

City of Philadelphia

Interconnected Signalized Corridors

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Presenters:

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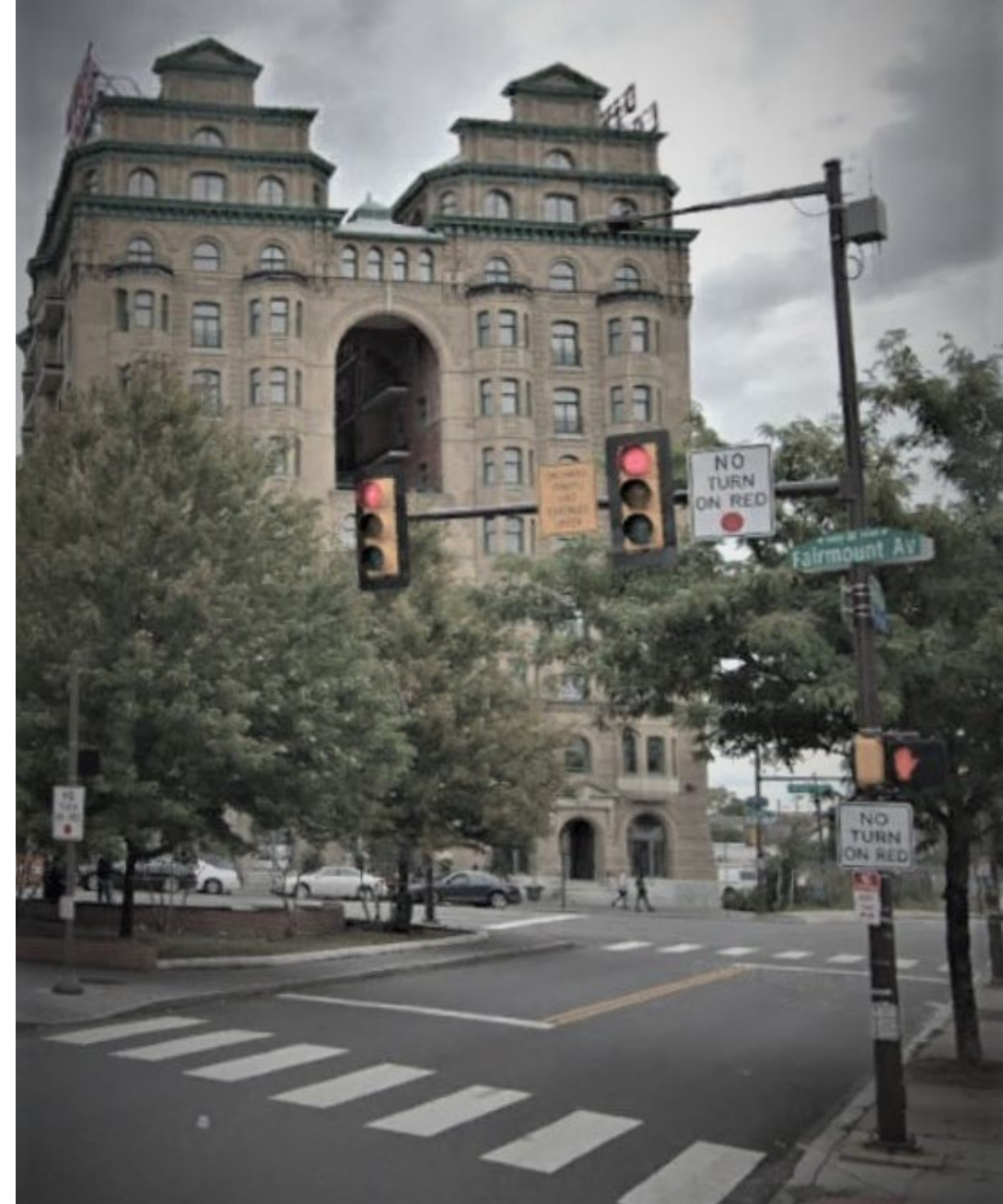


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AGENDA

- Project Description
- Typical Signal Upgrades
- Corridor Interconnectivity
- Traffic Operations Center
- Questions (End of Session)



Project Description

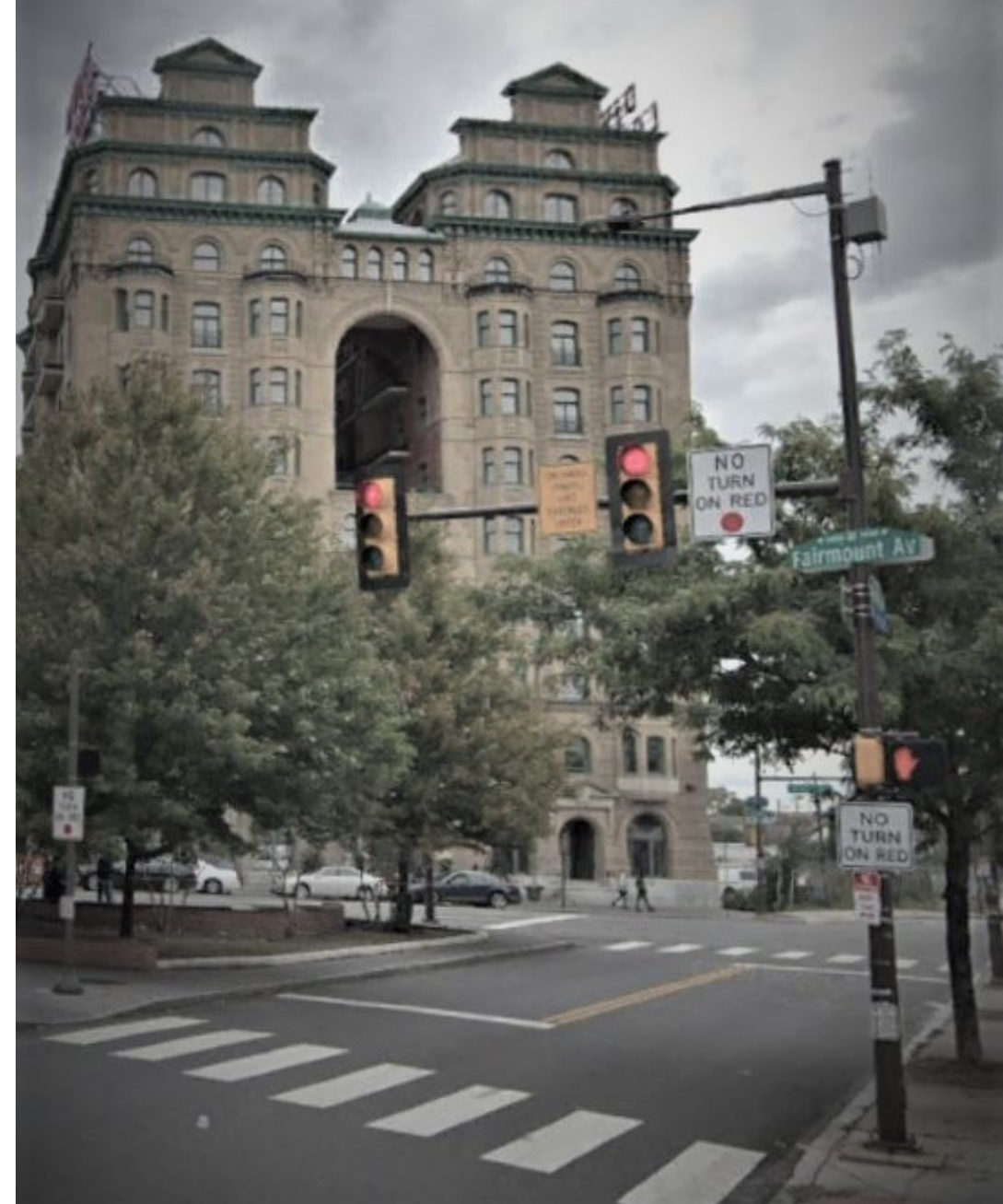


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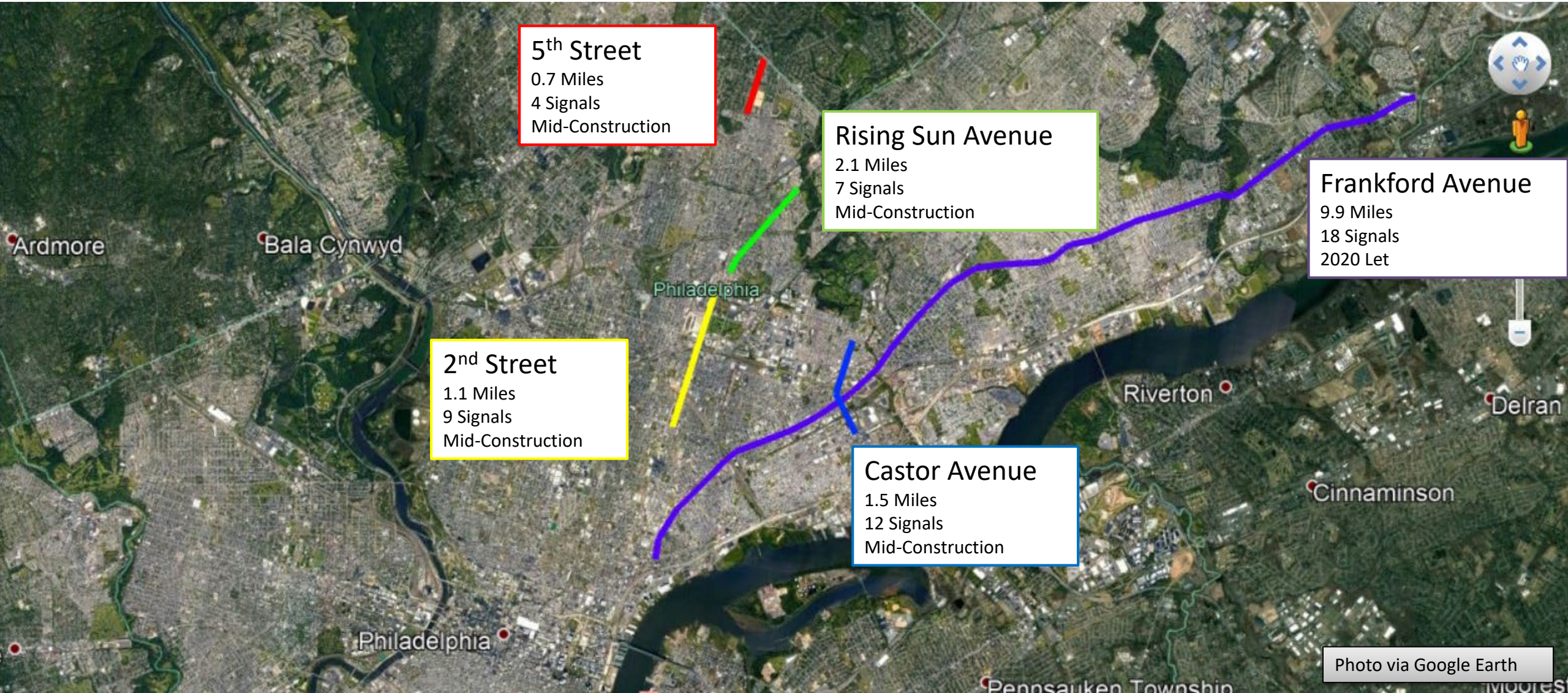


PROJECT NEEDS

- Client: PennDOT, District 6-0
- Municipality: City of Philadelphia
- Project Objective: Safety Improvement
 - Identified as having higher than average crash rates.
 - Multiple crashes with injury.
 - Multiple crashes involving pedestrians.



PROJECT LOCATIONS



City of Philadelphia



Typical Signal Upgrades



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Before Signal Improvements



Photo via Google Earth

After Signal Improvements



Photo via Google Earth



LED Luminaire Upgrades

TC-8800 Mast Arms

C-Posts (C.o.P.)

12" Overhead LED Vehicular Signals

D-Poles (C.o.P.)

Pedestrian Countdown Signals

ATC Cabinet (170 Pictured)

Photo via Google Earth

ADVANCED TRANSPORTATION CONTROLLER (ATC) CABINET

- Performance Advantages
 - Capable of managing even the most complex intersections using the most recent logic and algorithms
 - 16 – 32 Output Channels
 - 24 – 48 Input Channels
 - Full Serial Communication: SIU's are faster and more capable than older BIU's.
- Maintenance Advantages
 - Modular, pluggable design for quick parts changeout
 - Interchangeable components for storage/supply
 - Workforce familiarity



Photo via McCain Inc.



Photo via Econolite/Safetran

ADVANCED TRANSPORTATION CONTROLLER (ATC) CABINET

- Connectivity Advantages

- Present

- Can communicate with other new Controllers (ATC or 170) via Fiber Optic connections.
 - Can communicate with Philadelphia Traffic Operations Center via Fiber Optic connections.

- Future

- Can be modified to incorporate future technology such as CAV communication appliances.

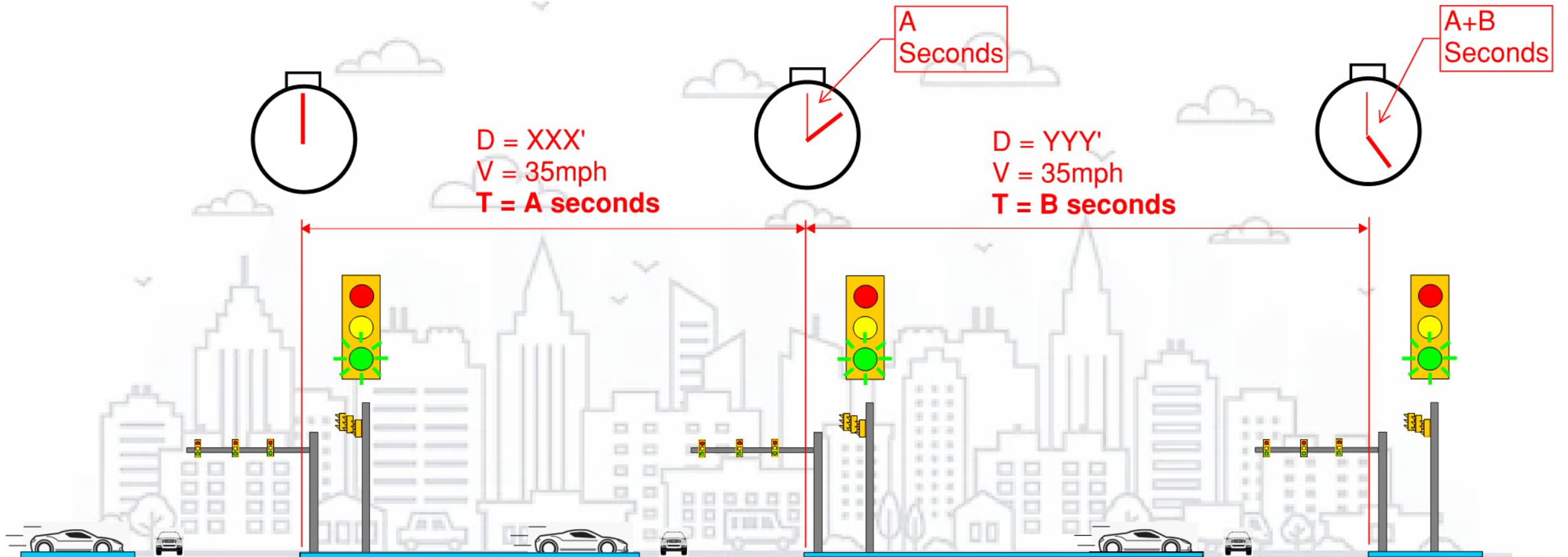
Corridor Interconnectivity



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INTERCONNECTED SIGNALS – BASIC IDEA



INTERCONNECTED SIGNALS - METHODS

- GPS Time Clock
 - Pro – Cheap; no need for physical/radio connection
 - Con – Can float and become totally ineffective
- Radio
 - Pro – Does not require fiber, poles, or conduit for connection along a corridor
 - Con – Depending on distance between signals and obstructions, it can require signal boosters
- Copper “Sync”
 - Pro – Simple, effective, works with mechanical controllers
 - Con – Obsolete; limited in that no information is actually transmitted beyond an electrical pulse
- Fiber Optic
 - Pro – Nearly instantaneous communication; can carry significantly more information (including video)
 - Con – Installation can be costly/difficult when no utility poles are present for installation.

INTERCONNECTED SIGNALS – REQUIRED HARDWARE

- Fiber Optic Cable
 - Backbone Fiber
 - **48 Strands** – Daisy Chain Configuration
 - Ties in to controllers at beginning of corridor, end of corridor, and any other intersecting interconnected corridors.
 - Requires larger controller cabinet for larger patch panels.
 - Local Fiber
 - **24 Strands** – Daisy Chain Configuration
 - Ties in at all other “local” controllers.
 - Breaks off of backbone in aerial splice enclosure.
 - 12 fibers carry info to controller and 12 fibers carry info from the controller.



INTERCONNECTED SIGNALS – REQUIRED HARDWARE

- Fiber Optic Cable - Installation
 - Aerial Installation - Preferred
 - Hung from utility poles or Septa poles.
 - Runs from utility pole, to mast arm or D-pole, to drum junction box, to controller cabinet.
 - Underground Installation - Alternative
 - Run in designated City-owned interconnect conduit or in available utility duct bank.
 - Must be run in flexible fabric inner-duct.
 - Requires extensive conduit proving and potentially repair if it is being installed in existing conduit.
 - Requires manhole modification.
 - Vulnerable to fires/conduit damage



INTERCONNECTED SIGNALS – REQUIRED HARDWARE

- Fiber Optic Switches
 - Layer 2 Fiber Switch
 - Allows controller to send and receive info along fiber optic cable.
 - One installed per upgraded or new controller.
 - Layer 3 Fiber Switch
 - Allows the corridor to send and receive information from the City of Philadelphia Traffic Management Center.
 - One was installed per upgraded corridor to create a “Hub” for connecting to the TOC.

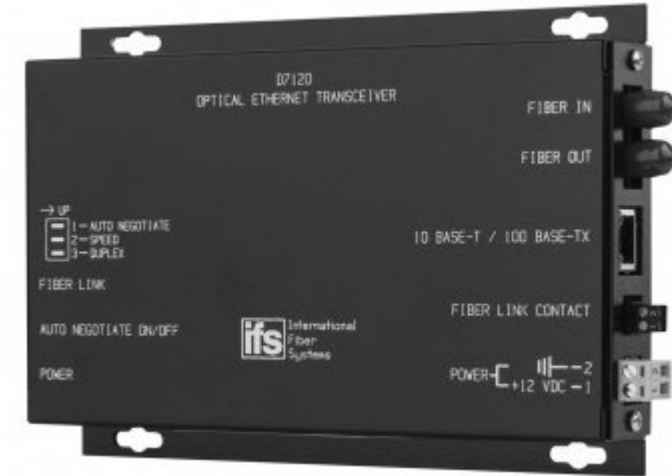


Photo via Interlogix

Traffic Operations Center



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TRAFFIC OPERATIONS CENTER

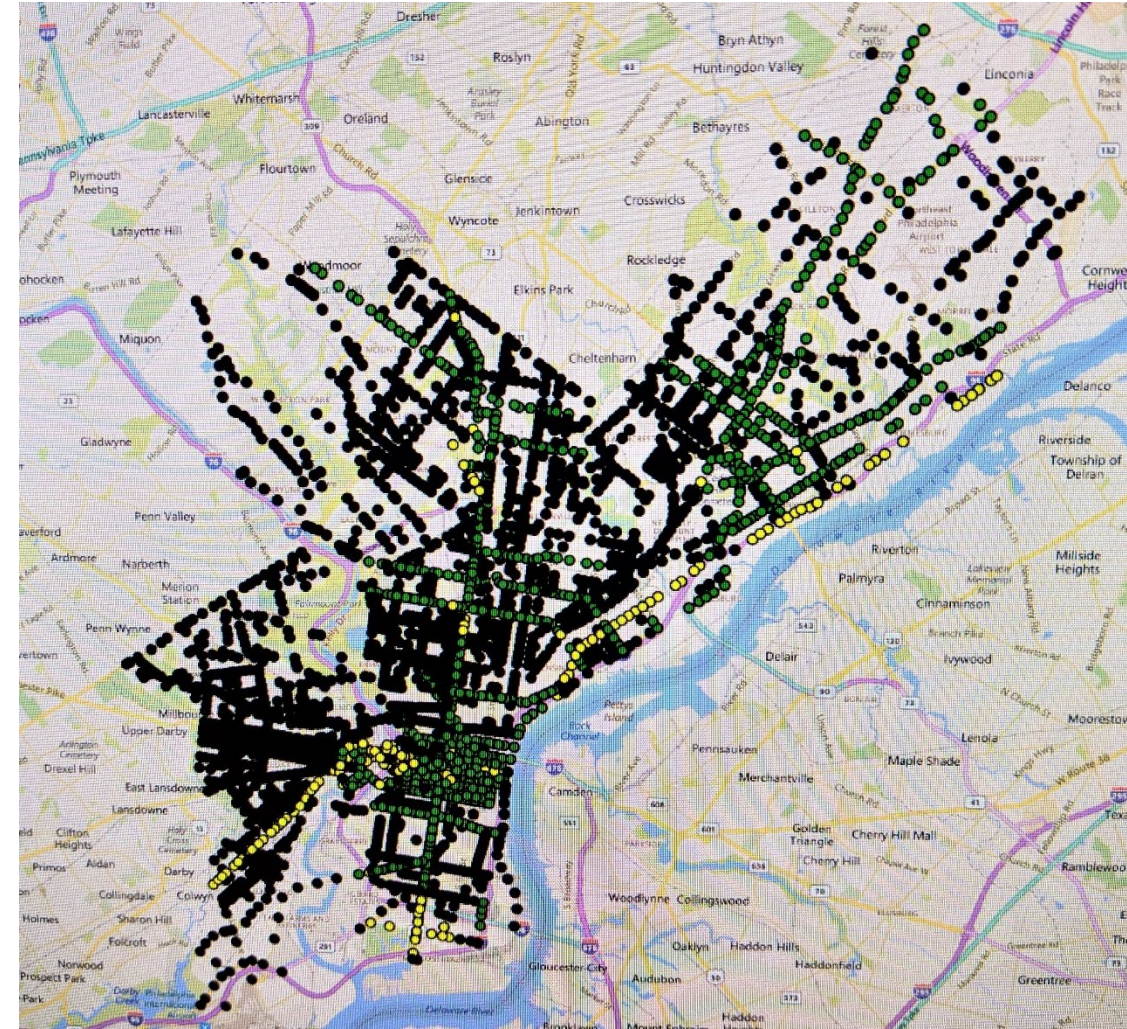
- Reduces the need for corridor-wide Synchro Modeling & requisite counts
- Allows for temporary timing modification for unforeseen events
- Proactive as well as reactive signal health monitoring
- Allows for informed product performance monitoring
- Data Analysis



TRAFFIC OPERATION CENTER – REAL TIME ADJUSTMENTS AND MONITORING

The most accurate modeling tool: **REAL LIFE**

- Synchro Modeling and required traffic counts are no longer required in all instances
 - Major phasing/lane configuration changes are an exception
- Begin with existing timing in new controllers
- Update to meet minimum timing requirements
- Optimize in real time



Cycle Summary Report

Intersection: 6540: Tyson&Eastwood
 Plan: [01] NORMAL
 Cycle length: 60 Phase Bank: 1
 Offset: 20

Barriers: 22 29.0 6.0

Force offs: 22 0

Phase: 2-NBT 16.0 4-EBT 31.0

Veh Intervals: 7 7.0 4 6.0

Ped Intervals: 10 6 4 5

Phase: 6- 16.0 8-WBT 31.0

Veh Intervals: 7 7.0 4 6.0

Ped Intervals: 10 6 4 5

Force offs: 22 0

Barriers: 15 29.0 6.0

Perm1(87654321): 15 0
 Perm2(.....):
 Perm3(.....):

Ped Adjust Database Estimated
 0 0

Legend Change Recalculate Print Close

Show Links Occupancy
 Speed Travel Time
 Volume Refresh

Select Preset Add Delete

Link Congestion Preset



6540: Tyson&Eastwood

2	3	4	5	6	7	8	9	10
100	100	100	100	100	100	100	100	100
55	55	55	55	55	55	55	55	55
0	0	0	0	0	0	0	0	0
20	20	20	20	20	20	20	20	20
40	40	40	40	40	40	40	40	40
55	55	55	55	55	55	55	55	55
0	0	0	0	0	0	0	0	0
20	20	20	20	20	20	20	20	20
40	40	40	40	40	40	40	40	40
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
2-6-	2-6-	2-6-	2-6-	2-6-	2-6-	2-6-	2-6-	2-6-
2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8
En Pm 1	15	15	15	15	15	15	15	15
Hld Rel	255	255	255	255	255	255	255	255
Zon Off	0	0	0	0	0	0	0	0
Plan Mode	Coord	Coord	Coord	Coord	Coord	Coord	Coord	Coord
Plan Name	NORM	AM	PM	120B	120T	120W	EBRK	MID
Version	Current							
Last Modification Date:	06/21/2017, 12:19:00 pm							
Validate Data								
6540 : Tyson & Eastwood								
NOT 2	0	TOD 8	0	Preempt	0			
EV A	35	Adv Warn 1	0	Low Pri A	0			
EV B	37	Adv Warn 2	0	Low Pri B	0			
EV C	36	Delay A	0	Low Pri C	0			
EV D	38	Delay B	0	Low Pri D	0			
RR1	0	Delay C	0					
RR2	0	Delay D	0					
Sp Ev 1	0	Delay E	0					
Sp Ev 2	0	Delay F	0					

Configuration Assignable Outputs Database Data for 6540: Tyson&Eastwood

Column 9	Column A	Column B	Column
Phase 1 On	0 Preempt Fail	0 Flash 0	0 Free
Phase 2 On	0 Sp Ev 1	0 Flash 1	0 NAND 3
Phase 3 On	0 Sp Ev 2	0 Fast Flash	0 NAND 4
Phase 4 On	0 Sp Ev 3	0 Dia Fig 3	0 OR 7
Phase 5 On	0 Sp Ev 4	0 Dia Fig 4	0 OR 8
Phase 6 On	0 Sp Ev 5	0 NOT 3	0
Phase 7 On	0 Sp Ev 6	0 NOT 4	0
Phase 8 On	0 Sp Ev 7	0 OR 4	0
Phase 1 Ck	0 Sp Ev 8	0 OR 5	0
Phase 2 Ck	0 Det Fail	0 OR 6	0
Phase 3 Ck	0 Sp Fnc 1	0 AND 4	0
Phase 4 Ck	0 Sp Fnc 2	0 NAND 1	0
Phase 5 Ck	0 Central Ctl	0 NAND 2	0
Phase 7 Ck	0 X DWalk	0	
Phase 8 Ck	0 X Walk	0	

Last Modification Date: 03/28/2017, 03:57:06 pm

Version Current Clear Highlights

6540 : Tyson & Eastwood

En Pm 1	15	15	15	15	15	15	15	15	15
Hld Rel	255	255	255	255	255	255	255	255	255
Zon Off	0	0	0	0	0	0	0	0	0
Plan Mode	Coord	Coord	Coord	Coord	Coord	Coord	Coord	Coord	Coord
Plan Name	NORM	AM	PM	120B	120T	120W	EBRK	MID	95NB
Version	Current								
Last Modification Date:	06/21/2017, 12:19:00 pm								
Validate Data									
6540 : Tyson & Eastwood									
NOT 2	0	TOD 8	0	Preempt	0				
EV A	35	Adv Warn 1	0	Low Pri A	0				
EV B	37	Adv Warn 2	0	Low Pri B	0				
EV C	36	Delay A	0	Low Pri C	0				
EV D	38	Delay B	0	Low Pri D	0				
RR1	0	Delay C	0						
RR2	0	Delay D	0						
Sp Ev 1	0	Delay E	0						
Sp Ev 2	0	Delay F	0						

Phase Bank 1 Database Data for 6540: Tyson&Eastwood

Phase Bank 1	Phase 1 NBT	Phase 2 EBT	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8 WBT
Walk	0	10	0	4	0	10	0	4
Don't Walk	0	6	0	5	0	6	0	5
Min Initial	4	7	4	4	4	7	4	4
Type 3 Limit	0	20	0	20	0	20	0	20
Add Per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Veh Ext	3.0	3.0	3.0	4.0	3.0	3.0	3.0	4.0
Max Gap	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
Min Gap	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
Max Limit	20	16	20	31	20	16	20	31
Maximum 2	30	50	30	40	30	50	30	40
Adv/Dly Walk	0	0	0	0	0	0	0	0
Min Ped Clear	7	6	7	7	7	6	7	7
Cond Srv Min	10	10	10	10	10	10	10	10
Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	3.0	4.0	3.0	3.6	3.0	4.0	3.0	3.6
Red Clear	1.0	3.0	1.0	2.4	1.0	3.0	1.0	2.4
Max Initial	0	20	0	20	0	20	0	20
Alt Walk	0	0	0	0	0	0	0	0
Alt Flash D	0	0	0	0	0	0	0	0
Alt Initial	0	0	0	0	0	0	0	0
Alt Exten	0	0	0	0	0	0	0	0

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Version Current Clear Highlights

6540 : Tyson & Eastwood

TOD Schedule Database Data for 6540: Tyson&Eastwood

Hour	Minute	Day of the Week	Plan
0(0)	0	1234567X	1
1(1)	0	---X	0
2(2)	0	---X	0
3(3)	0	---X	0
4(4)	0	---X	0
5(5)	0	---X	0
6(6)	0	---X	0
7(7)	0	---X	0
8(8)	0	---X	0
9(9)	0	---X	0
10(A)	0	---X	0
11(B)	0	---X	0
12(C)	0	---X	0
13(D)	0	---X	0
14(E)	0	---X	0
15(F)	0	---X	0

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TRAFFIC OPERATION CENTER – REAL TIME ADJUSTMENTS AND MONITORING

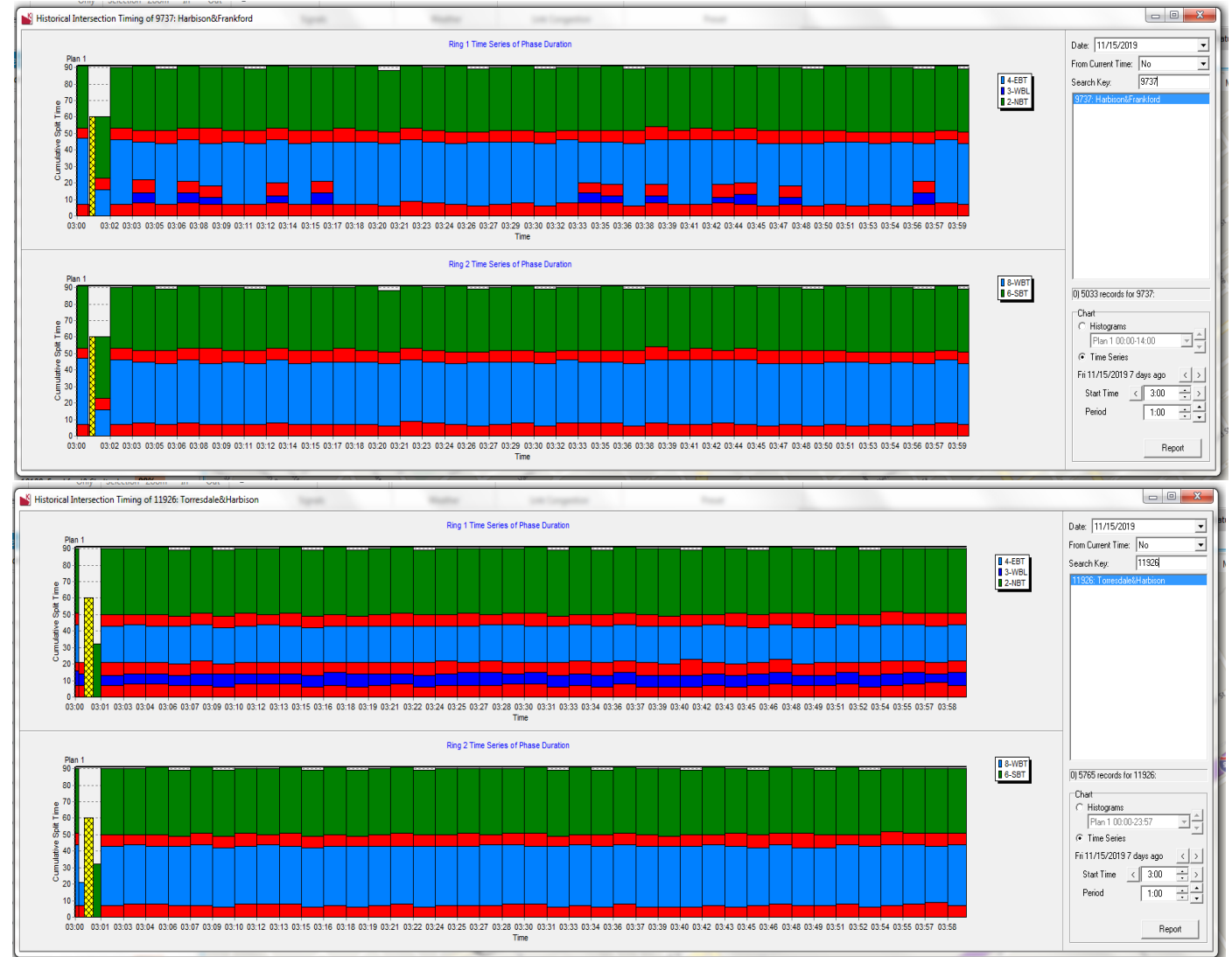
Monitor the performance in real time

- CCTV Camera Feed
- Field Observation
 - AM Peak
 - PM Peak
 - Off Peak
- Trial and Error
 - Changes can be undone with the click of a mouse.
- Temporary Adjustments for special needs
 - Ex: Accident on I-76 is flushing traffic onto surface streets



TRAFFIC OPERATION CENTER – SIGNAL HEALTH MONITORING

- Signals in flash
- Detection failure
- Pre-emption calls
- Phase Skips/Errors
 - Specific down to the exact cycle the error occurred.
- ITS Product Performance
 - What products work well
 - What products are frequently failing



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