I - 95 CORRIDOR COALITION

TSMO Webinar – Managing Arterials:

Three Case Studies from a Statewide to City perspective

August 22, 2019

Welcome and Introductions

Denise Markow, PE

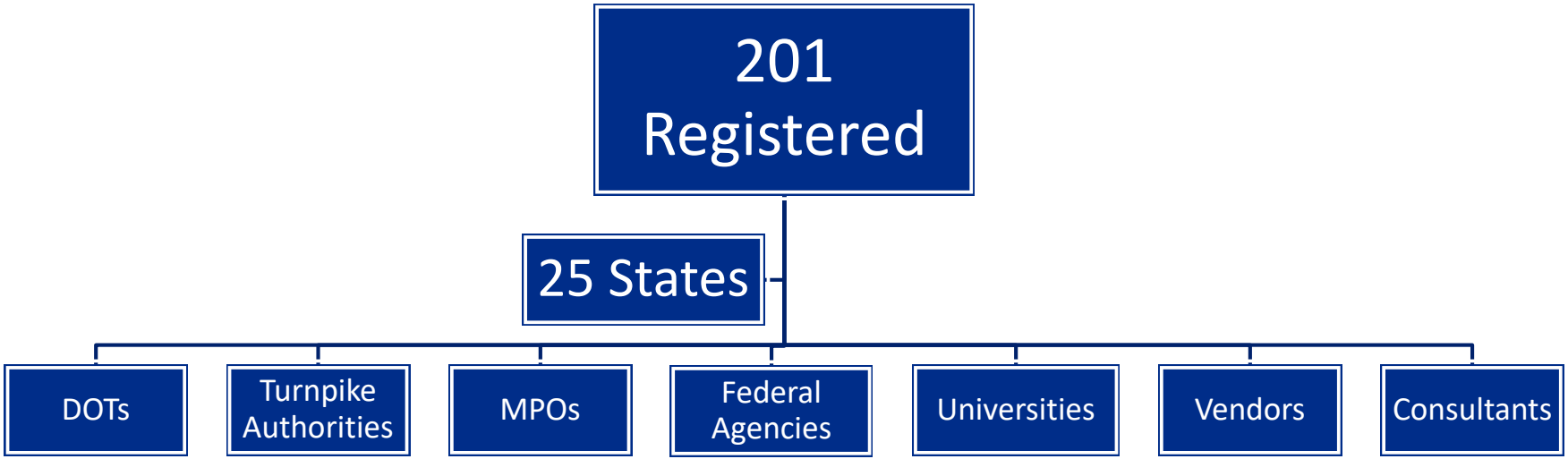
I-95 Corridor Coalition

TSMO Director

Agenda

10:30 am to 10:40 am	Welcome and Introductions	Denise Markow, I-95 Corridor Coalition
10:40 am to 11:00 am	10 years of Transit Signal Priority: Lessons Learned in New York City	Emad Makarious, New York City DOT
11:00 am to 11:20 am	Arterial Management Toolkit: Experiences from Washington, DC	Soumya Dey, District DOT
11:20 am to 11:40 am	Florida's Statewide Arterial Management Program (STAMP)	Raj Ponnaluri, Florida DOT
11:40 am to 12:00 pm	Wrap Up	Denise Markow, I-95 Corridor Coalition

I-95 Corridor Coalition Sponsored Event



Introductions

Emad Makarious

New York City DOT

Administrative Engineer

Soumya Dey

District DOT

Associate Director

Raj Ponnaluri

Florida DOT

State Connected Vehicles and Arterial Management Engineer

10 years of Transit Signal Priority: Lessons Learned in New York City

Emad Makarious, PE, PTOE
New York City DOT

10 years of Transit Signal Priority - Lessons Learned in New York City

TSMO Webinar: Managing Arterials

Thursday , August 22, 2019

Presented by:

Emad Makarious P.E., PTOE
Administrative Engineer

New York City Department of Transportation
Division of Traffic Operations
34-02 Queens Boulevard
Long Island City, New York 11101

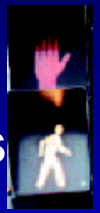
Agenda

- **SBS Features.**
- **City-Wide Wireless Network (NYCWiN)**
- **TSP Treatments**
- **Implementation Activities**
- **Present and Future TSP Corridors**
- **Maintenance of TSP Operations**

Traffic Signals in New York City

- **New York City has more than 45,000 Intersections**
- **13,560 Signalized Intersections**

- **120,000 Pedestrian Signals**



- **100-120 new Traffic Signals installed every year based on Warrant Studies**

Public Transit in NYC

- 5,700 buses operating on 2,800 miles of routes
- 300+ Bus Routes
- Over 2 Million daily riders
- Public transit system operated by MTA NYC Transit
- Streets and traffic signals operated and maintained by NYCDOT

BRT in NYC

Features

+Select bus service

Branding

Off-board Fare Collection

All Door Boarding

Real Time Passenger Information

Bus Lanes

New Bus Shelters

Bus Bulb Stations

Transit Signal Priority (TSP)


LUNCH SPECIALS
thfield Bank
ATM
Route
Minutes
$53
$78
$79
Destination
Bay Ridge
St George
Bay Ridge


PUSH
BUTTON
FOR BUS
ARRIVALS
AUDIO

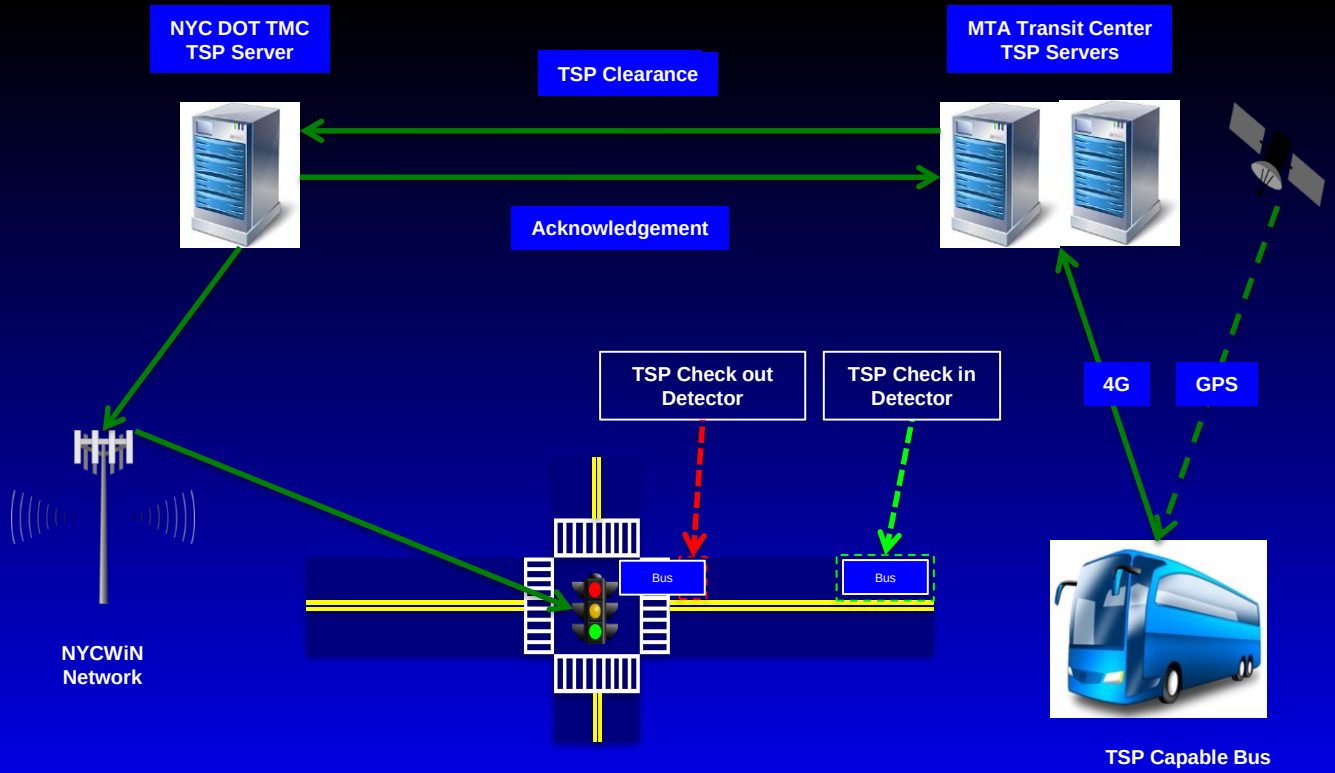
City-Wide Wireless Network (NYCWiN)

A new city-wide network (NYCWiN) has been installed by NYC's Department of Information Technology and Telecommunications (DOITT) which provides access for both stationary devices (traffic controllers, video cameras and emergency call boxes) and moving vehicles (emergency services – NYPD and NYFD) applications, including Transit Signal Priority (TSP).

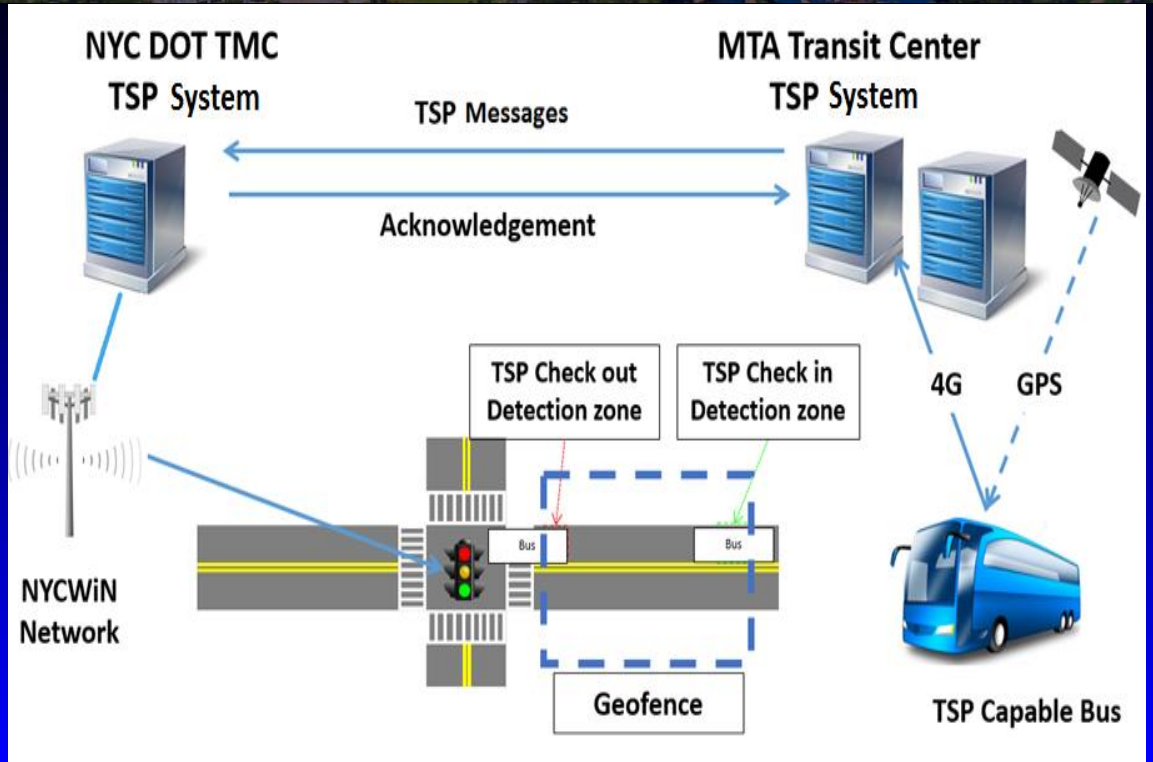
Benefits of NYCWiN for TSP

- **Eliminates need for infrastructure changes to traffic controllers**
- **Requires only in-vehicle systems – GPS modem and computer to locate vehicle's position**
- **Cost effective for city-wide use of TSP!**

CENTRAL TSP DEPLOYMENT

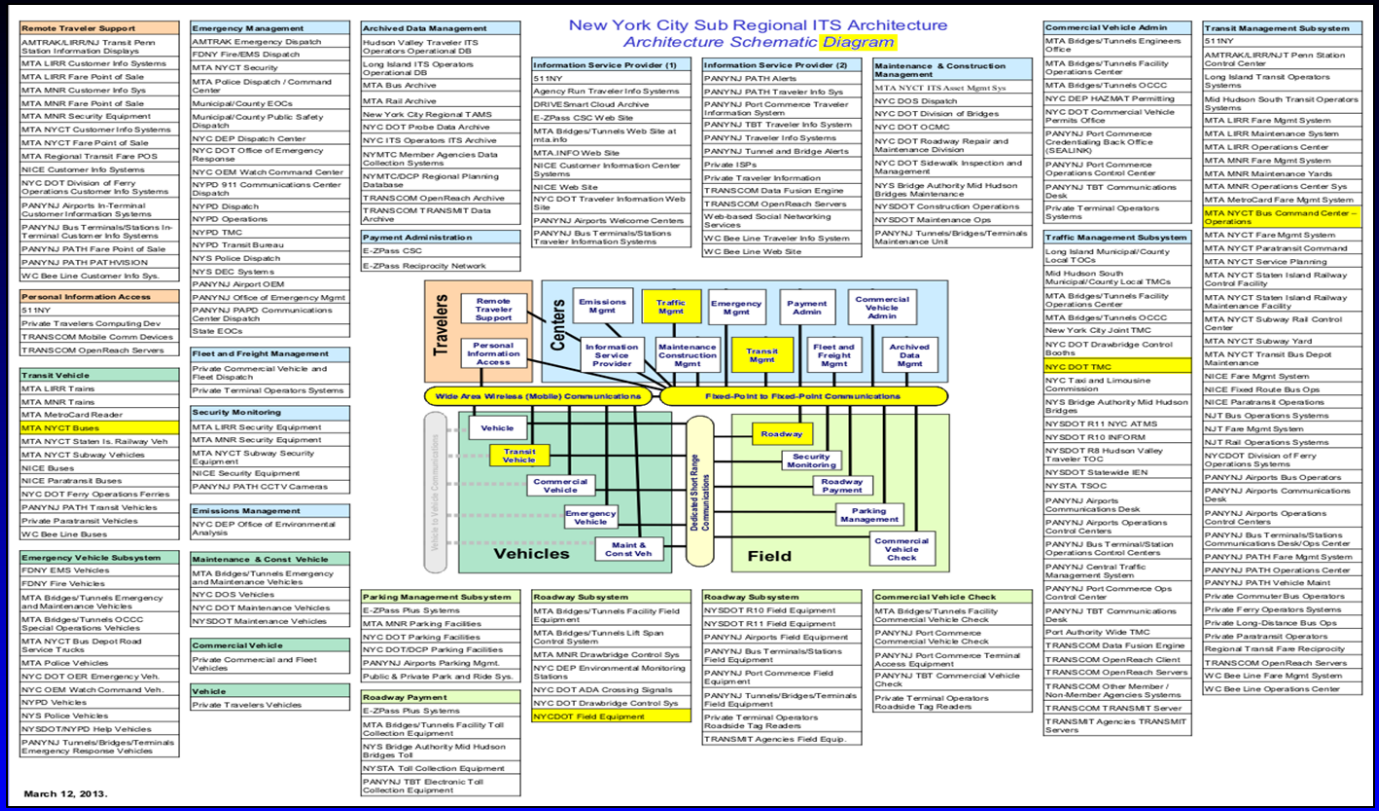


I. System design conforms with regional requirements – central TSP module

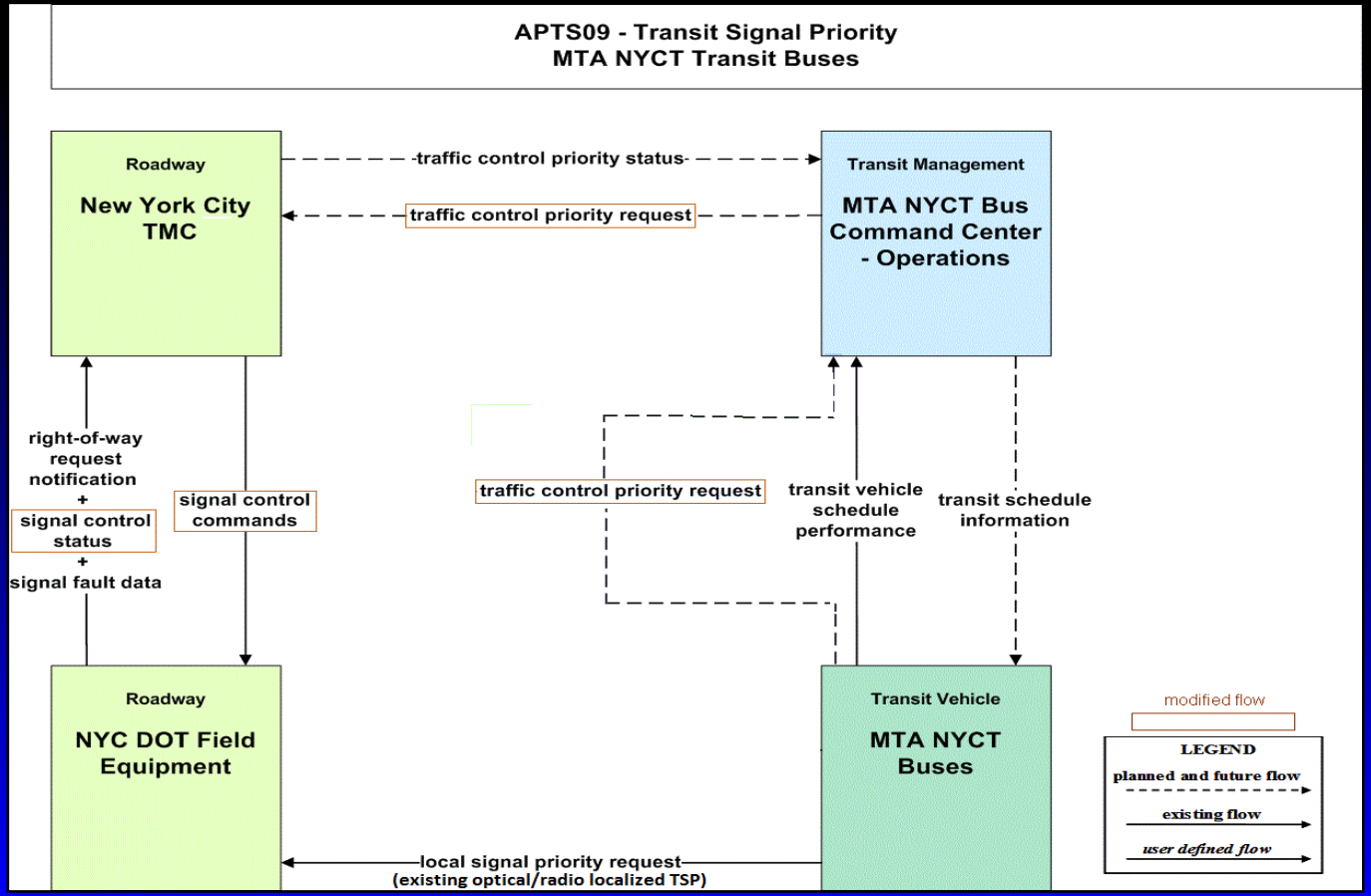


Portion of the NYC Sub Regional ITS Architecture Covered by the Transit Signal Priority Project

“Transit Signal Priority project - Subsystems are highlighted”



APTS09 - Transit Signal Priority



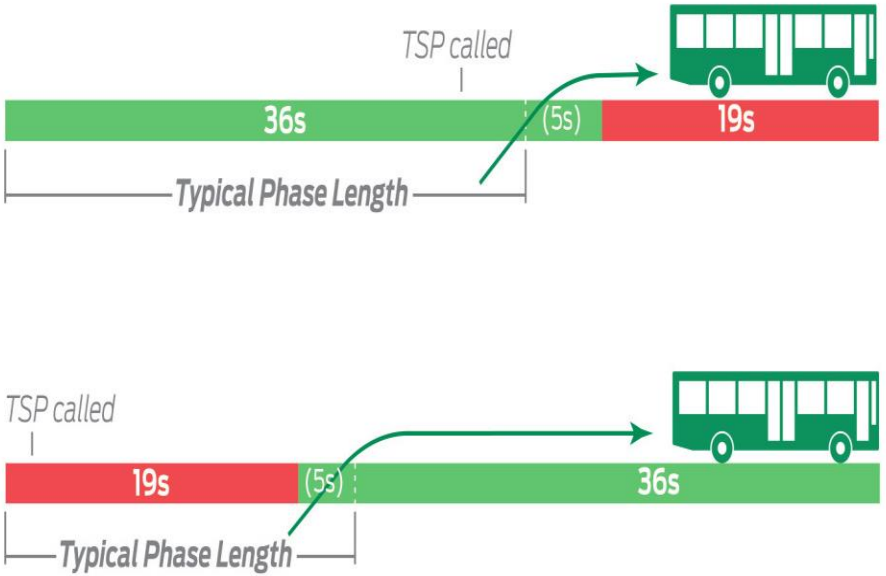
I. Signal design for central TSP module - Key Policies and Treatments (2-1)

1. TSP Treatments:

- Green Extensions
- Red Truncations (Early Green)
- Queue Jumps

2. Maintain coordination

3. Maintain minimum requirements for pedestrians based on 2009 MUTCD
(Manual on Uniform Traffic Control Devices)



I. Signal design for central TSP module - Key Policies and Treatments (2-2)

4. TSP calls recognized only within predefined detection zones upstream of each intersection
5. Door switches
6. First Come, First Served
7. TSP duration varies by intersection

Existing Conditions –Data Inputs

Network Data	Bus Data
Aerial photographs	Bus routes and schedules
Physical inventory	Passenger on and off counts
Signal phasing and timing	Bus stop placement
Turning movement counts and vehicle occupancy	Bus travel times
Pedestrian counts	Bus dwell times
Photo inventory	Traffic speed runs and side street queues

Software used to simulate and analyze plans for Transit Signal Priority (TSP) along the M15 SBS Route:

- **Synchro© macroscopic model to identify/correct existing problems and optimize signals and coordination for TSP**
- **Custom Aimsun© microscopic traffic simulation model for NYCDOT to compare traffic operations for:**

- **Existing conditions**
- **Improvements + Optimal signal timings for *all* traffic (Passive TSP)**
- **Improvements + Optimal timings + TSP (Active TSP)**

Modeling performed for AM, Midday and PM peak periods

Constraints

- **Pedestrians, seniors**
- **Coordination**
- **Capacity**
- **Cross-street traffic**
- **Bus stops**
- **Other corridor traffic**

“Before” and “After” Conditions

“Before” Conditions:

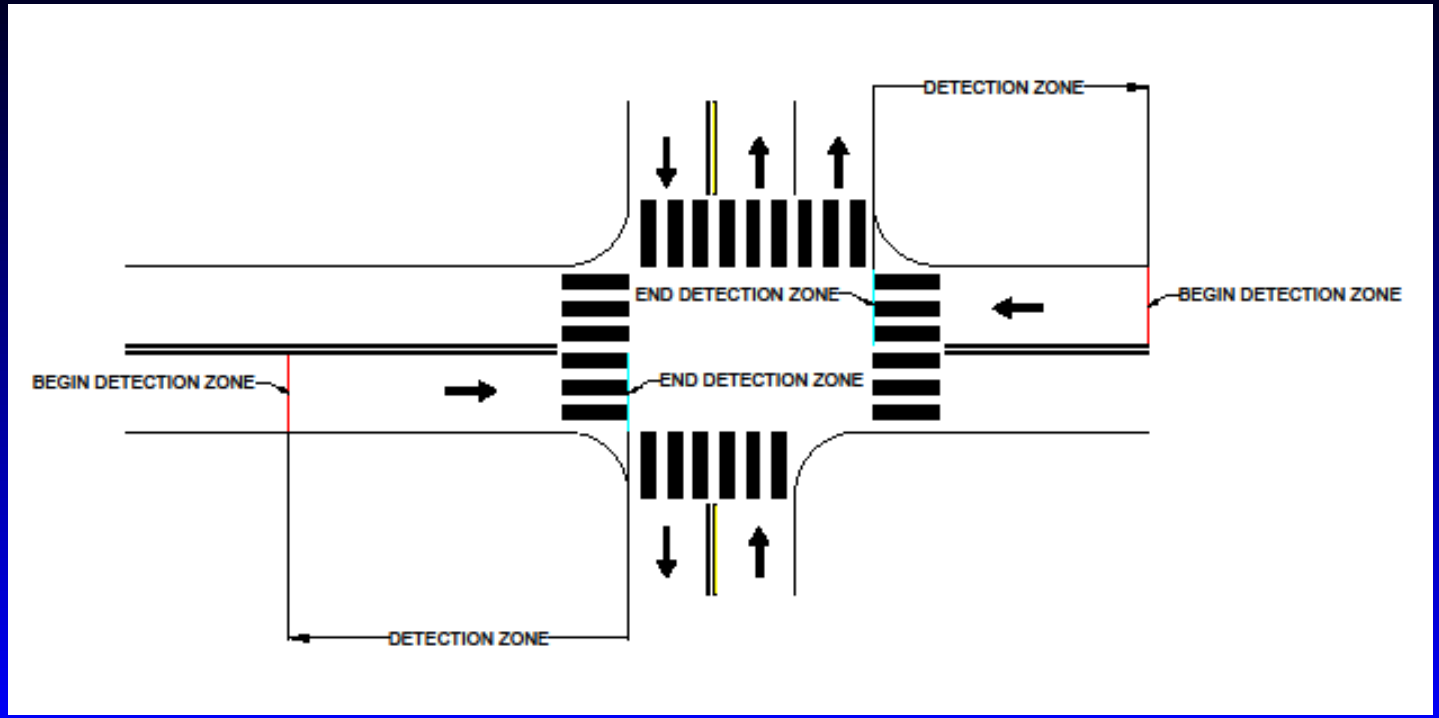
- Detail analysis associated with existing traffic operations, equipment research and recommendations including the “before” scenarios (simulation runs).

“After” Conditions:

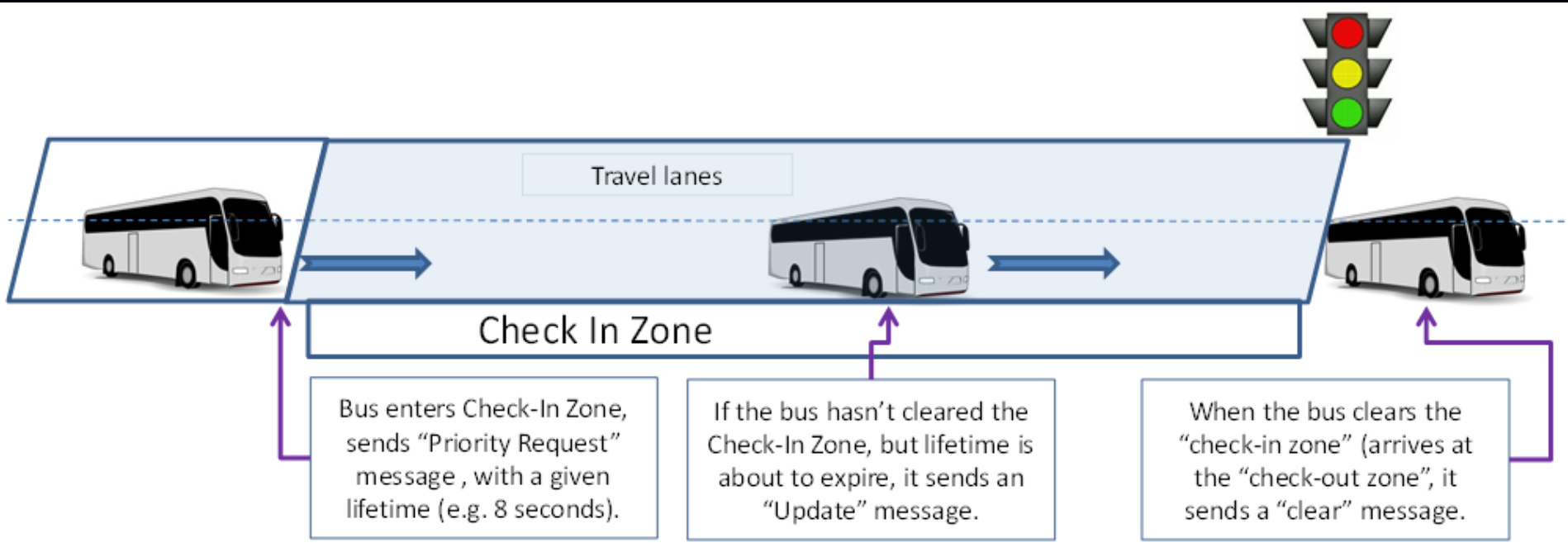
- Evaluation of the applied TSP scenarios for evaluating its effectiveness and potential for modification.

Detection Zones

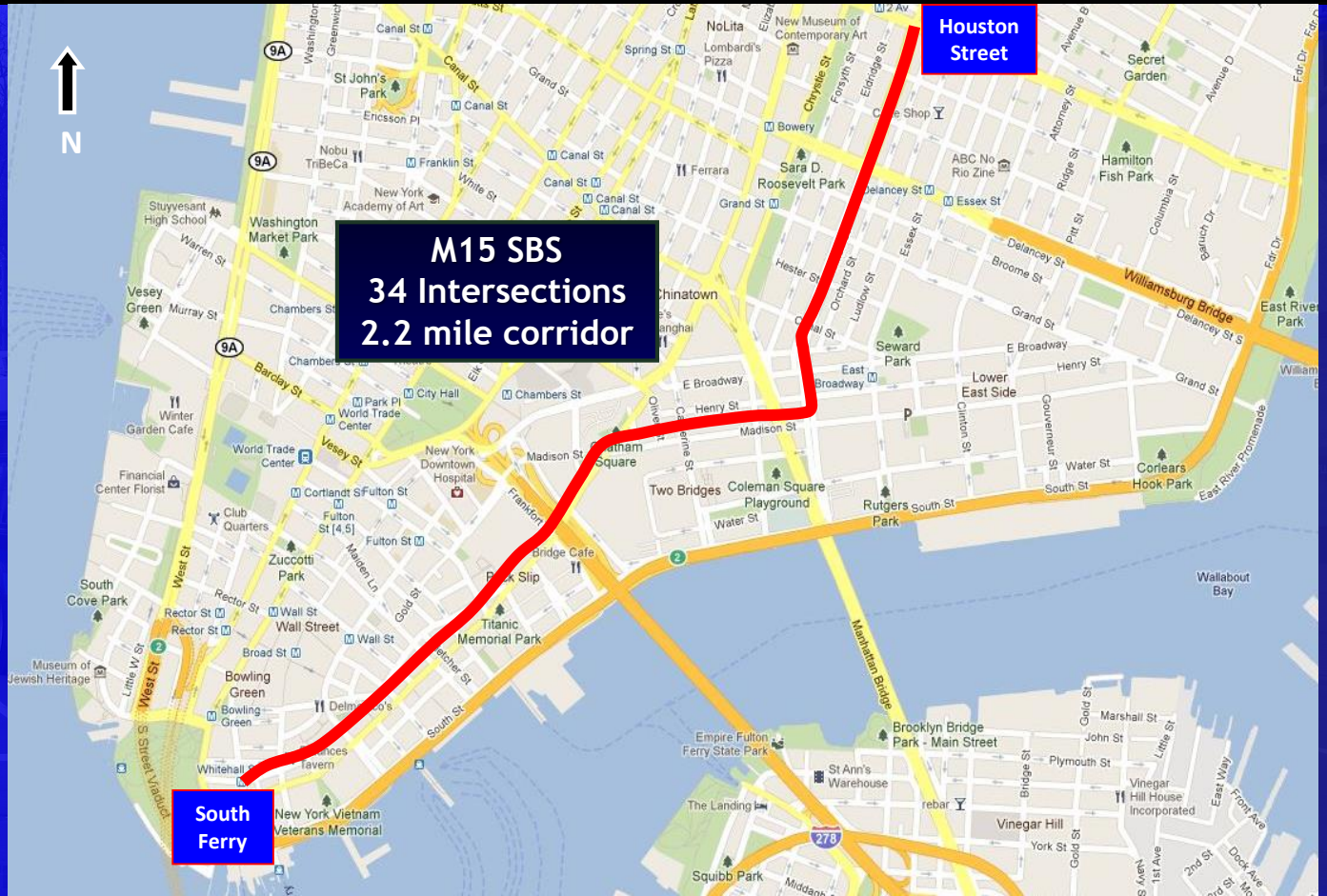
Region upstream of pedestrian crosswalk where TSP calls are recognized, measured in feet and based on estimated travel speed during each peak hour



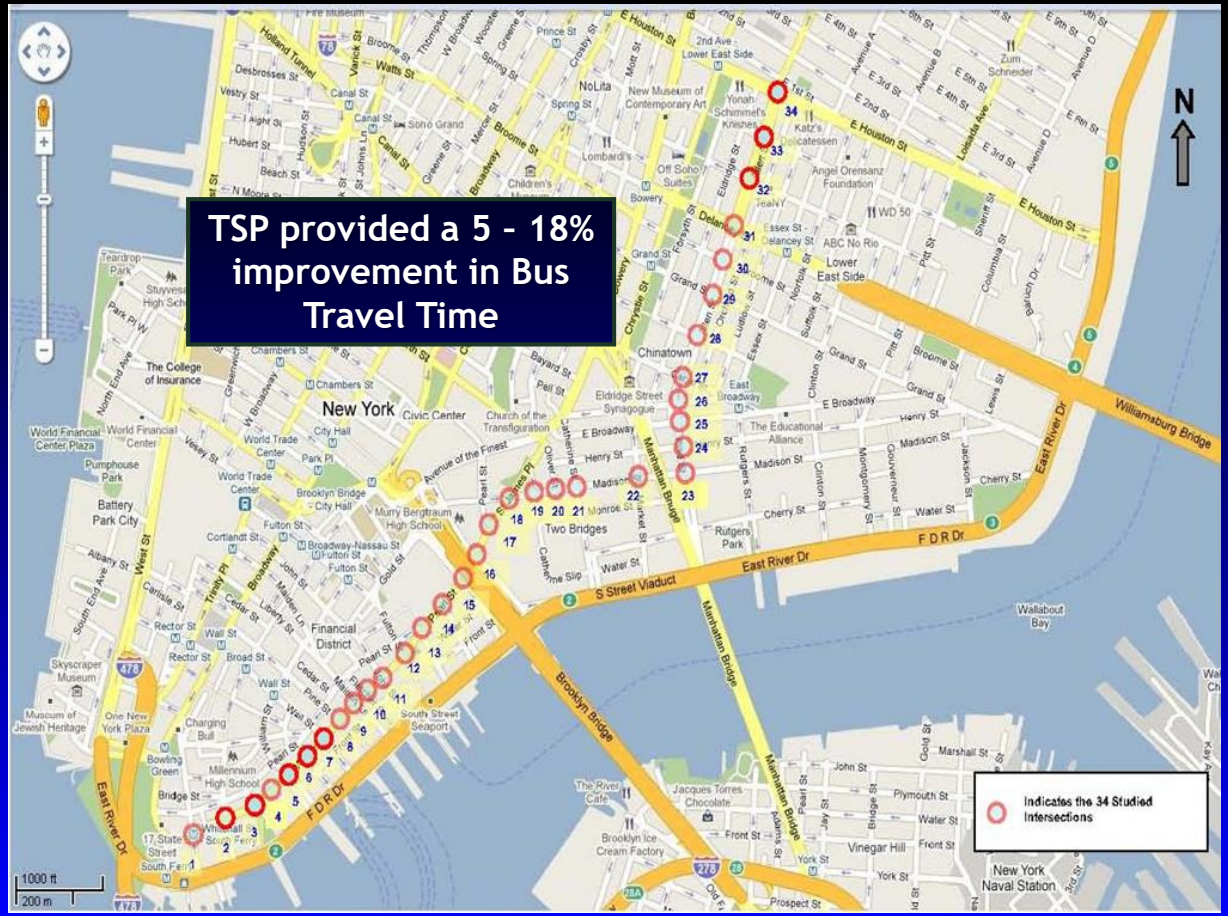
Bus Behavior at a TSP-Equipped Signal



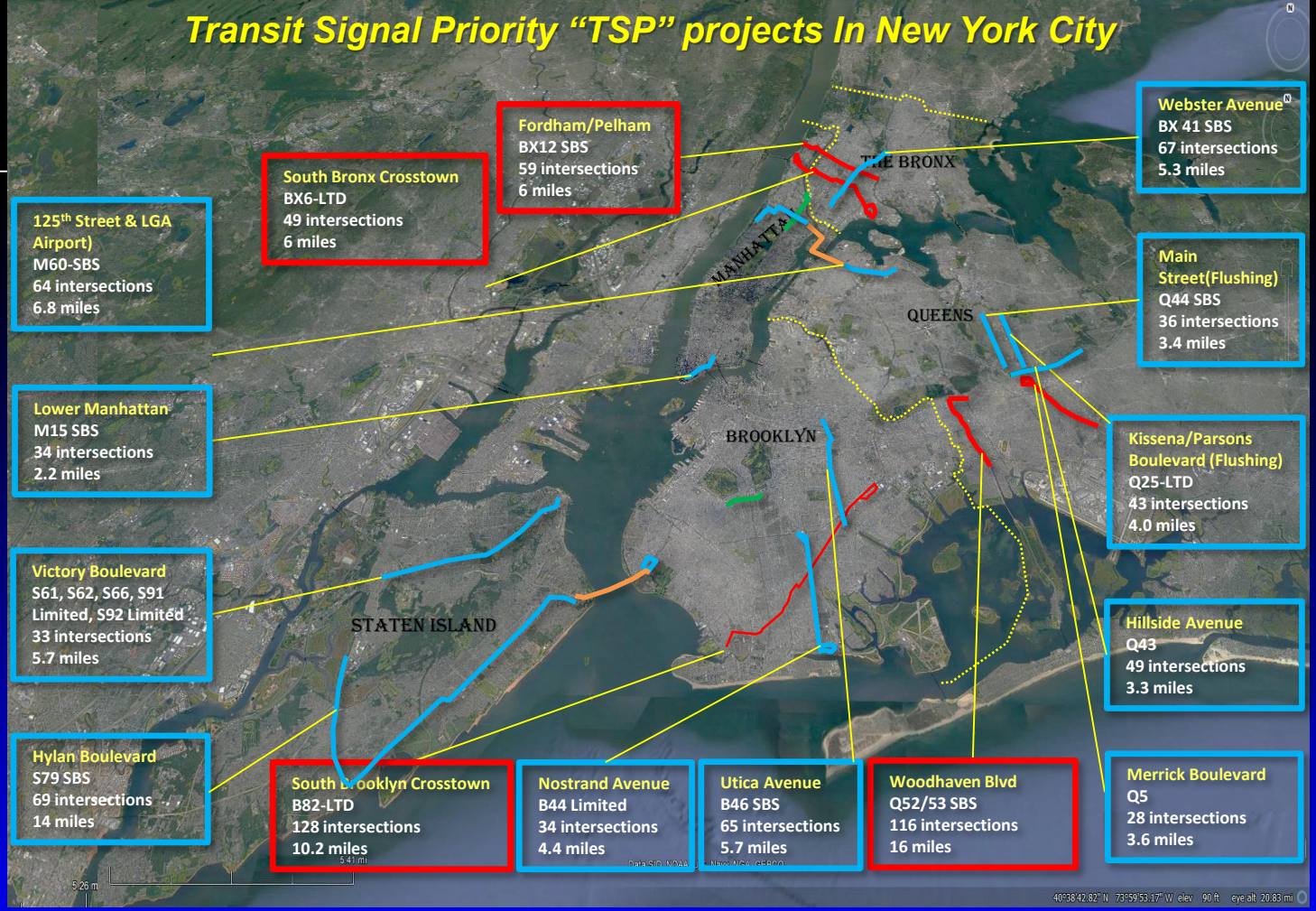
Lower Manhattan Project Area



Lower Manhattan Project Area



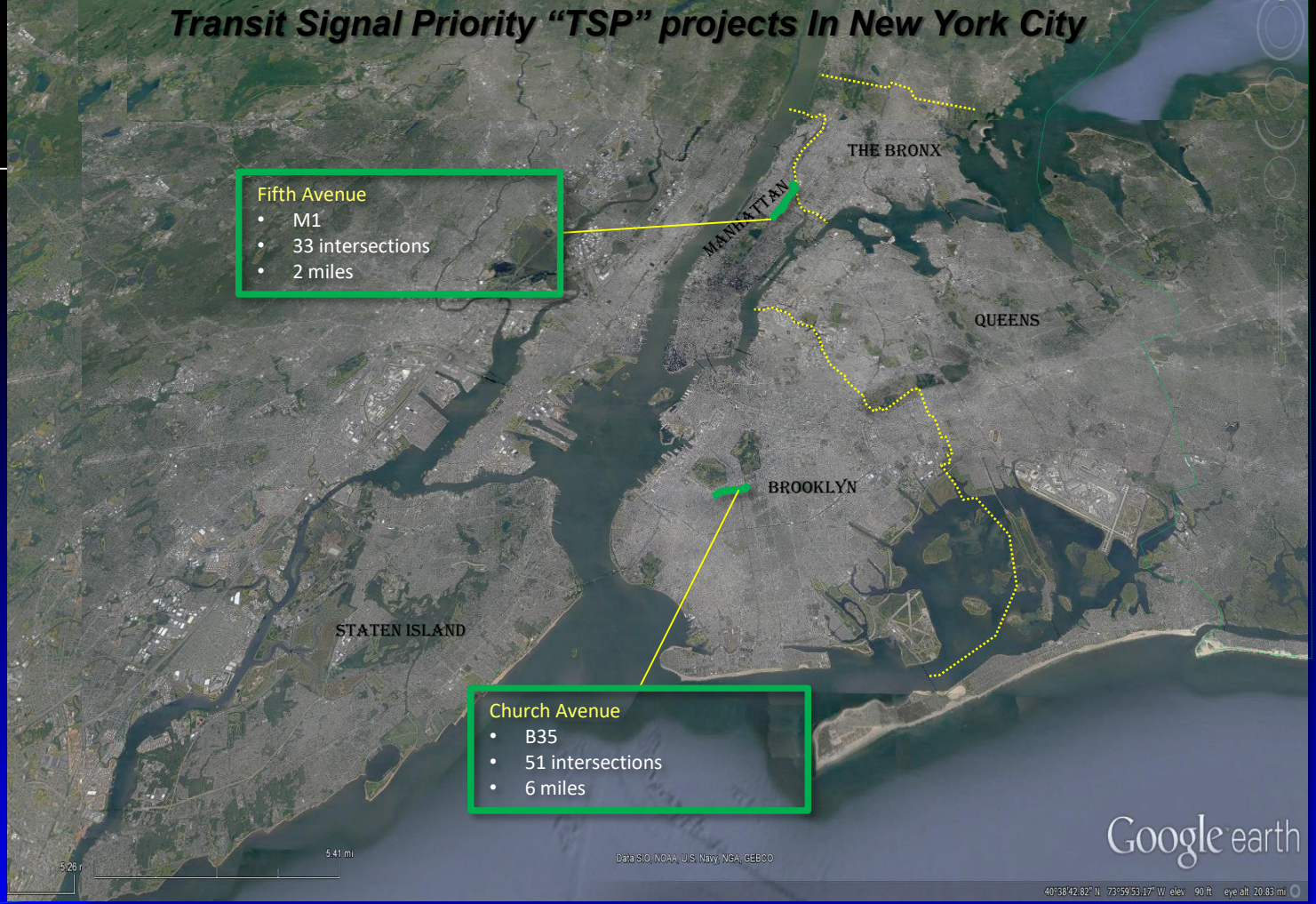
Transit Signal Priority "TSP" projects In New York City



Existing Corridors

Future Corridors (by end of 2020)

Transit Signal Priority "TSP" projects In New York City



Early Action Corridors

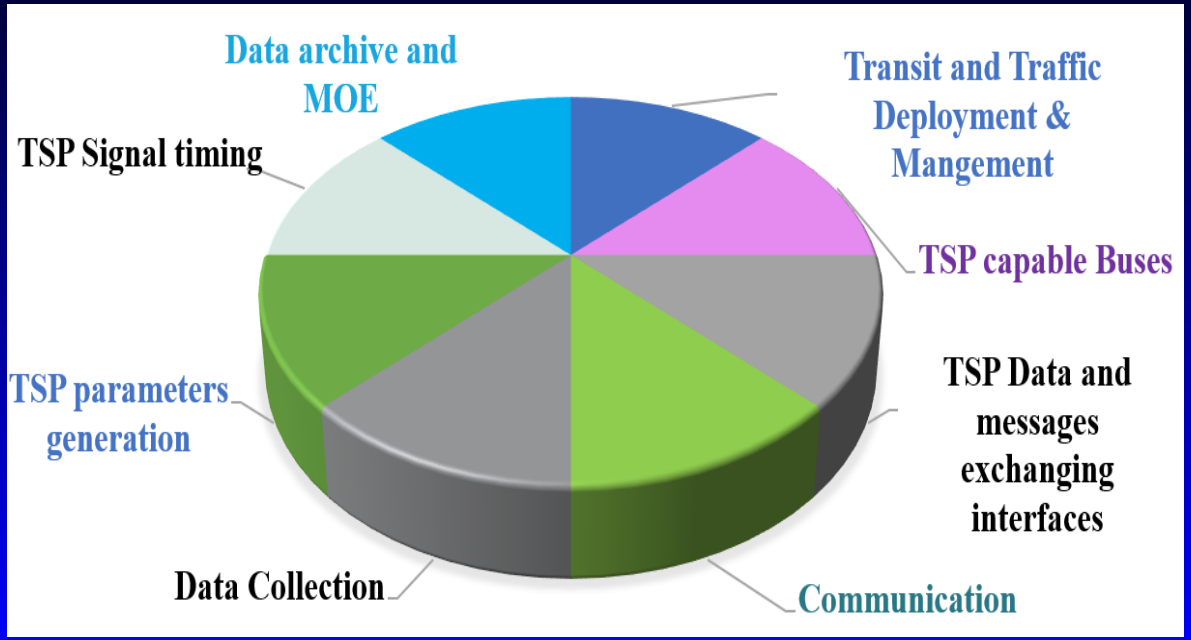
Maintenance of TSP Operations

- Monitor TSP Corridors on a daily basis.
- Identify anomalies
- Determine causes (Bus, Intersection, TSP settings).
- Make necessary adjustments.
    - Identify Bus
    - Modify TSP Settings
    - Inspect Intersection / Controller

- Observe these adjustments the next day during our daily monitoring schedule.

Innovative Methodologies to Apply TSP Program – Components

- **TSP program is a collection and combination of transit and traffic assets and services**



Innovative Methodologies to Apply TSP Program – Improvements

Adopt software-based fleet and download TSP parameters within 1/2 day for quick deployment.

New interface to send TSP parameters to NYCT and include additional 2-byte data in bus logs.

Deploy local and limited TSP routes differently and separate local and TSP buses data.

Central system collects data for “before” and “after” studies to minimize field involvement.

Reallocate eligible green time to increase efficiency and enhance safety for TSP operation.

Increase network bandwidth between NYCT and NYCDOT TMC to enhance transmission.

Innovative methodologies to measure TSP performance – TSP monitoring

- System wide TSP Monitoring
- Reports (Ongoing)
  - Communications
  - Performance
- Live Video Feeds
- Weekly E-Mail Alerts
- RTPI/Wayfinder signs

Innovative methodologies to measure TSP performance – dashboard report

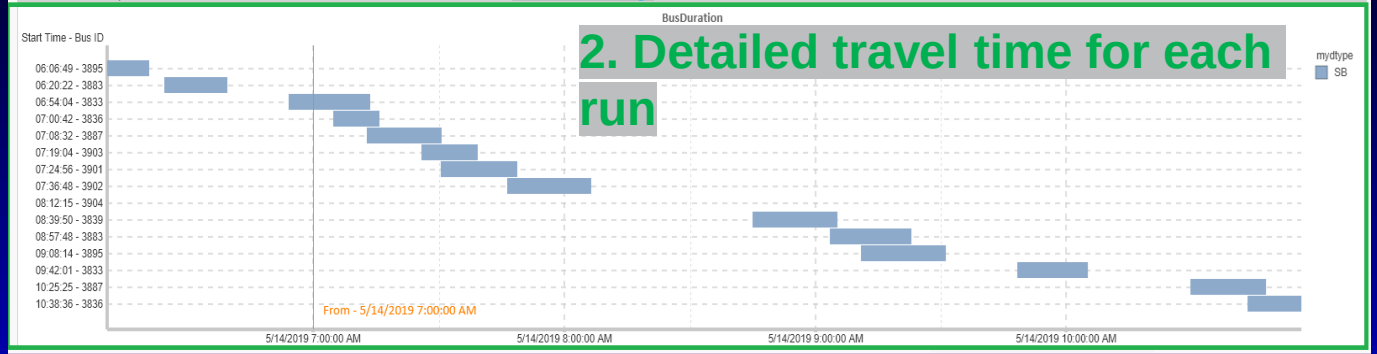
Travel time report

1.Travel time summary

Bus Average Duration

Peak Time Type	Route ID	Direction	Bus Duration (Average)	Project Bus Duration (Average)	Expect Run Time	Bus Runs	Within Expect Time
PM		SB	00:14:47	00:18:18		7	7
AM		SB	00:16:14	00:23:42	00:26:24	8	7
Average			**00:15:33**	**00:21:00**	**00:26:24**	**15**	**14**

Bus Duration Summary - 15



2. Detailed travel time for each run

Bus Duration Summary - 15

Start Time - BusID	Bus Start Time	Bus End Time	Peak Time Type	Route ID	Direction	Enable TSPs	Total Intersections	First TSP Intersection	Last TSP Intersection	Distance from First to Last TSP	Corridor Distance	Bus Duration	Project Bus Duration	Expect Run Time
06:06:49 - 3895												:48		
06:20:22 - 3883												:54		
06:54:04 - 3833												:20		
07:00:42 - 3836				M1	SB	NULL	32	7	27	11728	17252	00:10:58	00:16:07	
07:08:32 - 3887				M1	SB	22	32	7	32	14536	17252	00:18:02	00:21:24	00:26:24
07:19:04 - 3903				M1	SB	22	32	7	27	11728	17252	00:13:29	00:19:50	00:26:24
07:24:56 - 3901	05/14/2019 07:30:29	05/14/2019 07:48:42 AM		M1	SB	22	32	7	32	14536	17252	00:18:13	00:21:37	00:26:24
07:36:48 - 3902	05/14/2019 07:46:23	05/14/2019 08:06:26 AM		M1	SB	22	32	7	27	11728	17252	00:20:03	00:29:29	00:26:24
08:12:15 - 3904	05/14/2019 08:12:15	05/14/2019 08:12:15 AM		M1	SB	22	32	19	19	0	17252	00:00:00		00:26:24
08:39:50 - 3839	05/14/2019 08:44:55	05/14/2019 09:05:16 AM		M1	SB	22	32	7	32	14536	17252	00:20:21	00:24:09	00:26:24
08:57:48 - 3883	05/14/2019 09:03:30	05/14/2019 09:23:03 AM		M1	SB	22	32	7	32	14536	17252	00:19:33	00:23:12	00:26:24
09:08:14 - 3895	05/14/2019 09:11:00	05/14/2019 09:31:15 AM		M1	SB	22	32	7	29	13288	17252	00:20:15	00:26:17	00:26:24

3. TSP data and comparison with expected performance

Vehicle ID List - 10

Bus ID	Route	Travel Times
		15
3833	M1	2
3836	M1	2
3883	M1	2
3887	M1	2
3895	M1	2
3839	M1	1
3901	M1	1
3902	M1	1
3903	M1	1
3904	M1	1

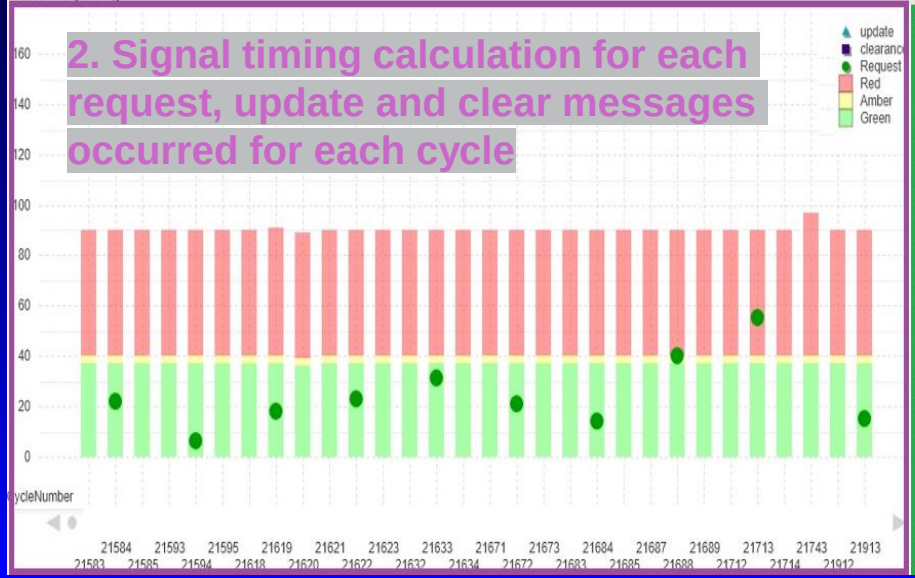
Innovative methodologies to measure TSP performance – dashboard report

Bus Duration Summary - 43

Start Time - BusID	Bus Start Time	Bus End Time	Peak Time Type	Route ID	Direction	Enable TSPs	Total Intersections	First TSP Intersection	Last TSP Intersection	Distance from First to Last TSP	Corridor Distance	Bus Duration	Project Bus Duration	Expect Run Time
06:54:04 -	05/14/2019 06:54:04	05/14/2019 07:13:39			SB	NULL	32	1	27	14469	17252	00:19:35	00:23:20	
07:00:42 -	05/14/2019 07:0				SB	NULL	32	7	27	11728	17252	00:10:58	00:16:07	
07:08:32 -	05/14/2019 07:1				SB	22	32	7	32	14536	17252	00:18:02	00:21:24	00:26:24
07:19:04 -	05/14/2019 07:2				SB	22	32	7	27	11728	17252	00:13:29	00:19:50	00:26:24
07:24:56 -	05/14/2019 07:3				SB	22	32	7	32	14536	17252	00:18:13	00:21:37	00:26:24

1. Travel time summary

TSP and Split Log



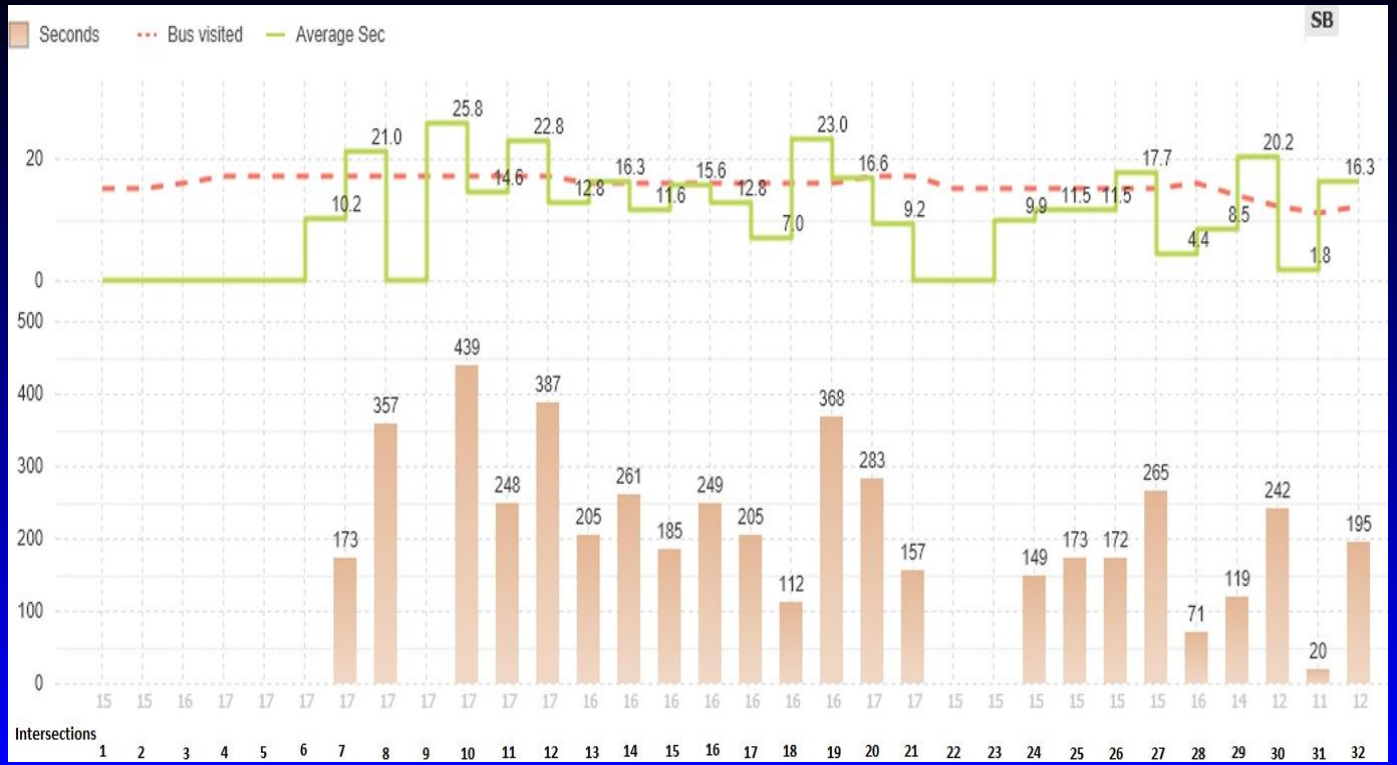
2. Signal timing calculation for each request, update and clear messages occurred for each cycle

Bus message and Split log

CycleNumber	Cycle From	Cycle To	Green Time	Default G Time	Request	Update	Clearance
174946	06:06:47	06:08:18	49	0	38		
174946	06:06:47	06:08:18	49	0	39		
171269	06:06:54	06:08:24	52	0	64		
171269	06:06:54	06:08:24	52	0	66		
174012	06:08:32	06:10:02	49	49	4		
174012	06:08:32	06:10:02	49	49	5		
172614	06:08:48	06:10:18	45	45	60		
173091	06:10:26	06:11:56	34	35	3		
							20
							23
	40	06:12:10	46	45	17		
	40	06:12:10	45	45	19		
173285	06:10:40	06:12:10	46	45			22
175132	06:10:40	06:12:10	45	45			24
21584	06:10:47	06:12:17	37	37	22		
23330	06:10:47	06:12:17	37	37	23		
173840	06:10:59	06:12:29	49	49	45		
175688	06:10:59	06:12:29	49	49	45		
173840	06:10:59	06:12:29	49	49			49
175688	06:10:59	06:12:29	49	49			50
166226	06:11:08	06:12:38	45	45	51		
164378	06:11:08	06:12:38	45	45	53		

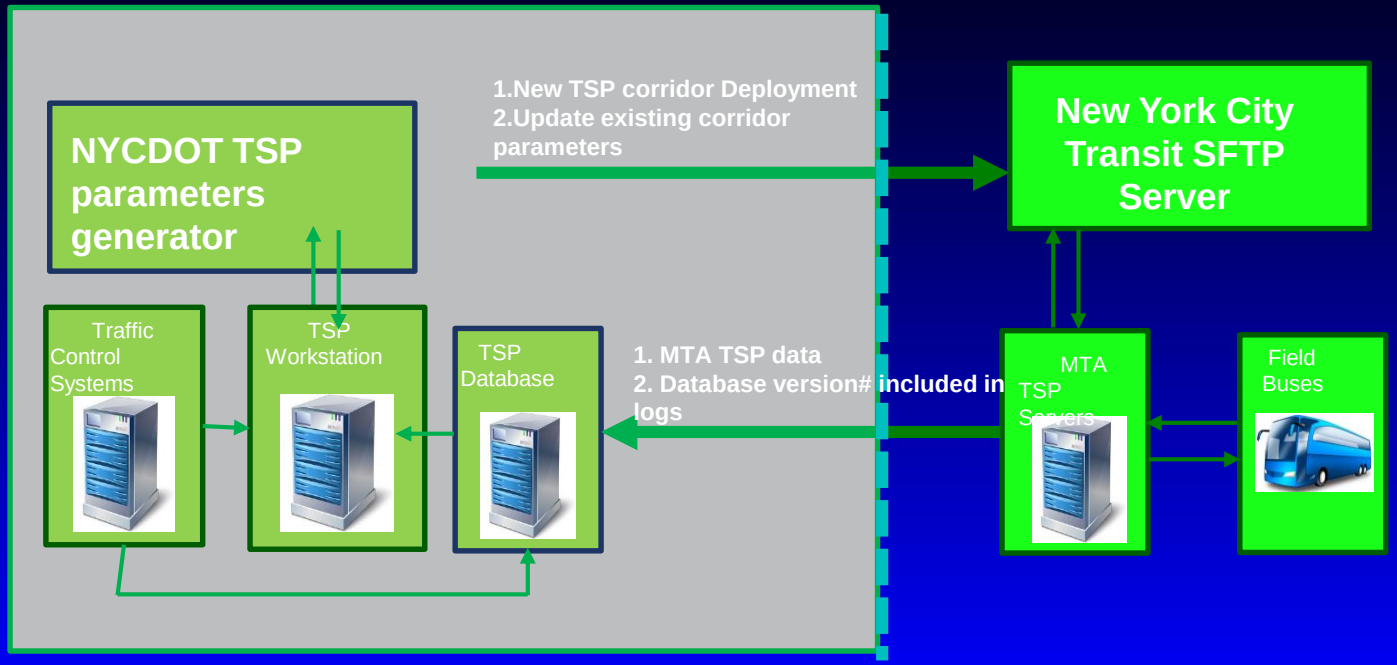
3. TSP green time calculation for each cycle

Innovative methodologies to measure TSP performance – dashboard report



Innovative methodologies to measure TSP performance – data exchange interface

- Data exchange interface – deploy and fine tune operation



Build future sustainability

TSP Before vs. After Studies

- **Positive results with bus travel times improvement of 5 to 30 percent (see table below for details) .**
- **10-30% faster bus speeds, about 10% increase in ridership, more reliable service, customer satisfaction of 95%, safer streets/reduction in crashes.**

Route	AM Before	AM After	AM Improvement	Midday Before	Midday After	Midday Improvement	PM Before	PM After	PM Improvement
M15 NB	18.7	15.3	**18.2%**	17	16.2	**4.7%**	20	16.8	**16%**
M15 SB	19.1	16.5	**13.6%**	18.4	16.7	**9.2%**	18.1	15.5	**14.4%**
S79 To BK	51.5	36.9	**28.3%**	37.4	29.9	**20.1%**	51.4	40.5	**21.2%**
S79 To SI	41.2	32.3	**21.6%**	40.5	27.1	**33.1%**	56.1	40.3	**28.2%**
B44 NB	30.6	25.1	**18.0%**	27.4	26.2	**4.4%**	29.6	26.2	**11.50%**
B44 SB	24.5	21.2	**13.5%**	27	22.3	**17.4%**	29.4	22.1	**24.8%**
BX41 NB/EB	45.1	36.4	**19.3%**	NA	NA	NA	51.6	41.5	**19.6%**
BX41 SB/WB	40.6	33.6	**17.2%**	NA	NA	NA	45.8	36.2	**21.0%**

Data Sources: 1. http://www.nyc.gov/html/brt/downloads/pdf/brt-transit-signal-priority-july2017.pdf 2. http://www.nyc.gov/html/brt/downloads/pdf/bus-forward.pdf

American Council of Engineering Companies (ACEC)

Diamond Award

New York State

and

National Recognition Award

ITS Project of the Year
ITS - NY

Transit Signal Priority
Select Bus Service

Emad Makarious, PE

Administrative Engineer

New York City Department of Transportation

Arterial Management Toolkit: Experiences from Washington, DC

Soumya Dey, PE, PMP
District DOT

Arterial Management Toolkit – Experiences from Washington, DC

Presented by:
Soumya Dey, P.E., PMP, Associate Director, DDOT
Presented to:
I-95 Corridor Coalition – Arterial Management Webinar
August 22, 2019

OVERVIEW

Washington, DC – Regional Setting

- 68.3 square miles
- DC metropolitan area
  - Population 5.6 million
  - 7th largest metro
- DC population 700,000
  - 500,000 daily commuters
  - 100,000+ daily visitors
- Arterial system, not freeway centric
- Multimodal nature of travel
- Lowest auto ownership

DC's Unique Travel Characteristics

Arterial System

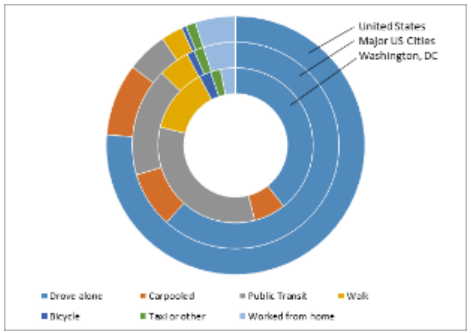
- < 15 miles of freeway
- 1650 signalized intersections
- One out of every four vehicle trip entering the District is "cut through"
- 2 out of 3 cars in the District during rush hours is from out of state

From		Freeway	Arterial	Total
VA	# of Routes	2	3	5
	Inbound VPD	190,000	120,000	310,000
MD	# of Routes	2	47	49
	Inbound VPD	112,000	488,000	660,000
VA+MD	Inbound VPD	302,000 (37%)	608,000 (63%)	970,000

Source: MWCOG Travel Demand Model 2010 Forecasts

Multi-modal travel

- 2nd highest percentage of non-vehicle mode share
  - 38% Transit (2nd to NY)
  - 3.1% Bike (5th in country)
  - 12% Walk (2nd to Baltimore)
- 37% of DC residents do not own an automobile
- 75% of trips by non-SOV mode by 2032



DDOT's Arterial Management Toolkit

Arterial Management Strategies	Benefits
Signal Management Strategies	

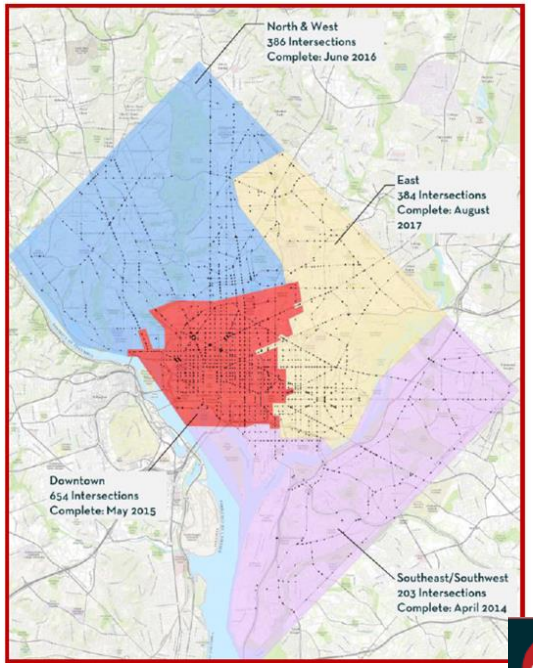
Signal Timing Optimization (1650 intersections)	• Benefit cost of 41:1
	  • 33% reduction in emissions
	  • 20% reduction in delays
	  • 10% reduction in stops
	  • 10% reduction in fuel consumption

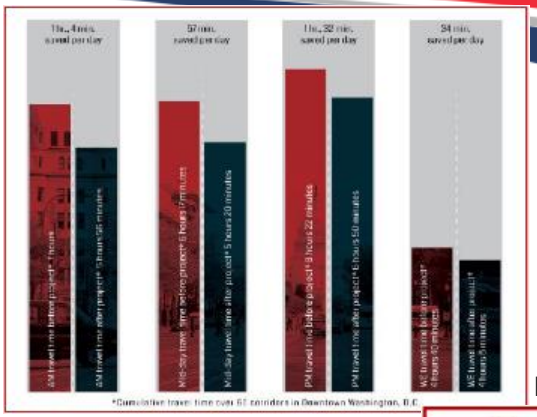
Transit Signal Priority (195 intersections)	• Reduced bus travel time by 5.3%, more robust analysis underway
Adaptive Signal Control (3 corridors)	• Travel time benefits on mainline • Excessive side street delay • Not pedestrian friendly
Lane Management Strategies	
Reversible Lanes	• Effective from capacity utilization standpoint • Safety and economic development/placemaking concerns
Assessment of Existing Rush Hour Restrictions	***Discussion***
Bus Only Lanes	***Discussion***
Curbside Management Strategies	
Parking Pricing	***Discussion***
Pick-up, drop-off zones	• Being expanded after pilot based on hot spot analysis of TNC pick-up/drop off from Shared Street

SIGNAL MANAGEMENT STRATEGIES

SIGNAL TIMING OPTIMIZATION

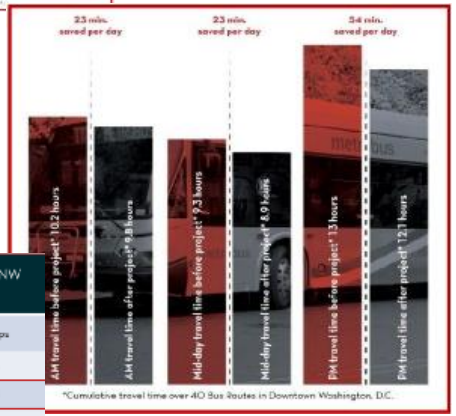
Benefits of Signal Optimization





Corridor Travel Time Benefits

Bus Travel Time Benefits



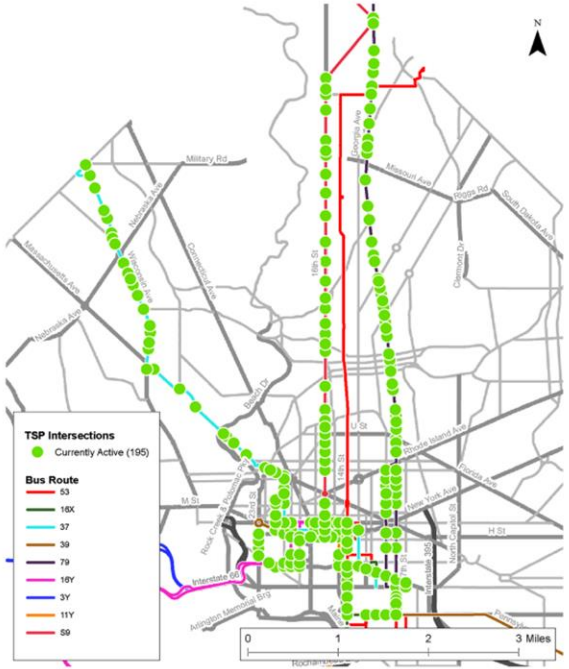
- Benefit cost of 41:1
- 33% reduction in emissions
- 20% reduction in delays
- 10% reduction in stops
- 10% reduction in fuel consumption

Benefits to Cyclists

	Pennsylvania Avenue NW Before		Pennsylvania Avenue NW After	
	Travel Time	Stops	Travel Time	Stops
AM Eastbound	7:30	5	6:20	5
AM Westbound	8:30	7	7:30	3
MD Eastbound	8:10	8	7:20	5
MD Westbound	8:20	7	8:10	6
PM Eastbound	10:30	8	10:10	7
PM Westbound	7:45	7	8:10	5

TRANSIT SIGNAL PRIORITY

Transit Signal Priority



- Transit signal priority at 195 intersections
- Collaborative process with WMATA
- Reduces bus travel time by 5.3%
- More robust “with” and “without” assessment underway using the following performance metrics :
  - Bus runtime
  - Bus travel time reliability
  - Schedule deviation distribution
  - Headway distribution
  - Pedestrian crossing compliance
  - Mainline auto travel time
  - Mainline number of stops
  - Side street queues
  - Phase green time distribution
  - Percent buses requesting priority

ADAPTIVE CONTROL SIGNAL

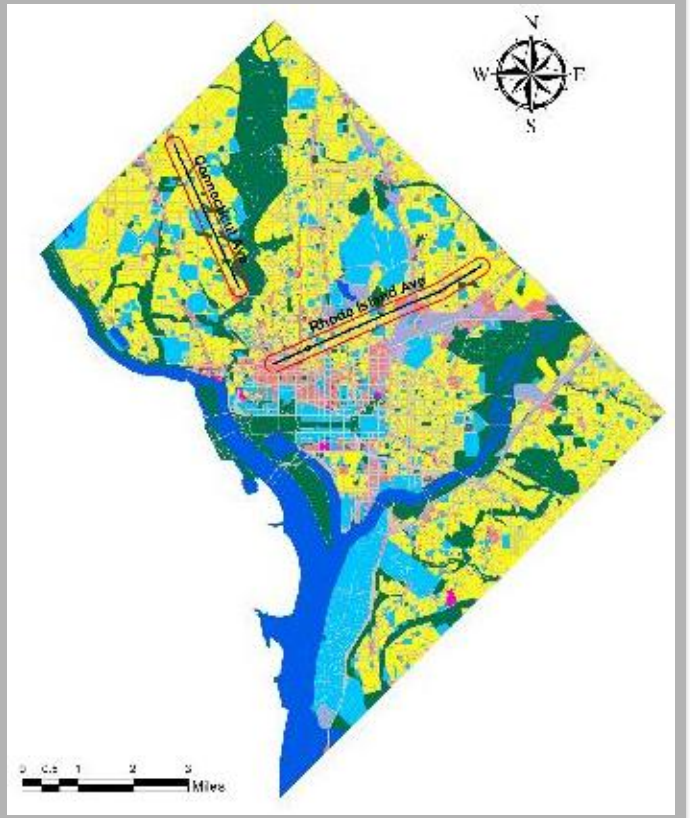
Adaptive Signal Control

- DDOT's pilot Adaptive Signal Control project concluded in 2018 with the activation, testing, and evaluation of Adaptive Signal Control Technology (ASCT) on three arterials within the District of Columbia:
  - Rhode Island Avenue NE from 4th Street NE to Eastern Avenue NE;
  - New York Avenue from 4th Street NW/I-395 Interchange to Bladensburg Road NE; and
  - Pennsylvania Avenue SE from Anacostia Freeway Ramp/Fairlawn Avenue to Southern Avenue SE
- Following completion of ASCT pilot testing, controller timings were reverted to Time Based Coordination to mitigate excessive side street delay and queues in the peak hours and provide predictable operations for pedestrians.
- While limited travel time benefits were observed on the mainlines, unacceptable impacts to side street queues and delays were observed.
- On the whole, the shortcomings of the Adaptive software application have been concluded to outweigh its benefits for this operating environment.
- The report is anticipated to be finalized in fall 2019.

LANE MANAGEMENT STRATEGIES

FRAMEWORK FOR RUSH HOUR RESTRICTION EVALUATION

Scope of Work

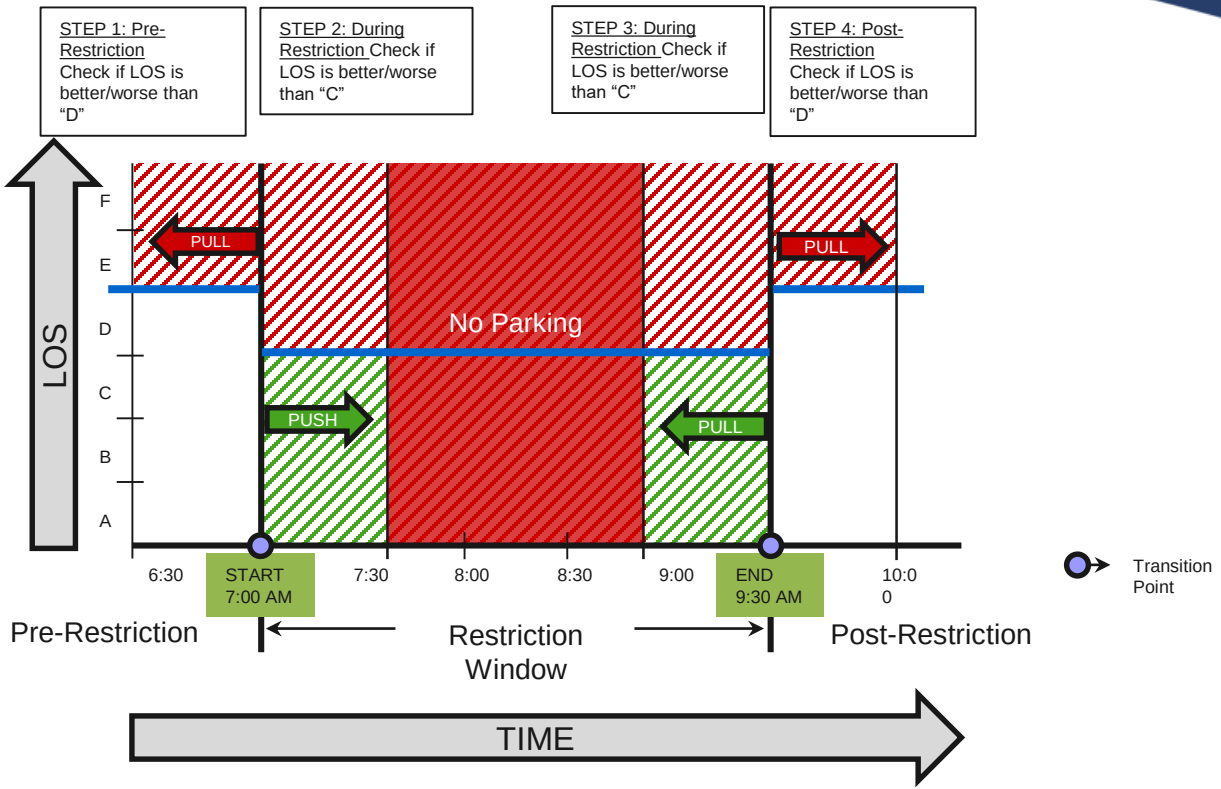


- Assess the validity of the prevailing peak hour restriction times that were set a while ago.
- Develop a framework that would allow conceptual evaluation of similar roadways to understand whether a modification of peak period parking restriction (i.e., expansion, reduction or shift) may offer benefits.
  - Tradeoff between mobility and accessibility
  - Accommodating competing demands on curbspace
  - Impacts on neighborhoods – cut through, parking, etc.
- Evaluate the interaction among peak period parking restrictions, traffic operations, and parking along two (2) arterial corridors in the District.

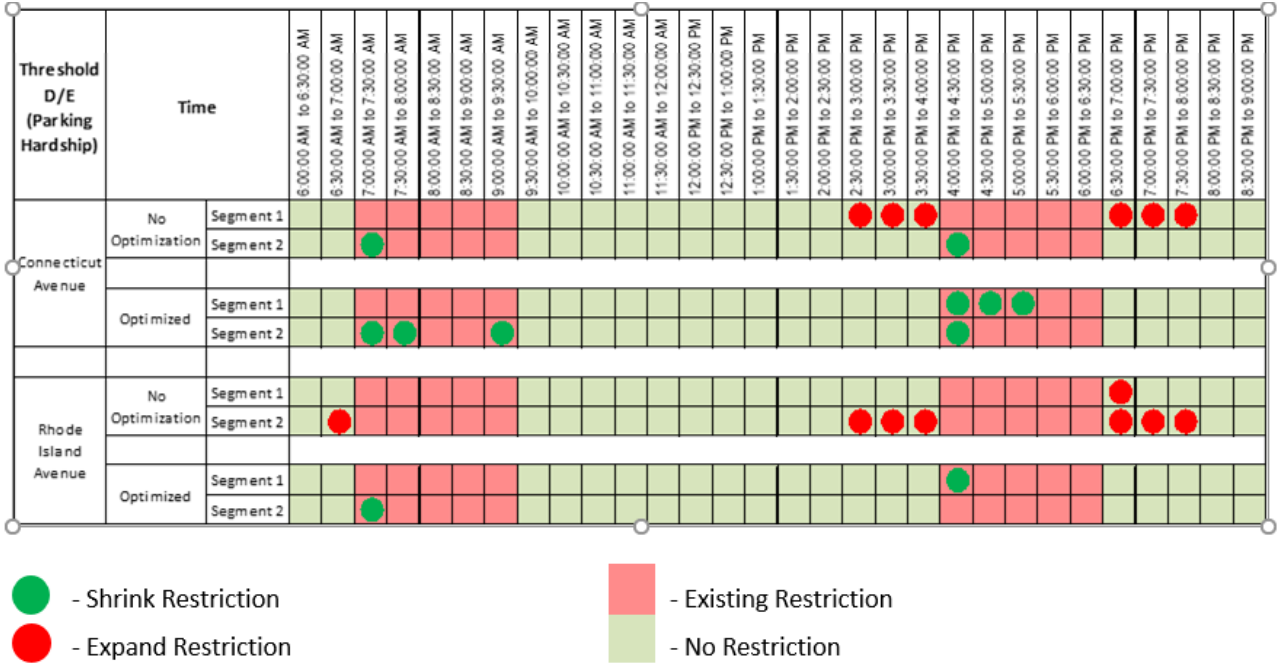
Assessment Framework

Step1	• Assess existing conditions
Step 2	• Determine need for restrictions
Step 3	• Establish acceptable operational thresholds
Step 4	• Establish duration of restriction time
Step 5	• Treatment of transition points

Framework for Assessing Rush Hour Restrictions



Summary of Findings



Elements of Policy Framework

Existing Corridor LOS	Good Public Transportation Available	Neighborhood Cut Through Potentials Present	Neighborhood Parking Adequate**	Neighborhood Parking Near or at Capacity
"D" or better through Peak Periods	Consider keeping current parking restrictions or increasing parking restrictions	Consider keeping current parking restrictions or increasing parking restrictions	Consider keeping current parking restrictions or increasing parking restrictions	Consider decreasing parking restriction time period
"E or F" through Peak Periods	Consider increasing parking restrictions	Consider increasing parking restrictions	Consider increasing parking restrictions	Consider keeping current parking restrictions or increasing restrictions
"E" during *shoulder time* periods*	Consider keeping current parking restrictions or increasing restrictions	Consider keeping current parking restrictions	Consider keeping current parking restrictions or increasing restrictions	Consider keeping current parking restrictions
"F" during *shoulder time* periods	Consider keeping current parking restrictions or increasing restrictions	Consider keeping current parking restrictions or increasing restrictions	Increase parking restriction time periods	Consider keeping current parking restrictions or increasing restrictions

BUS ONLY LANES

H & I Streets NW Pilot Bus Lanes

Early Coordination

- Community
- Federal Reviewers
- DDOT Teams
- Interagency Partners

High Visibility Launch Events

Enforcement

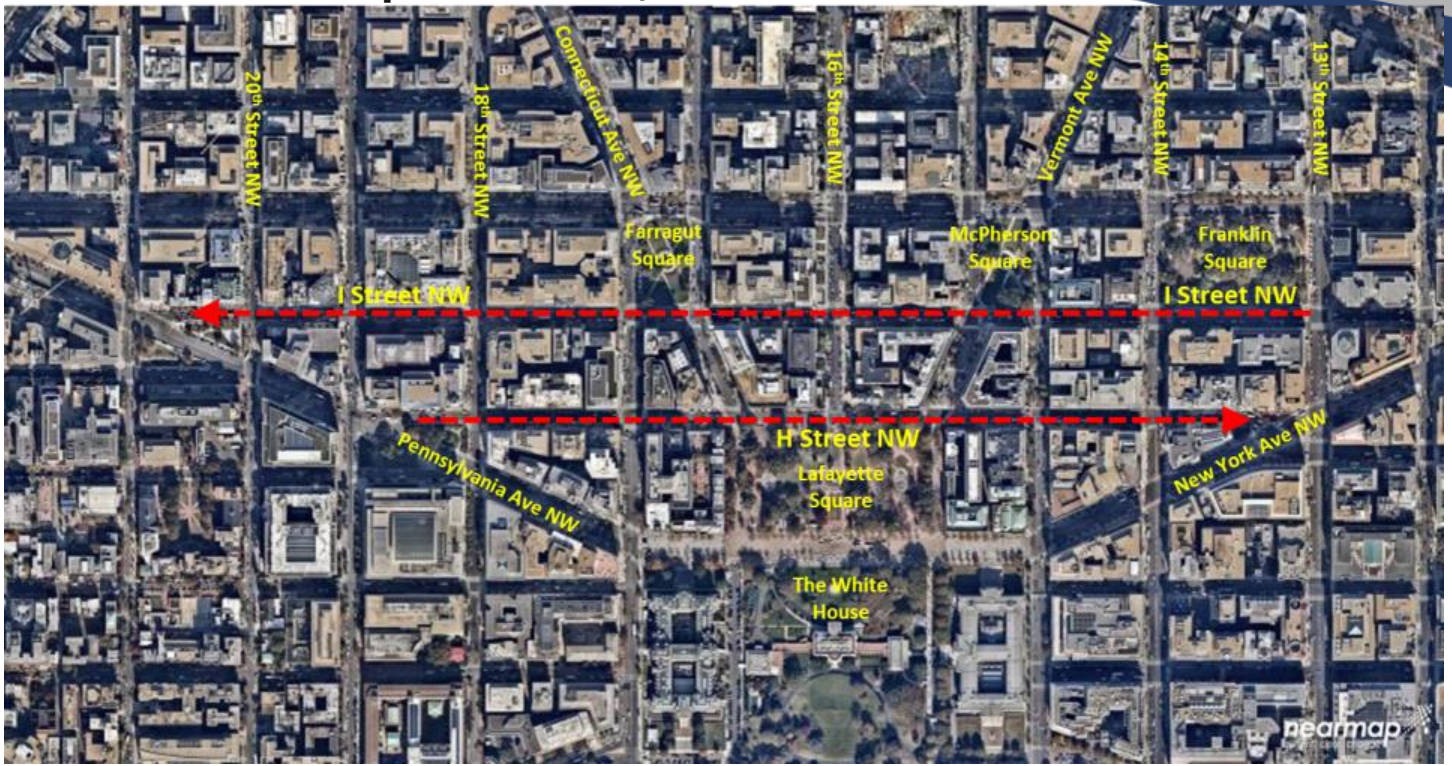
Enhanced Markings & Signage

Evaluation Plan

- Monitor Bus Lane Performance and Compliance

H & I Streets NW Pilot Bus Lanes

June 3 to September 27, 2019

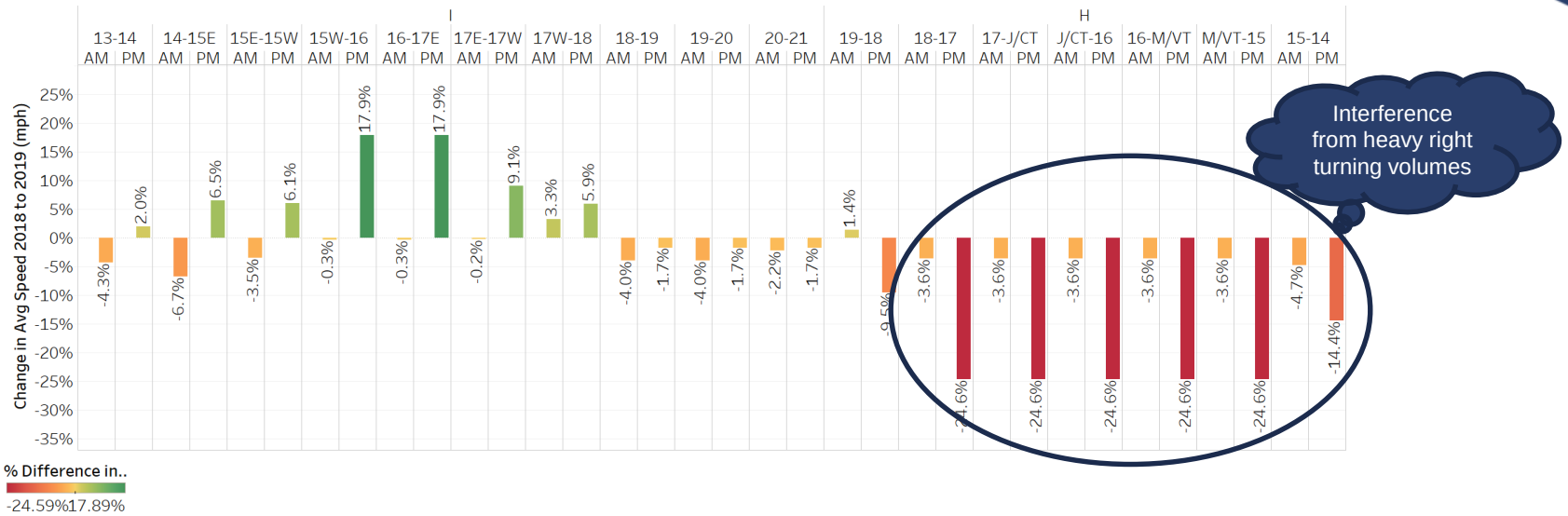


Bus Lanes - Hours of Operation

AM Rush: 7am – 9:30am PM Rush: 4pm – 6:30pm

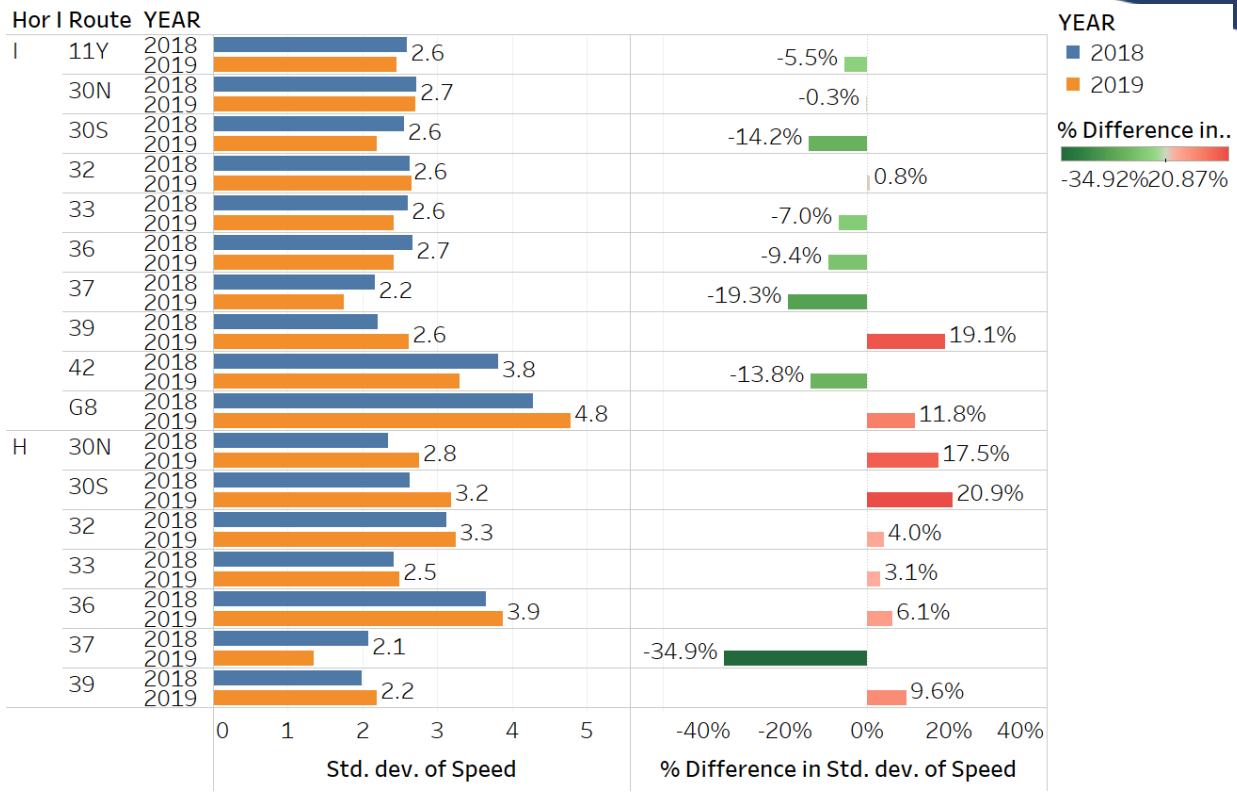
H & I Streets NW Pilot Bus Lanes – Average Bus Speed

Percent Change in Average Speed by Block



H & I Streets NW Pilot Bus Lanes – Bus Reliability

Standard Deviation of Average Travel Speed



Key Issues to be Resolved

- Conflict of buses with right turning vehicles - restrict right turns at key intersections, exclusive right turn lanes at others
- Bus layover – needs to be relocated
- Encroachment on bus lanes - continued enforcement

REVERSIBLE LANES

Reversible Lanes – the DC Experience

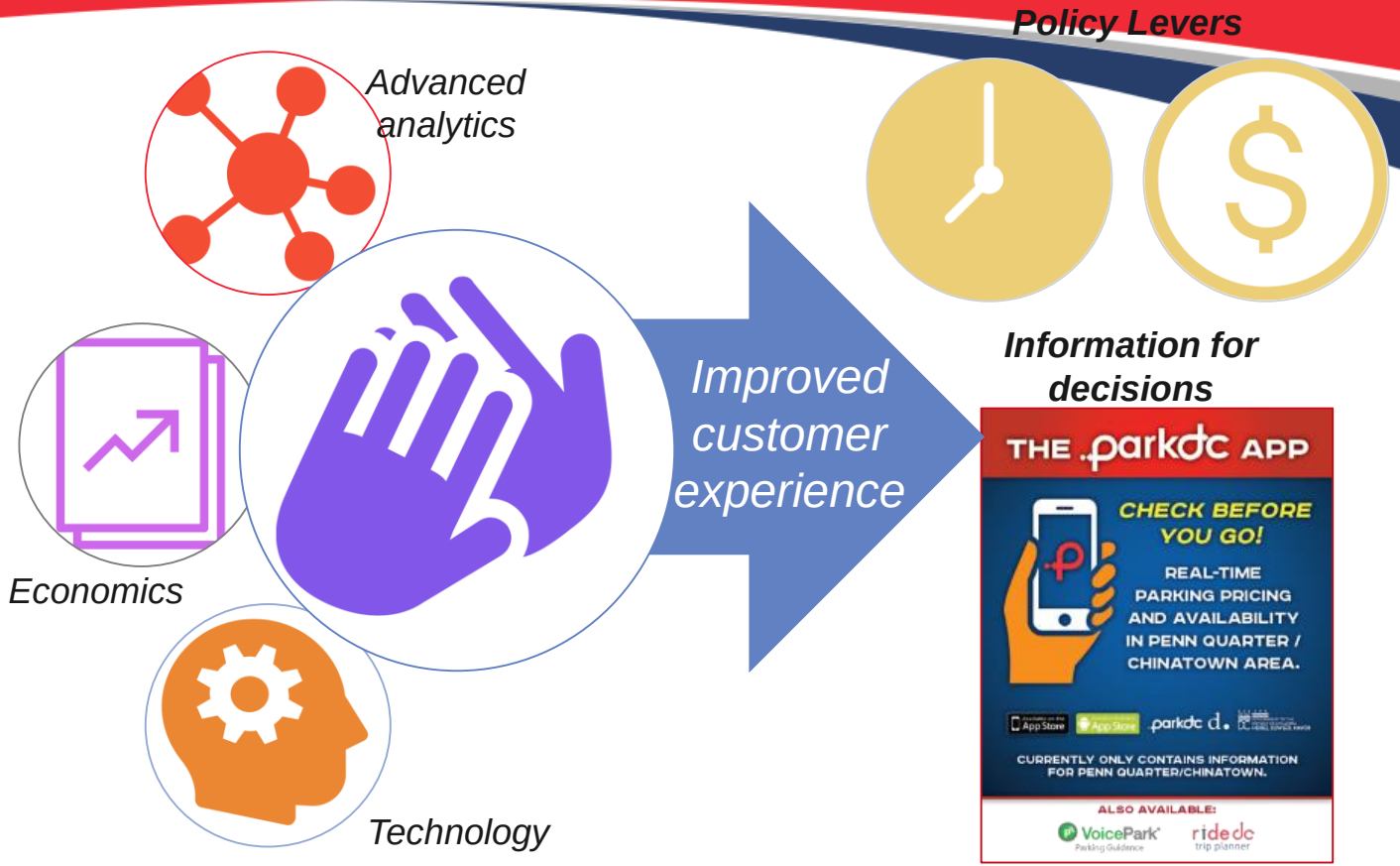
- Utilization of existing infrastructure
  - Aligns transportation supply and demand; benefits to traffic operations
- Economic Revitalization/Placemaking
  - Caters to “through” traffic; not “destination” traffic
- Safety Assessment
  - Higher crash rates than comparable surrogates after normalized for traffic volumes (Connecticut Avenue vs Massachusetts Avenue and Wisconsin Avenue). Higher percentage of head-on and side-swipe crashes.
  - Higher percentage of crashes during reversible lane operations (NOT after normalized for traffic volumes). Higher percentage of head-on and side swipe compared to District average.
  - Illegal encroachment on reversible lanes in some sections; low utilization of reversible lanes in those sections
  - Can be confusing to pedestrians and visitors
- Should be assessed on a case-by-case basis

Evaluation Criteria	Result
Utilization of existing capacity	
Safety	
Economic development/placemaking	

CURBSIDE MANAGEMENT STRATEGIES

CURBSIDE PARKING PRICING

What is parkDC?



Lever 1: Pricing (FH-FL)

Price Change	Rate Structure (hourly rates)										
Baseline				$2.30							
Round 1 *October 2016*			$2.00	$2.30	$2.75						
Round 2 *February 2017*		$1.50	$2.00	$2.30	$2.75	$3.25					
Round 3 *May 2017*	$1.00	$1.50	$2.00	$2.30	$2.75	$3.25	$4.00				
Round 4 *August 2017*	$1.00	$1.50	$2.00	$2.30	$2.75	$3.25	$4.00	$4.75			
Round 5 *November 2017*	$1.00	$1.50	$2.00	$2.30	$2.75	$3.25	$4.00	$4.75	$5.50		
Round 6 *October 2018*	$1.00	$1.50	$2.00	$2.30	$2.75	$3.25	$4.00	$4.75	$5.50	$6.00	
Round 7 *22 January 2019*	$1.00	$1.50	$2.00	$2.30	$2.75	$3.25	$4.00	$4.75	$5.50	$6.00	$6.50

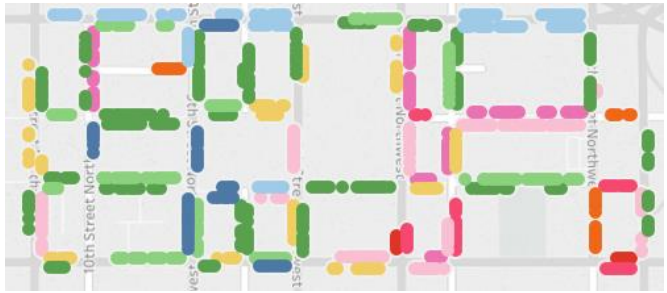
Highest price point impacts less than 8 block faces during weekday 11 AM – 4PM and less than 2 block faces during the Weekday 4PM – 10 PM

Once a block hits the "sweet spot" at a certain price point, we do not change it

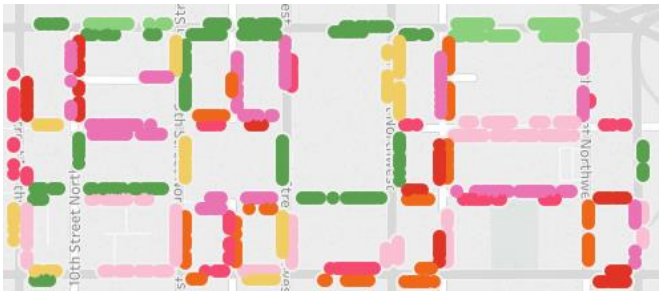
Lever 2: Time Limits

Increased time limit to 4 hours in **eastern third of pilot area**
(start at 4 PM instead of 6:30 PM and all day Saturday)

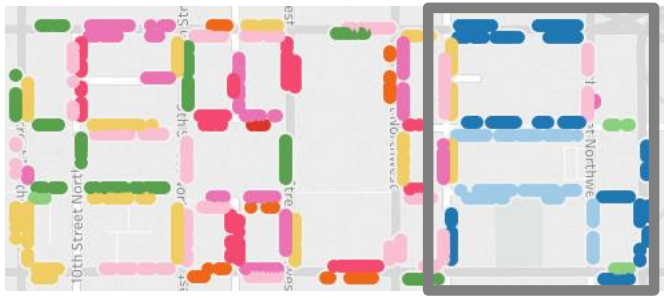
7 AM – 11 AM, M-F



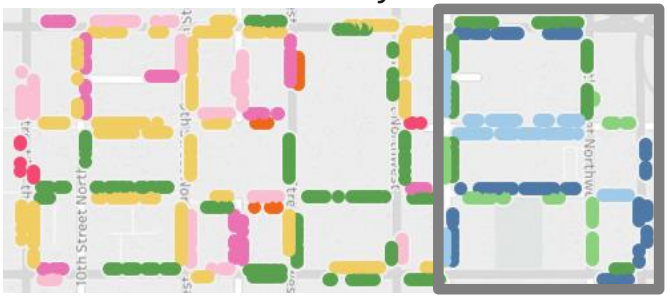
11 AM – 4 PM, M-F



4 PM – 10 PM, M-F



Saturdays



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Progress over time

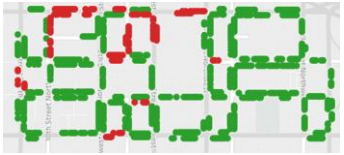
Pilot Measure	Pre-Pilot	Round 1 October 2016	Round 2 February 2017	Round 3 May 2017	Round 4 August 2017	Round 5 November 2017	Round 6 October 2018	Round 7 January 2019
Number of Price Points	1	3	5	7	8	9	10	11
Increased Price	-	94 blocks	172 blocks	142 blocks	71 blocks	89 blocks	63 blocks	106 blocks
Steady Price	-	223 blocks	185 blocks	222 blocks	262 blocks	266 blocks	280 blocks	261 blocks
Decreased Price	-	47 blocks	13 blocks	7 blocks	38 blocks	16 blocks	20 blocks	4 blocks
Blocks at Equilibrium (no change recommended)		60% (conservative approach to first round price changes)	50%	60%	71% (larger percentage not changed due to construction)	72%	77% (Conservative approach for blocks without sensor data)	70%

Round 7 – Morning. M-F

Round 7 – Afternoon, M-F

Round 7 – Evening, M-F

Round 7 – Saturday

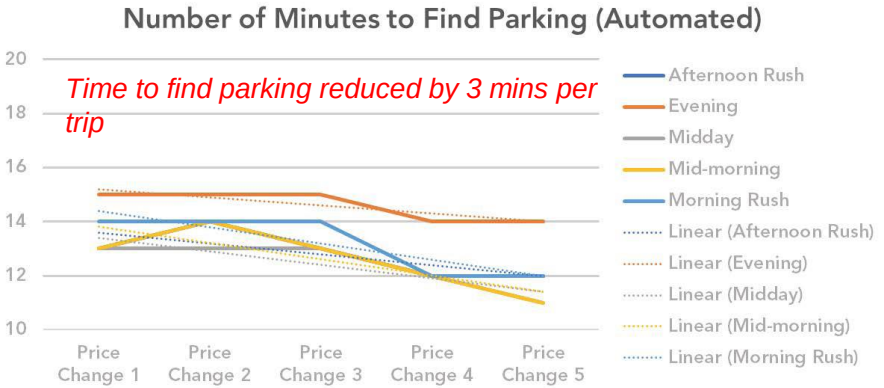


*Green blocks at target occupancy: 70% - 90%

Goal 1: Reduce time to find a space

DDOT directly influenced customers' ability to find and pay for parking

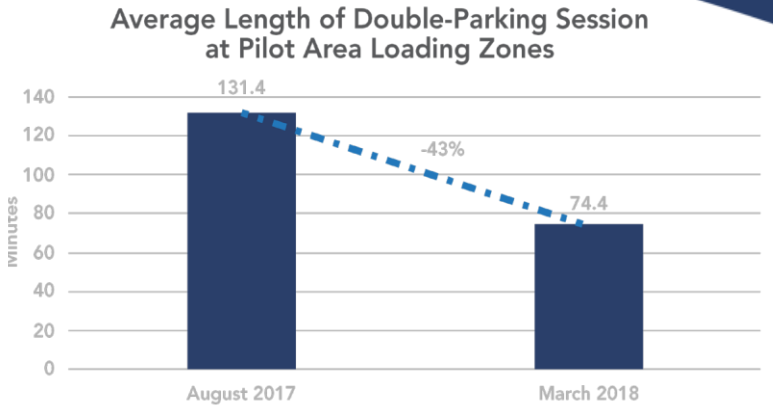
- Parking availability increased on high-demand blocks, and underutilized spaces found more takers
- Turnover increased (10% reduction in stays from 66 to 60 mins.)
- The pilot made parking easier to find (5% increase in space availability)



Decline in illegal parking

As supply increased, illegal parking decreased

Double parking citations fell by 55%

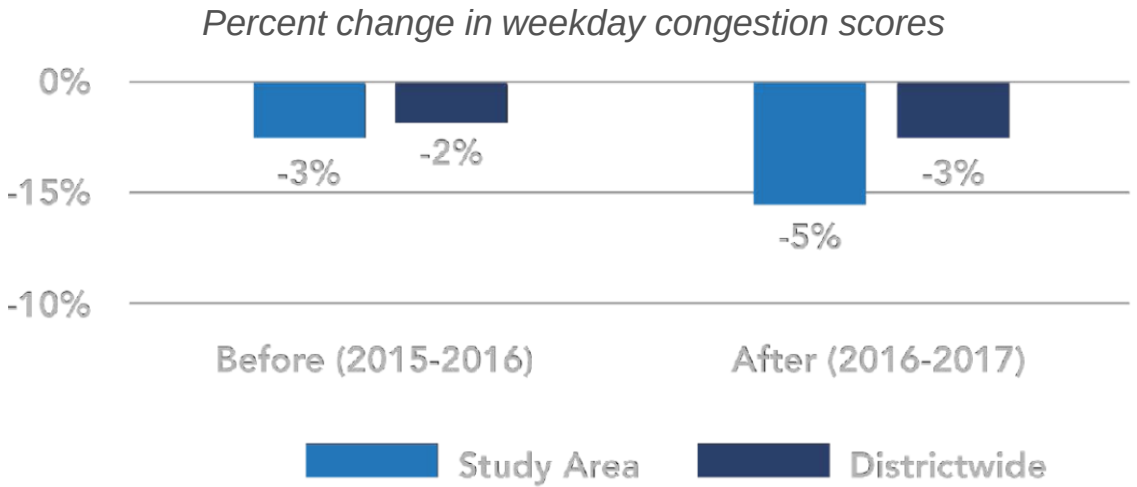


	Pilot Area	Control Area
	Average Double Parking	Average Double Parking
Before (2015)	1.8%	2.4%
After (2017)	0.8%	2.0%
Change over Time	-0.9%	-0.4%

Goal 2: Reduce congestion & improve safety

Circling for parking decreased by as much as 15%

Congestion decreased and travel time reliability increased



Performance vs. Goals Overview

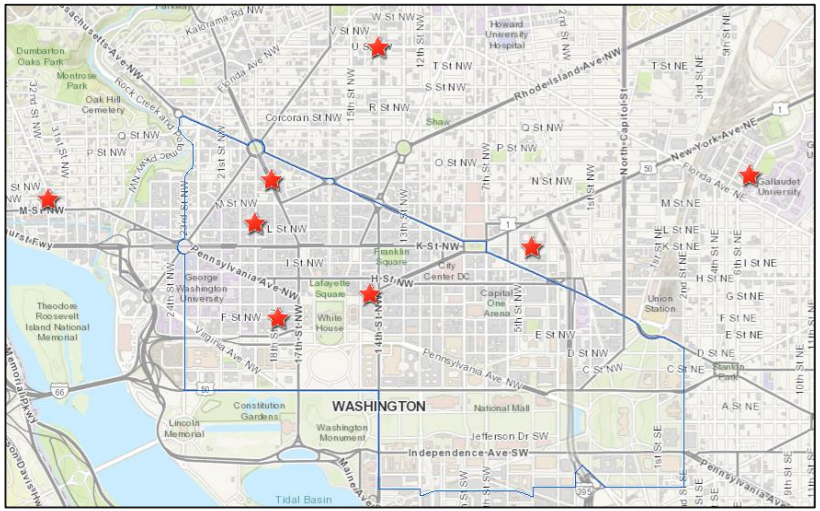
Reduce time to find an available parking space	Objective Met?
Increase parking availability	Yes
Provide parking availability to customers real-time	Yes
Improve parking regulatory signage	Yes
Reduce congestion and pollution, improve safety, encourage use of alternative modes	**Objective Met?**
Reduce double parking	Yes
Reduce circling for parking	Yes
Encourage travel by other modes	Yes
Improve operations of commercial loading zones	Yes

Develop parking management solutions through cost-effective, asset-lite approach	Objective Met?
Test different parking occupancy detection solutions	Yes
Explore effectiveness of fusing data from various sources	Yes

PASSENGER PICK UP DROP OFF (PUDO) ZONES

Pick-up/Drop-off (PUDO) Zone Pilot Program

- DDOT's Pick-up/Drop-off (PUDO) Zone pilot program evolved from the Nightlife Curbside Restriction Pilot, which restricted night time parking at popular nightlife locations
- The PUDO Zone pilot launched in December 2018 (14th and U Street NW)
- PUDO zone characteristics:
  - Active passenger or commercial loading/unloading allowed
  - At least 40-feet (ideally 60+ feet)
  - 24-hour No Parking
  - Higher fine than regular No Parking zone ($35 → $75)



PUDO Zone Locations as of 8/15/19 (Wharf location not pictured)

Pick-up/Drop-off (PUDO) Zone Pilot Program

PUDO Zone Pilot Goals

- **Safety-** Facilitate safe movement of people and goods by keeping curbs clear
- **Curbside Efficiency/Utilization-** Reduce curbside turnover time, decrease queue lengths, increase trip completion, and reduce crashes.
- **Traffic Control-** Allow more space for all modes to interact with the curbside to improve throughput.

Observation and Feedback

- Reductions in double-parking and blocking travel/bike lanes
- Reductions in congestion
- Increased use of curb lanes for passenger pick-up/drop-off;
- Less ride hailing from the roadway
- Positive feedback from stakeholders including BIDs, ANCs, and commercial interests


d. delivers
district department of transportation

Florida's Statewide Arterial Management Program (STAMP)

Raj Ponnaluri, PE, PhD, PTOE, PMP
Florida DOT

Florida's Statewide Arterial Management Program (STAMP)

Raj Ponnaluri, PhD, PE, PTOE, PMP
Connected Vehicles and Arterial Management Engineer
Florida Department of Transportation

FDOT TSM&O
Transportation Systems Management & Operations

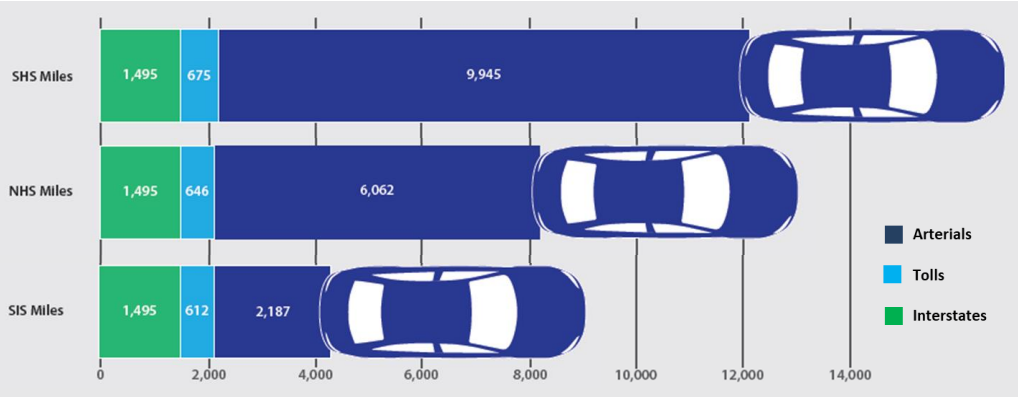
Agenda

1. Understanding Florida's Arterial System
2. Traffic Signals in Florida
3. Statewide Arterial Management Program (STAMP)
4. STAMP Action Plan
   - Key Elements of the STAMP Action Plan
   - STAMP Action Plan Outline
   - STAMP Outcomes and Performance Assessments
   - STAMP Action Items
5. Traffic Signal Maintenance and compensation Agreement (TSMCA)
6. Traffic Signals Training
7. Signal Phase and Timing (SPaT) - Traffic Signal CAV Application
8. Automated Traffic Signal Performance Measures (ATSPM)

Understanding Florida's Arterial System

Florida's **arterial system:**

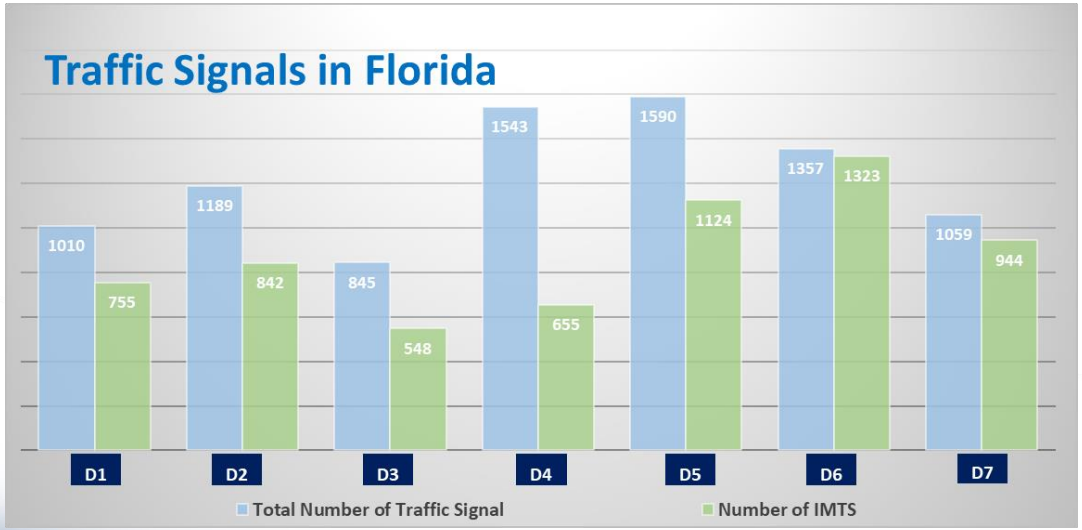
- 82% of the total state highway system (SHS) center-line miles
- 74% of total national highway system (NHS) center-line miles
- 51% of total strategic intermodal system (SIS) center-line miles



Source: FDOT Planning Office
http://www.fdot.gov/statistics/hwysys/default.shtm

Traffic Signals in Florida

FY 2018-2019 TSMCA Traffic Signal Counts and Interconnected and Monitored Signals



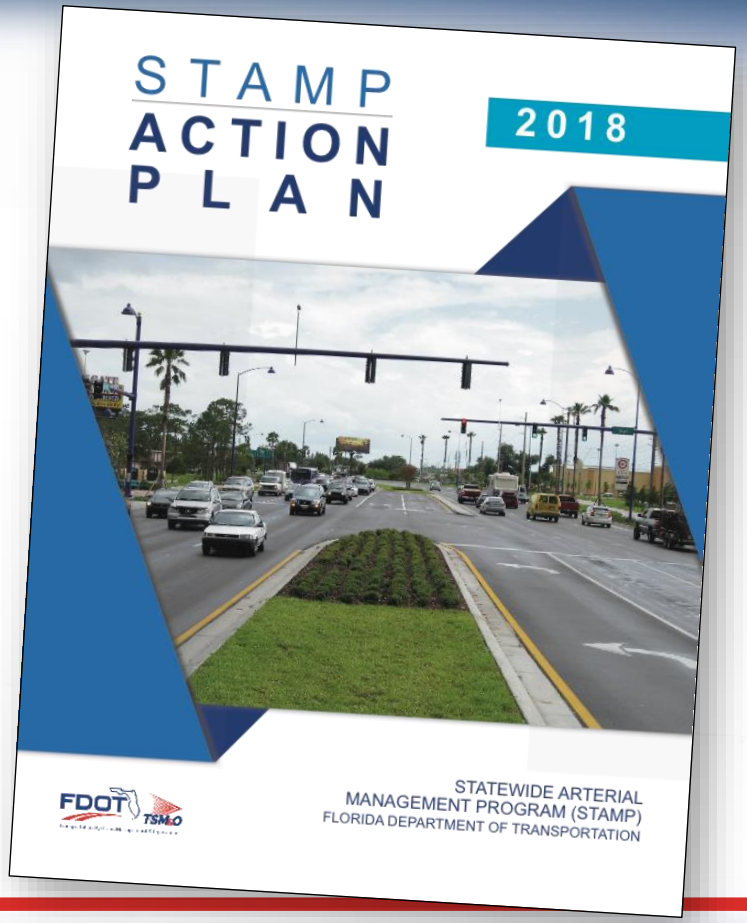
Out of **8,593 traffic signals of SHS 6,191 (approximately 72%)** are interconnected and monitored.

Statewide Arterial Management Program (STAMP)

Mission: To deliver the TSM&O Strategic Plan's vision, mission and goals for arterials.

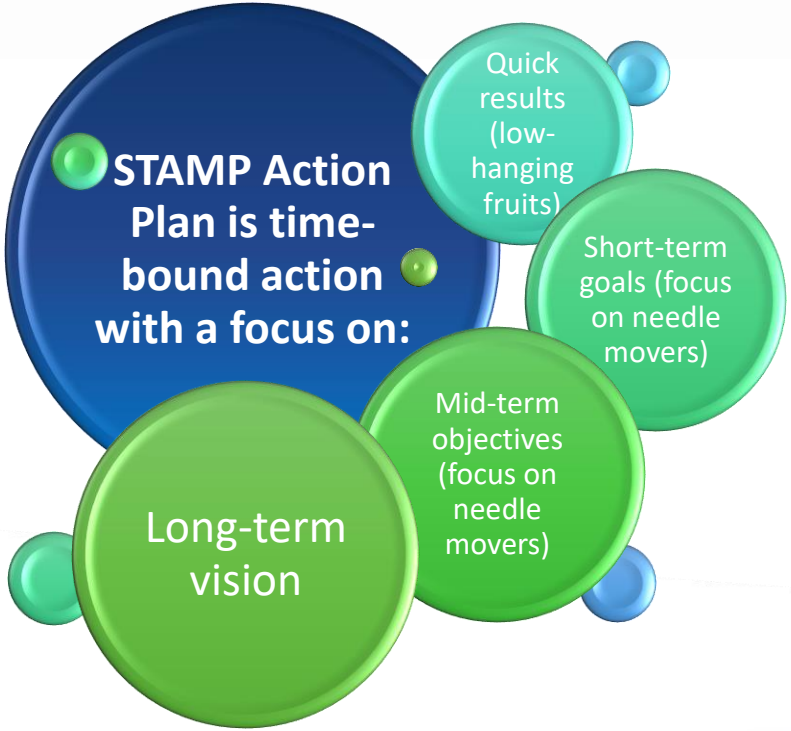
STAMP Action Plan

- STAMP Action Plan
  - Builds upon TSM&O Strategic Plan
    - Arterial Management is one of the six priority focus areas of Strat Plan
  - Develops a comprehensive approach to arterial management
  - Focuses on action for the next 3 years

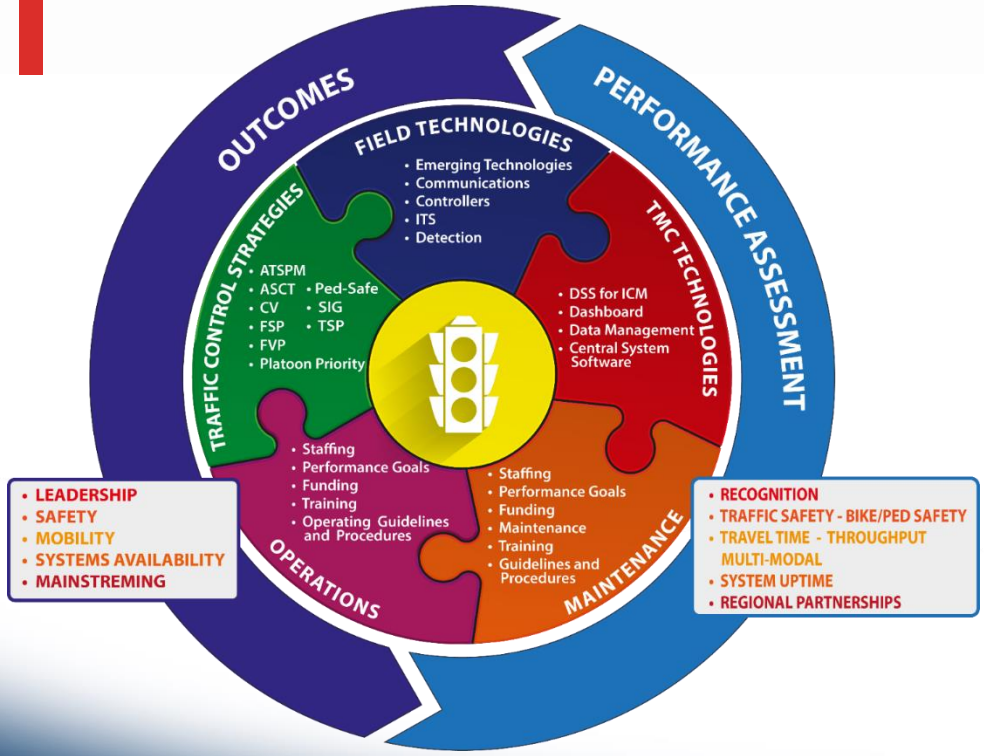


STAMP Action Plan Outline

- Focus on ***needle movers*** – action items that make a noticeable difference in the program to take it to the next level
- Districts and locals providing input
- STAMP Action Plan is time-bound



Key Elements of the STAMP Action Plan



- Traffic Control Strategies
- Field Technologies
- TMC Technologies
- Maintenance
- Operations

STAMP Outcomes and Performance Assessment

Leadership	The associated performance assessment for leadership is ***FDOT recognition locally and nationally.***
Safety	The associated performance assessments are improved ***traffic and bike-ped safety***.
Mobility	The associated performance assessment for mobility are ***travel time improvement and increased throughput for all roadway users, regardless of travel mode choice.***

STAMP Outcomes and Performance Assessment

Systems Availability	The performance assessment associated for systems availability is to have ***higher system uptime.***
Mainstreaming	The performance assessment associated for arterial mainstreaming is ***enhanced regional partnerships and local support***

STAMP Action Items

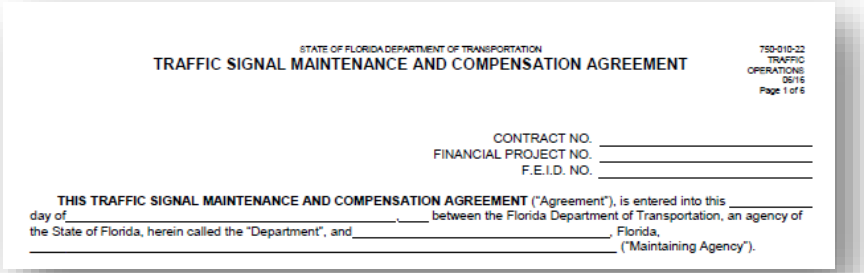
The STAMP Action Plan outlined 69 action items that are specific, measurable, accountable, relevant, and timely for CO and Districts to accomplish within the next three to five years.

Districts and CO will be moving towards achieving action item goals in a time bound schedule.

In the process, the action items may be modified, added, or removed in full coordination with the Districts and FDOT Partners

Traffic Signal Maintenance and Compensation Agreement (TSMCA)

- FDOT compensates local agencies for operating and maintaining all of its on-system traffic signals via TSMCA
- FDOT compensates approximately $41M under TSMCA to the Local Agencies



STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL MAINTENANCE AND COMPENSATION AGREEMENT

750-010-22
TRAFFIC OPERATIONS
05/16
Page 1 of 5

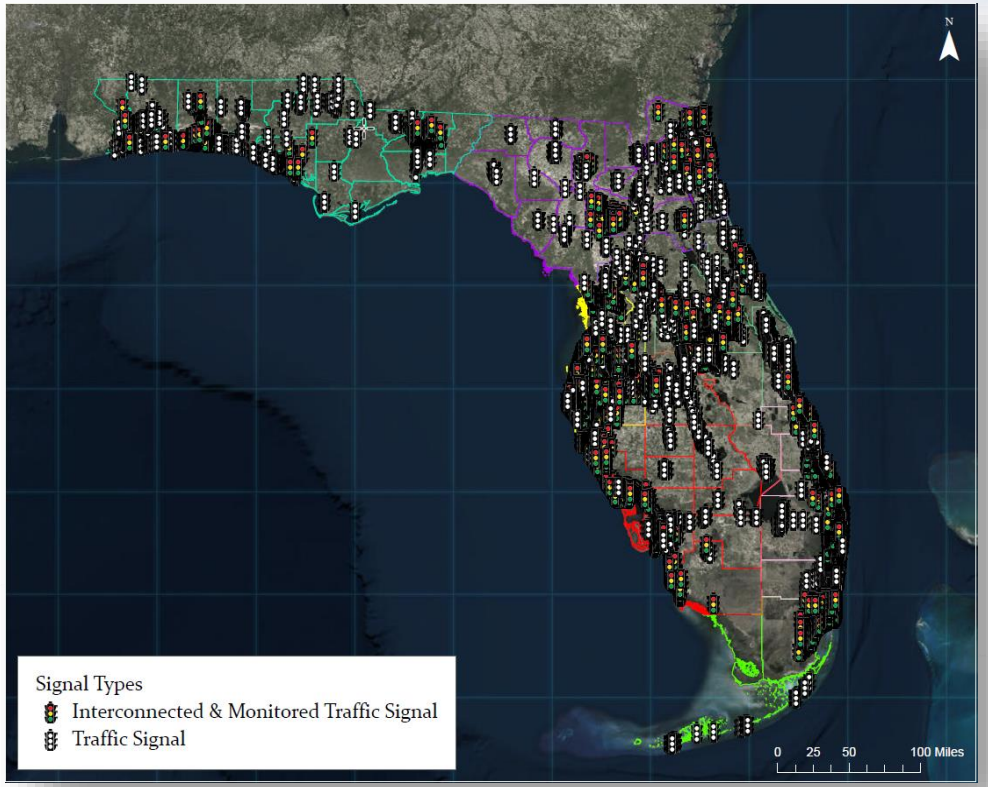
CONTRACT NO. _____
FINANCIAL PROJECT NO. _____
F.E.I.D. NO. _____

THIS TRAFFIC SIGNAL MAINTENANCE AND COMPENSATION AGREEMENT ("Agreement"), is entered into this _____ day of _____, ____ between the Florida Department of Transportation, an agency of the State of Florida, herein called the "Department", and _____, Florida, _____ ("Maintaining Agency").

- Exhibit B of the TSMCA includes unit rates for the following nine systems
  - Traffic Signals
  - Traffic Signals Interconnected and Monitored
  - Intersection Control Beacon
  - Pedestrian Flashing Beacon
  - Emergency Fire Department Signal
  - Speed Activated Warning Display or Blank Out Signs
  - Traffic Warning Beacons
  - Travel Time Detector
  - Uninterruptible Power Supplies

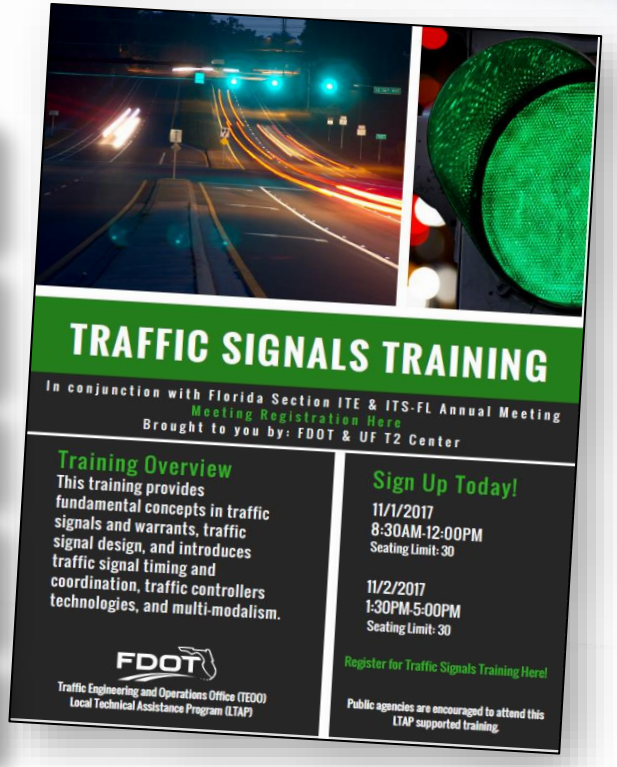
TSMCA

- 8,593 signals on the state highway system covered under TSMCA
- TSMCA covers
  - Damage reimbursements
  - Utility locates
  - Preventive maintenance
  - Emergency maintenance
  - Service restoration (temporary poles, stop signs, and/or signals)

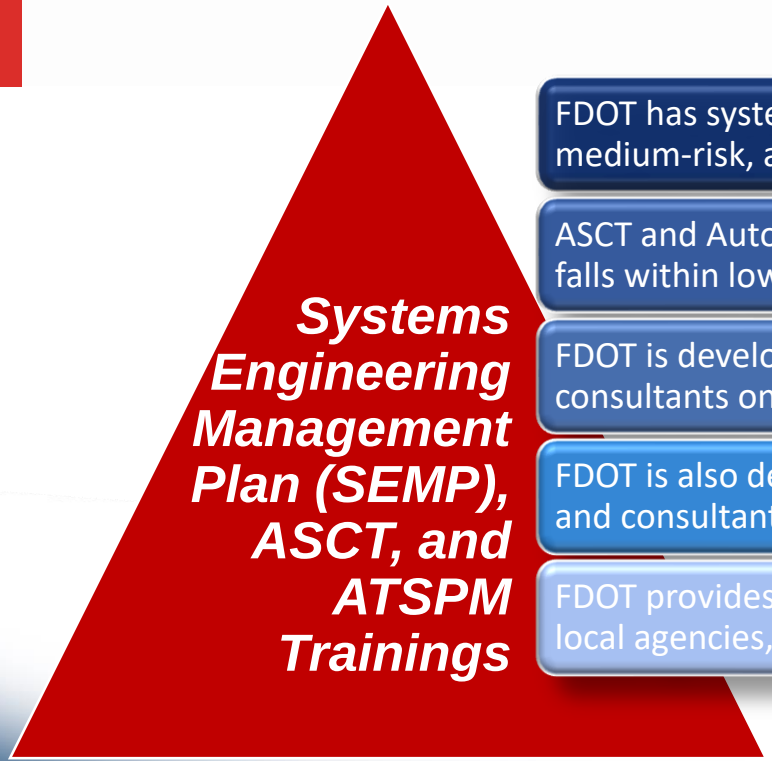


Traffic Signals Training

- FDOT has a Statewide TSM&O Excellence Program (STEP) in place for training and resource development
- FDOT developed traffic signal 102 training to cover basics of traffic signal design, warrant analysis, retiming, and other traffic signal design elements
- Trainings developed to be in-person for more advance topics
- Modules on basic traffic signal introduction and warrant analysis are under development as computer based training (CBT)
- CBT will be pre-requisite for other advanced in-person training modules



Traffic Signals Training



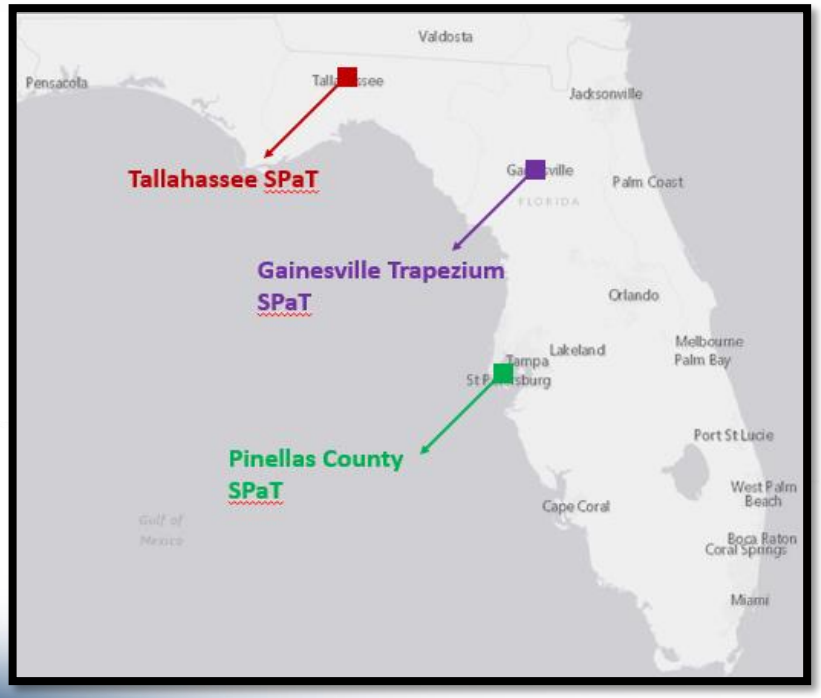
- FDOT has systems engineering process in place for low-risk, medium-risk, and high-risk projects
- ASCT and Automated Signal Performance Measures (ATSPM) falls within low to medium risk projects
- FDOT is developing PSEMP trainings to train local agencies and consultants on Project SEMP (PSEMP) process
- FDOT is also developing ASCT training to train local agencies and consultants on ASCT systems and process for deployment
- FDOT provides hands-on training on ATSPM deployment to local agencies, as needed

Traffic Signal Computer Based Training

Available to FDOT and Private Sector!

Link to the training:
http://wbt.dot.state.fl.us/ois/TSMO/index.htm

Signal Phase and Timing (SPaT) - Traffic Signal CAV Application



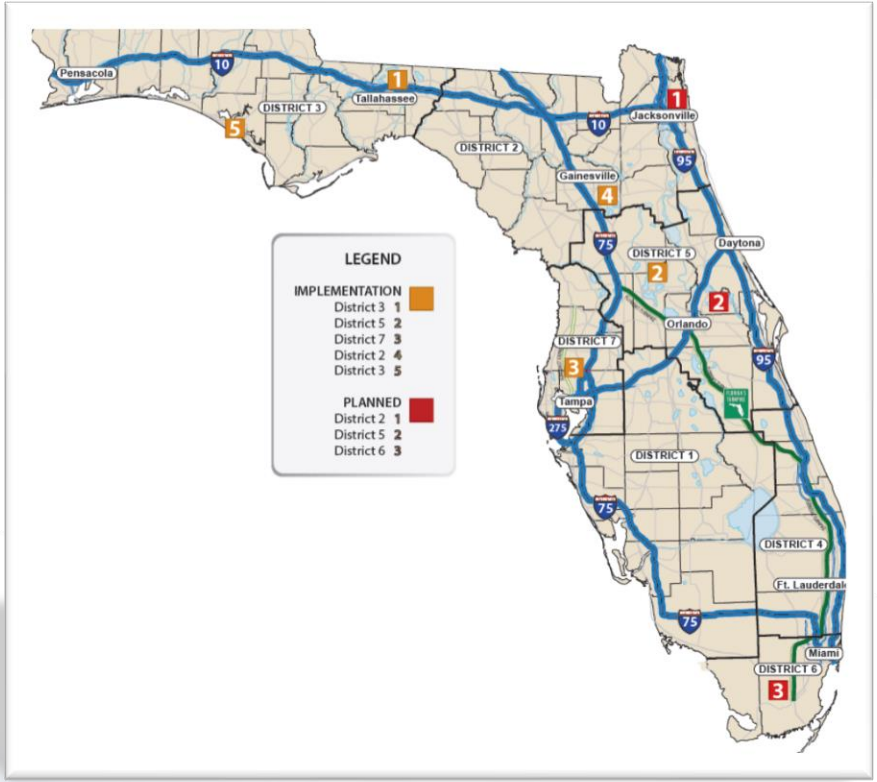
SPaT Projects in Florida:

Tallahassee SPaT in District 3- **Operational Phase** (21 Signals)

Gainesville Trapezium SPaT in District 2- **Deployment Phase** (27 Signals)

Pinellas County SPaT in District 7- **Procurement Phase** (23 Signals)

ATSPM Deployment



District Coordination

- STAMP Working Group – Meet bi-monthly
- SharePoint site for sharing and uploading agreements

QUESTIONS?

Thank You!

Questions?

Remaining Questions from the CHAT Box

Wrap Up

Meeting information & presentations will be posted to the I-95 Corridor Coalition website. Participants will receive a link to the presentations after they are posted.

Contact Information

I-95 Corridor Coalition

- Denise Markow, PE, I-95 Corridor Coalition, TSMO Director - dmarkow@i95coalition.org, 301-789-9088

Speakers

- Emad Makarious, New York City DOT - emakarious@dot.nyc.gov
- Soumya Dey, District DOT - soumya.dey@dc.gov
- Raj Ponnaluri, Florida DOT - raj.ponnaluri@dot.state.fl.us

Thank You!