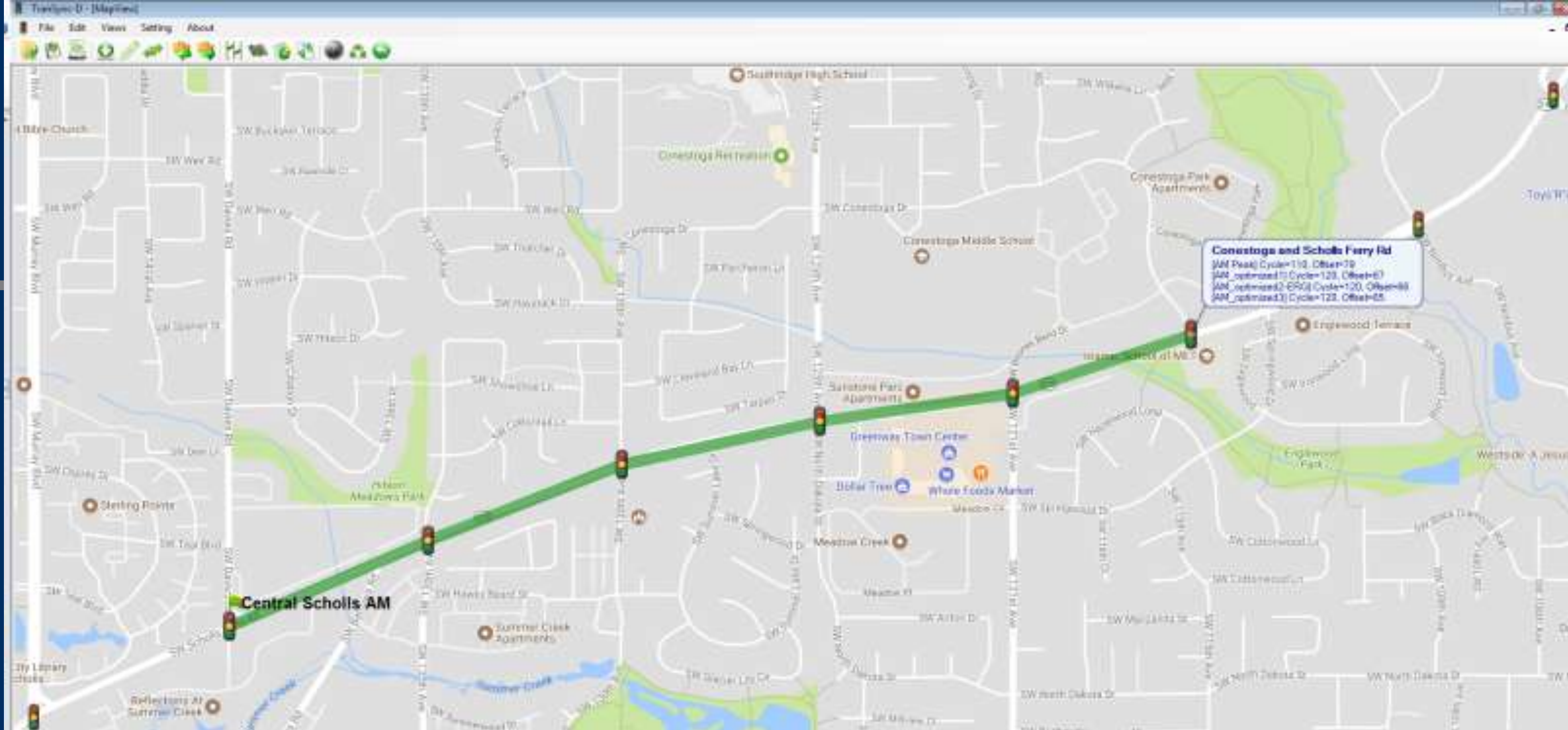
Features	Synchro	TranSync
Inputs	Turning volume, lane configuration	Cycle and splits (*no volume)
Timing Data Management	One file for each timing plan	Multiple agency, timing plans in a single database
Optimization	Delay based with detailed geometry and volume	Maximum bandwidth without volume
Diagnosis	No field diagnosis	GPS and real-time time-space diagram on iOS device
Evaluation/Performance	Delays, stops produced by Synchro	Performance index for Quality of Signal Timing based on field GPS runs

Washington County's Experience

- Citizen complaints in AM, years since retimed
- Used TranSync-D for "better than Synchro" models for retiming project.

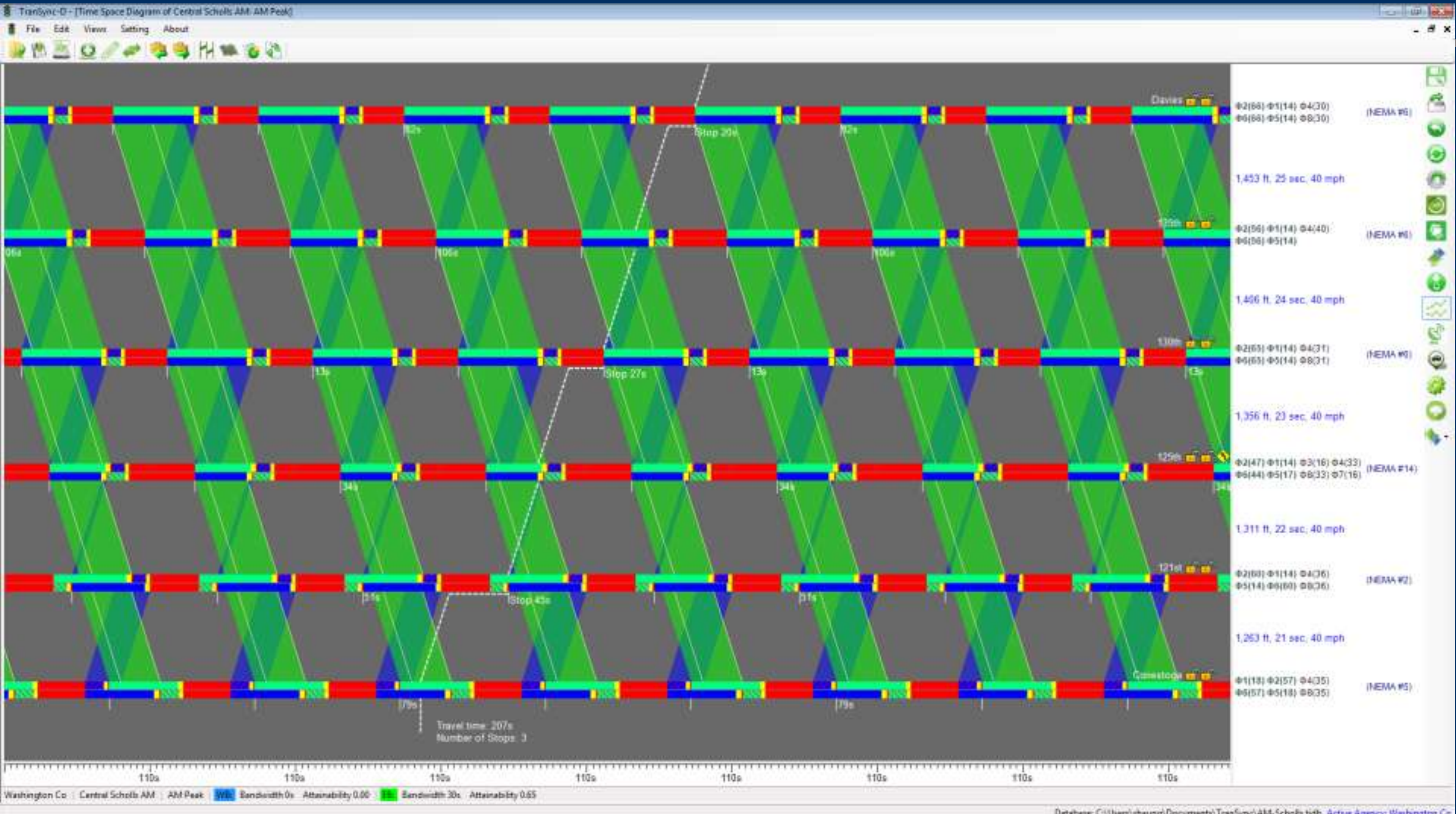


Scholls Ferry Rd Retiming Project


Conestoga and Scholls Ferry Rd
Central Scholls AM
Greenway Town Center
Conestoga Middle School
Englewood Terrace
Meadow Creek
Sterling Pointe

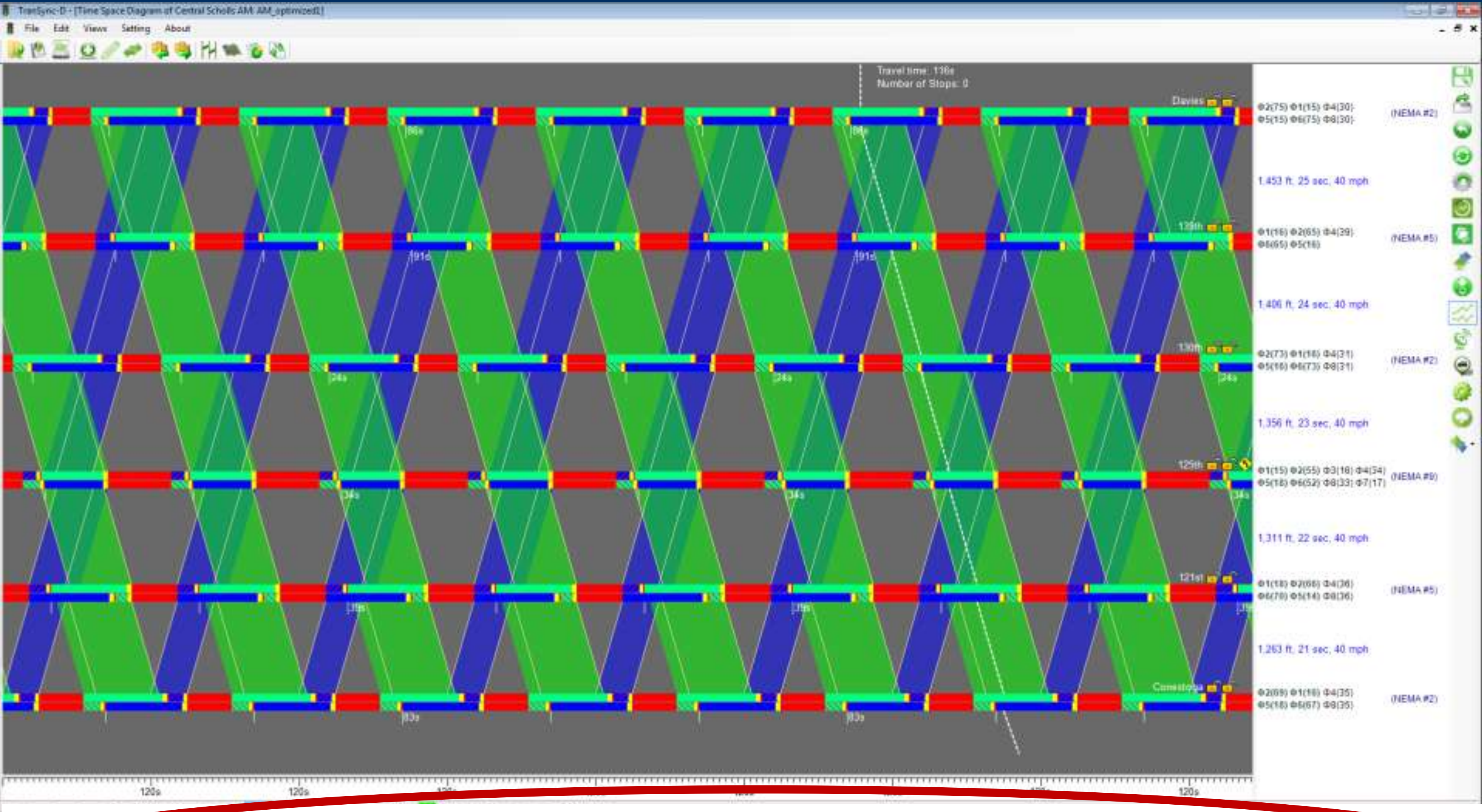

OR-210
Google

Old AM Timing Plan



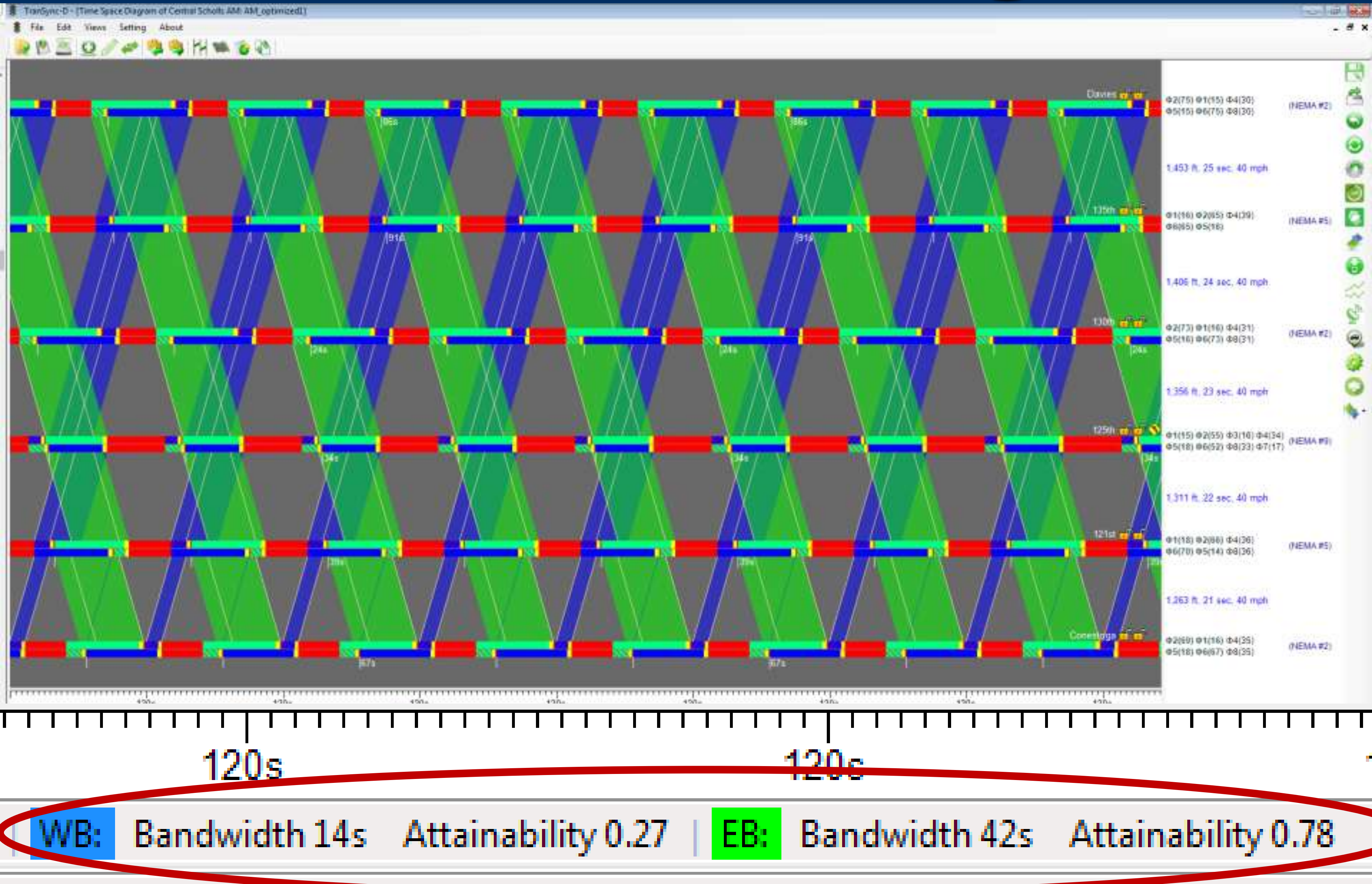
AM Peak | WB: Bandwidth 0s Attainability 0.00 | EB: Bandwidth 30s Attainability 0.65

TranSync Optimized AM Timing

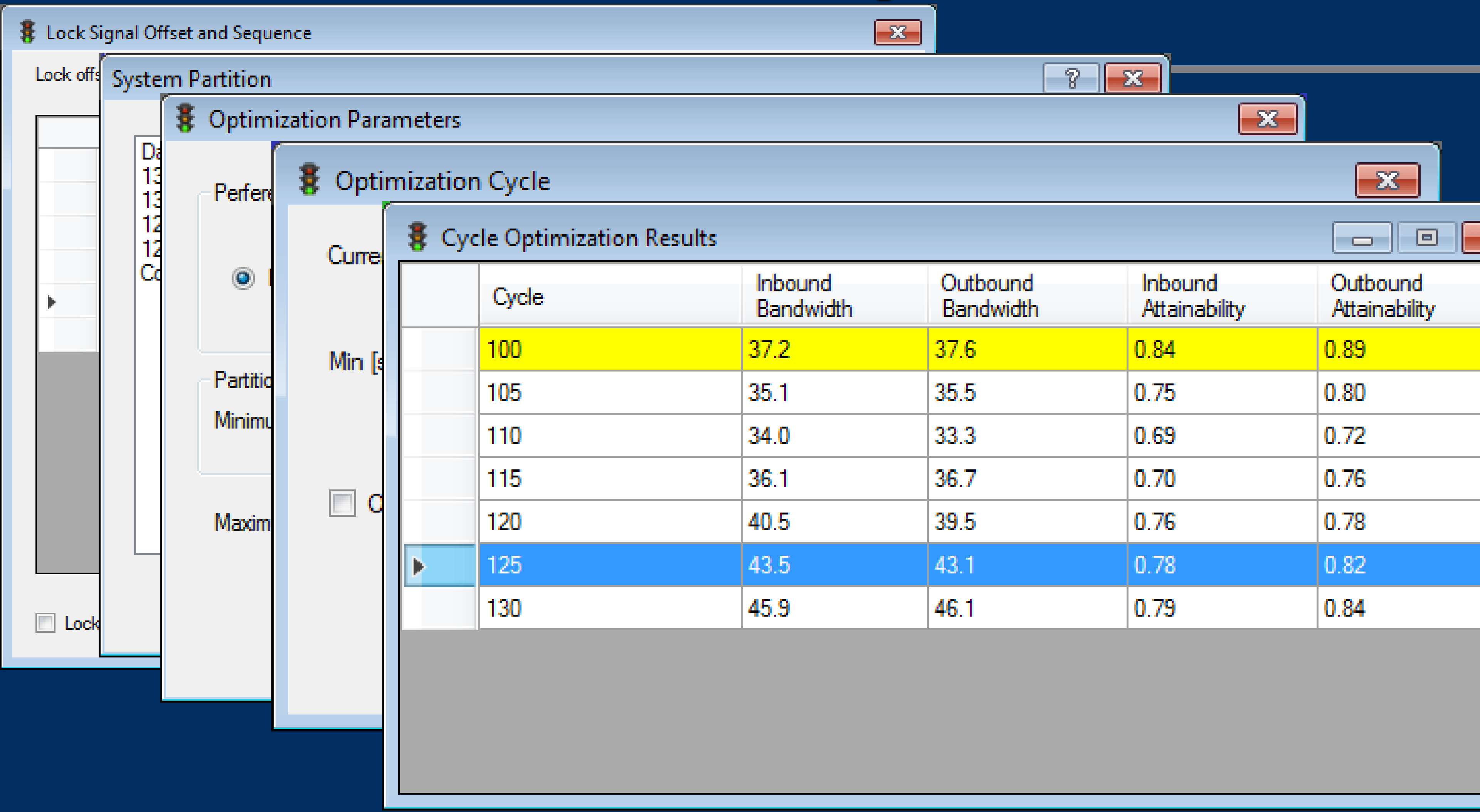


WB: Bandwidth 30s Attainability 0.58 | EB: Bandwidth 51s Attainability 0.94

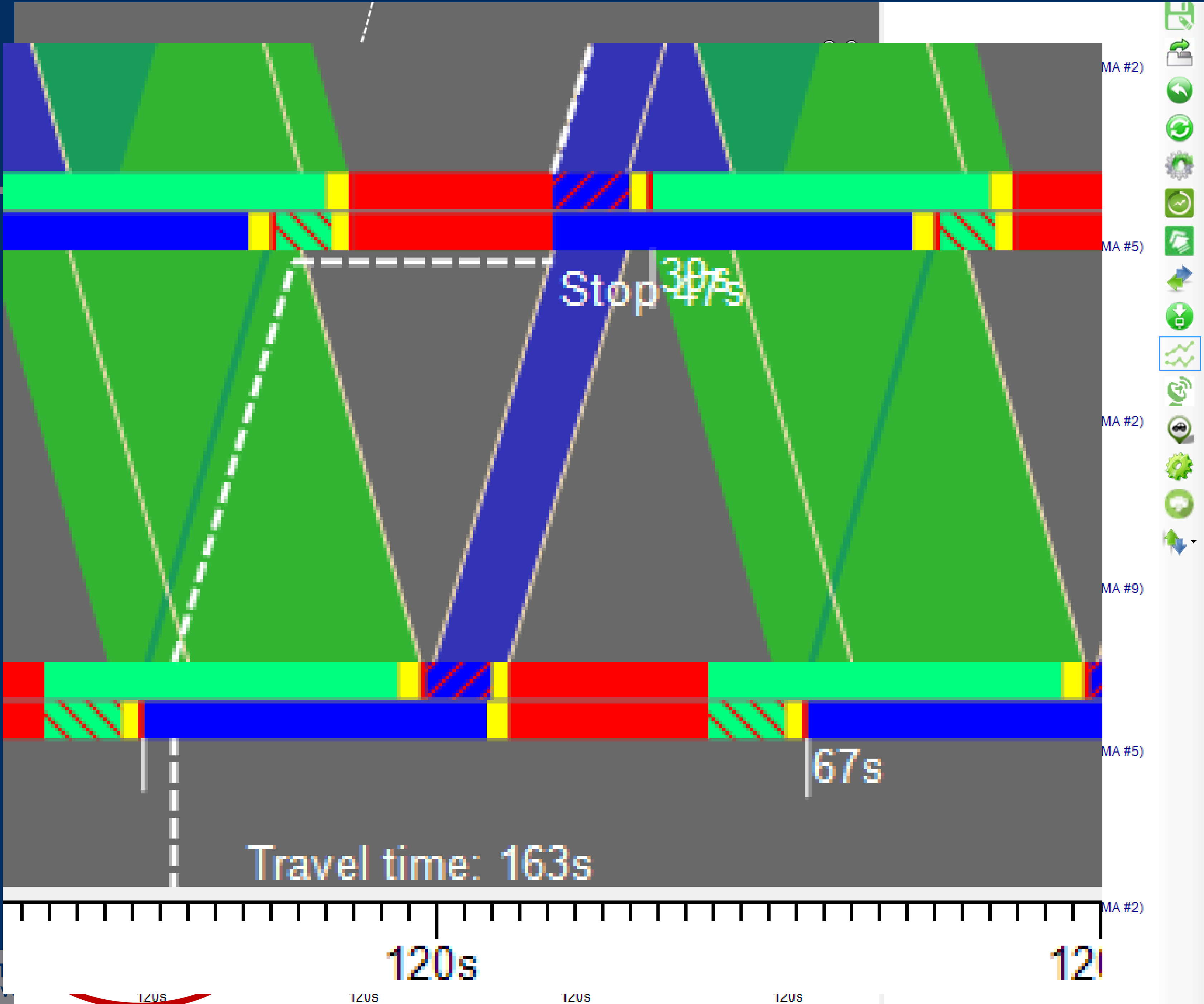
Field-Tuned AM Timing Plan



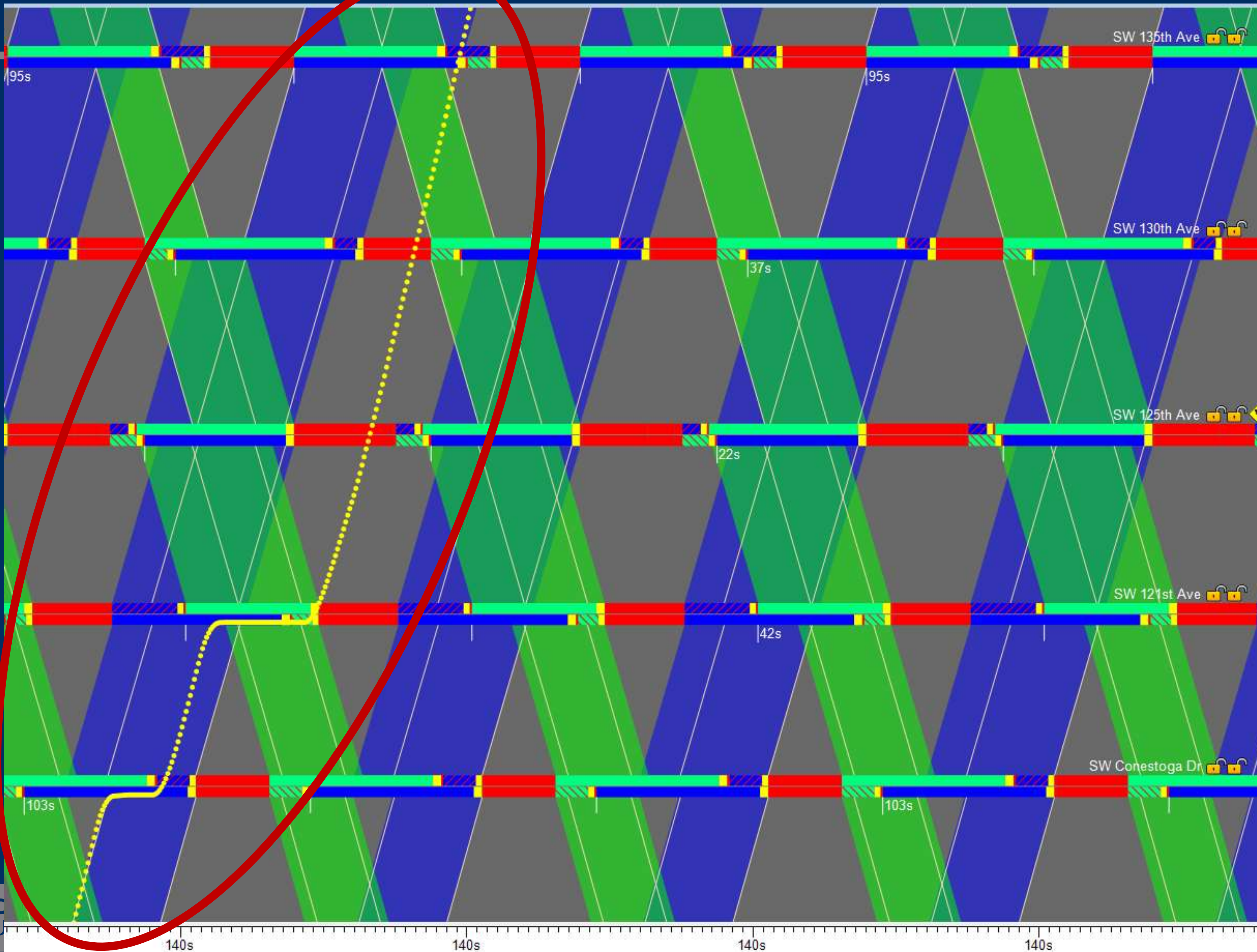
More Control in Optimization



Cycle	Inbound Bandwidth	Outbound Bandwidth	Inbound Attainability	Outbound Attainability
100	37.2	37.6	0.84	0.89
105	35.1	35.5	0.75	0.80
110	34.0	33.3	0.69	0.72
115	36.1	36.7	0.70	0.76
120	40.5	39.5	0.76	0.78
125	43.5	43.1	0.78	0.82
130	45.9	46.1	0.79	0.84


MA #2)
MA #5)
Stop 47s
39s
MA #2)
MA #9)
67s
MA #5)
Travel time: 163s
MA #2)
120s
120s
120s
120s
120s

Clock & Phase Order Issues



Corridor Synchronization Performance Index

Summary

Arterial: PM 140

Timing	No. of Runs	Average Speed (mph)	Average Speed Score	Average Stop Score	Average Score	Quality of Signal Timing
PM 140 (Avg)	4	23.9	70	70	70	D+
PM 140 (WB)	2	25.1	73	85	81	B-
PM 140 (EB)	2	22.7	67	54	58	F

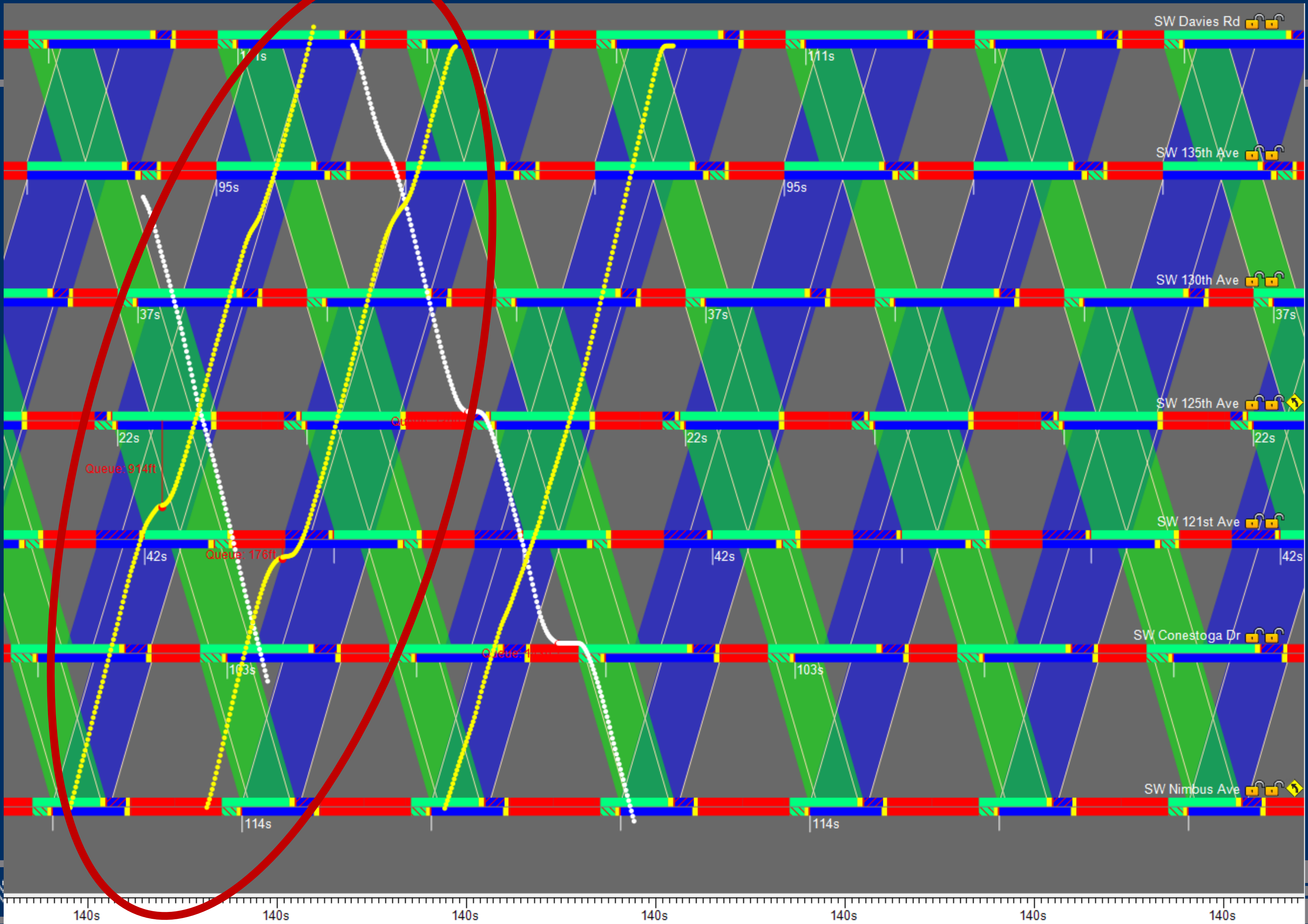
Details

Arterial: PM 140

Timing Plan: PM 140

Timing	GPS File Name	Average Speed (mph)	% Speed	Speed Score	No. of Stops	Stand No. of Stops	% Stop	Stop Score	Original Score	Cycle Adj.	Spacing Adj.	Adjusted Score	Quality of Signal Timing
PM 140 (WB)	PM 140[PM 140]-WB-2018-05-01 15-49-58	25.9	65%	75	2	1.8	26%	80	78	78(+0)	78(+0)	78	C+
PM 140 (WB)	PM 140[PM 140]-WB-2018-05-01 16-23-50	24.3	61%	71	1	1.2	18%	90	84	84(+0)	84(+0)	84	B
PM 140 (EB)	PM 140[PM 140]-EB-2018-05-01 15-40-46	26.9	67%	77	1	1	14%	93	88	88(+0)	88(+0)	88	B+
PM 140 (EB)	PM 140[PM 140]-EB-2018-05-01 16-17-38	18.5	46%	56	3	4	57%	16	28	28(+0)	28(+0)	28	F

Clock & Phase Order Corrected



Corridor Synchronization Performance Index

Summary

Arterial: PM 140

Timing	No. of Runs	Average Speed (mph)	Average Speed Score	Average Stop Score	Average Score	Quality of Signal Timing
PM 140 (Avg)	5	33.1	91	98	96	A
PM 140 (WB)	3	32.6	92	98	96	A
PM 140 (EB)	2	33.8	90	97	95	A

Details

Arterial: PM 140

Timing Plan: PM 140

Timing	GPS File Name	Average Speed (mph)	% Speed	Speed Score	No. of Stops	Stand No. of Stops	% Stop	Stop Score	Original Score	Cycle Adj.	Spacing Adj.	Adjusted Score	Quality of Signal Timing
PM 140 (WB)	PM 140[PM 140]-WB-2018-05-02 16-29-50	32.7	82%	92	0	0	0%	100	98	98(+0)	98(+0)	98	A
PM 140 (WB)	PM 140[PM 140]-WB-2018-05-02 16-19-51	31.2	78%	88	1	0.2	3%	98	95	95(+0)	95(+0)	95	A
PM 140 (WB)	PM 140[PM 140]-WB-2018-05-02 16-08-31	34	85%	95	1	0.2	2%	98	97	97(+0)	97(+0)	97	A
PM 140 (EB)	PM 140[PM 140]-EB-2018-05-02 16-24-31	39.6	99%	100	0	0	0%	100	100	100(+0)	100(+0)	100	A
PM 140 (EB)	PM 140[PM 140]-EB-2018-05-02 16-12-42	28.1	70%	80	2	0.8	11%	95	90	90(+0)	90(+0)	90	A-

Resultant New Timing Cycle Lengths – Scholls Ferry

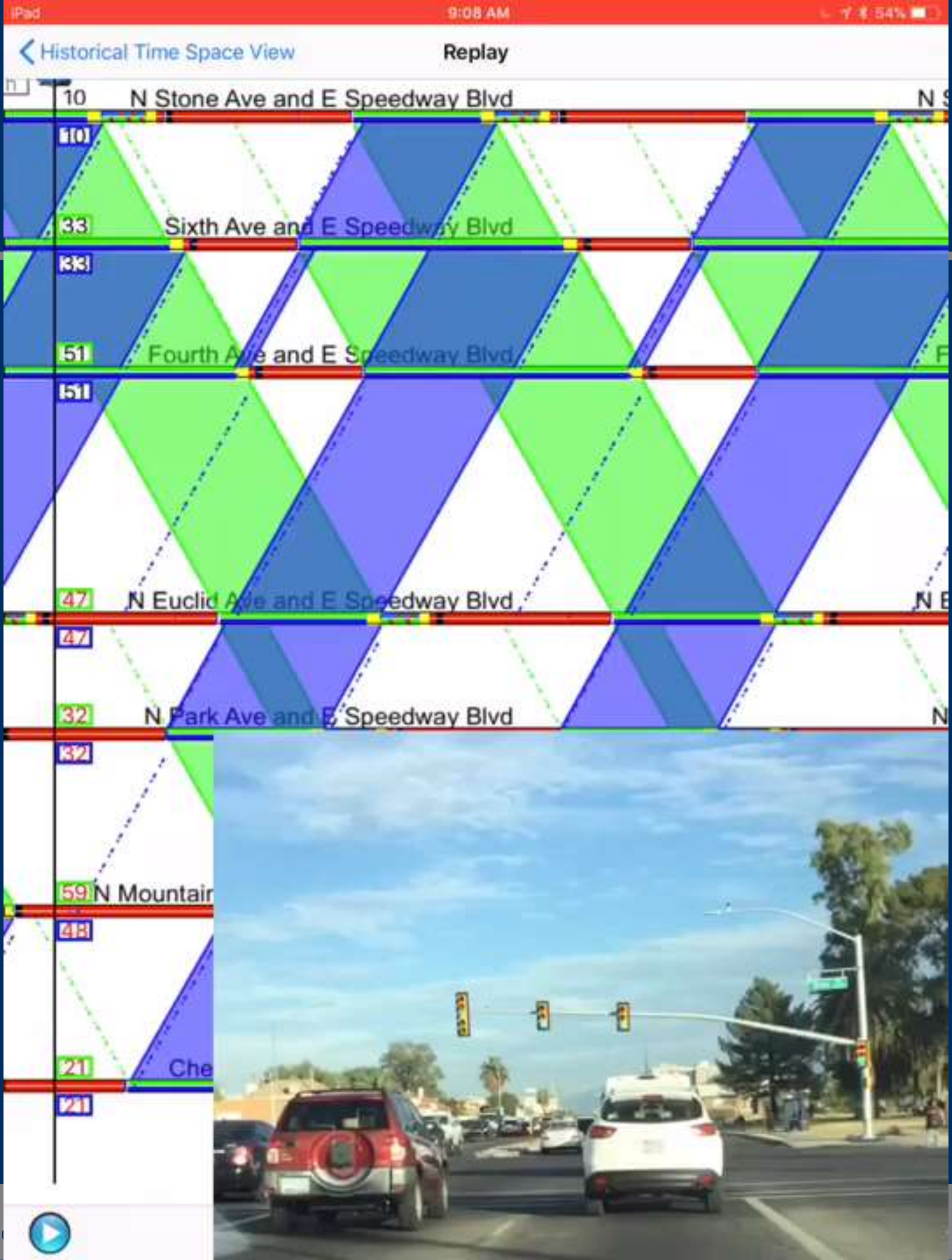
	OLD	NEW
AM Shoulder	110	110
AM Peak	110	120
Midday	100	100
PM Shoulder	100	125
PM Peak	120	140
Weekend	100	100

County Conclusions

- Effective tool for (1) retiming projects & (2) timing health & accuracy.
  - Useful features in D = better starting point for implementation
  - Useful features in M = ground-truth results to adjust from for progression.
  - Non-coord movement timing optimization through other means (field fine tuning)

County Conclusions

- Must import accurate timing parameters
- Clearly showed issues
  - Clock drift or
  - Differing field timings vs. TranSync/Synchro files.
- Manual process but high benefit/cost
- No cabinet access required!
  - Ideal for consultant retiming & reporting.


iPad
9:08 AM
54%
Historical Time Space View
Replay
10 N Stone Ave and E Speedway Blvd
33 Sixth Ave and E Speedway Blvd
51 Fourth Ave and E Speedway Blvd
47 N Euclid Ave and E Speedway Blvd
32 N Park Ave and E Speedway Blvd
59 N Mountain
48
21 Che


U.S. Department of Transportation
Office of the Secretary of Transportation
UTC Spotlight
University Transportation Centers Program
This month: University of Nevada, Reno | January 2015
New Signal Timing Tool Helps Engineers Save User Costs and the Environment


GIANT BURGER


PROFESSIONAL CONFERENCES AND MEETINGS.
3:05 / 50:00
Experiencing interruptions?
Find out why
Are Adaptive Signal Control Systems a Solution to Urban Congestion?
US Department of Transportation Office of the Assis...
Subscribe
26
151 views

Questions?