

Active Traffic Management through Adaptive Signal Control on Midtown Manhattan Grid Network

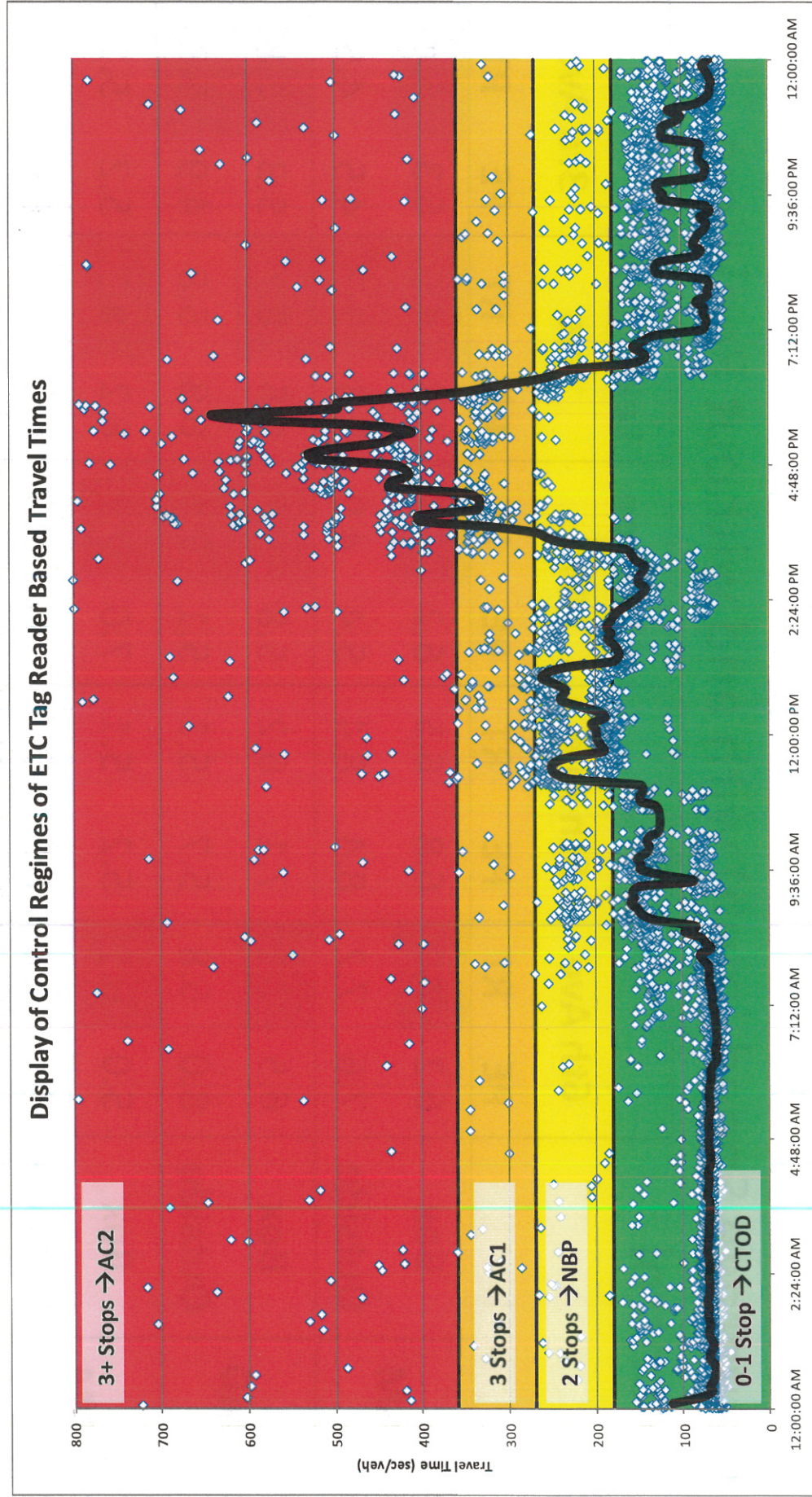
Status Report: MIM Ongoing Observations & Next Steps

September 20, 2011

Outline

- Level 1 Control
 - Real time control ongoing
 - Results to date
- Level 2 Control
 - Testing and results to date – single intersection
 - Next round of testing – multiple intersections
- Next Steps

Level 1 Control Decision Process



Solid line = 50th percentile

ETC Speed Comparison

- Average Speed (mph) with and without Real time control

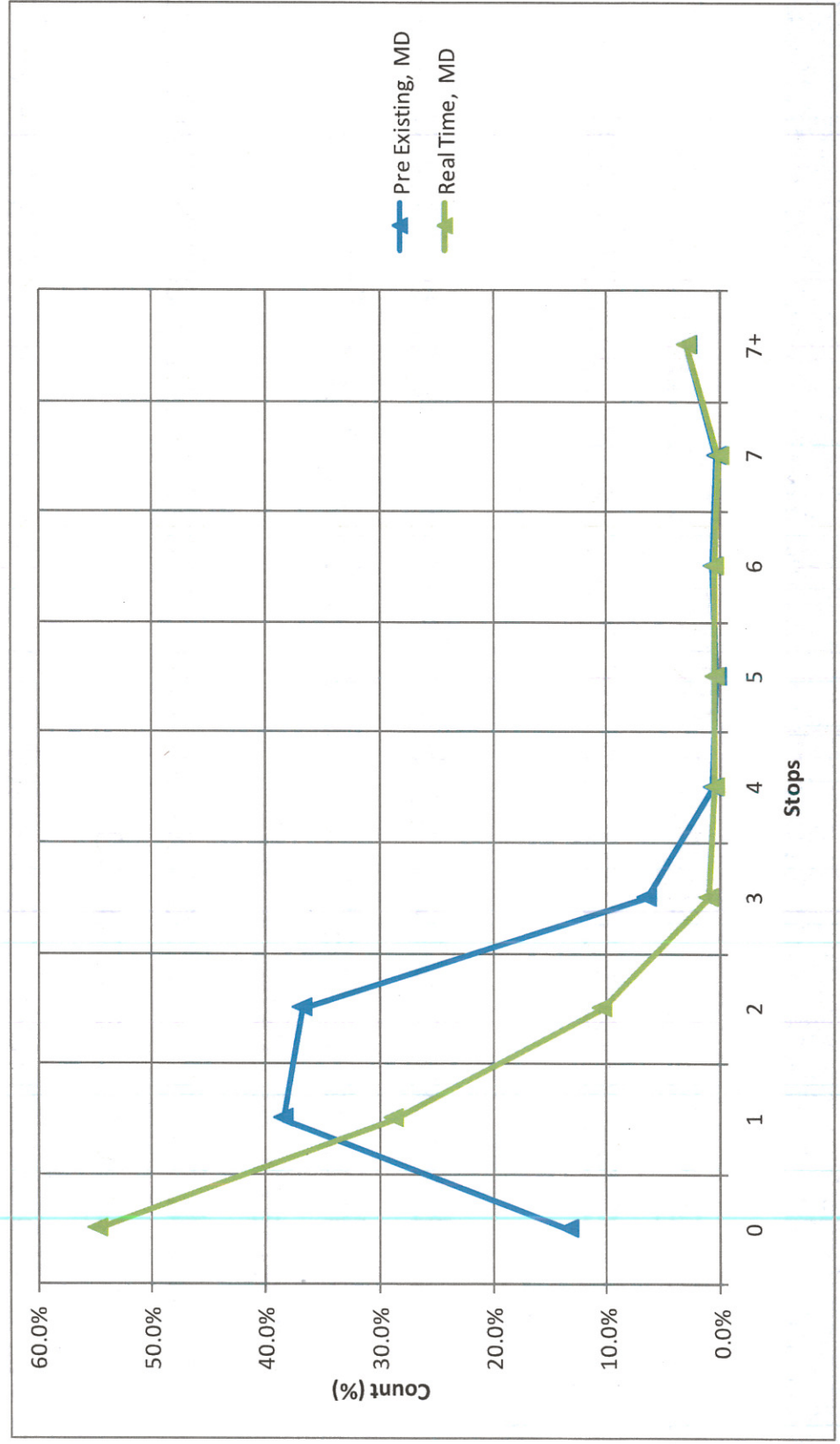
	6th Ave		5th Ave		Madison Ave		Lexington Ave		3rd Ave		
	PE	RT	PE	RT	PE	RT	PE	RT	PE	RT	
AM	Box	6.2	7.9	6.8	6.5	6.2	7.7	4.8	4.9	6.3	6.4
	Outside	7.6	7.2	8.4	8.4	5.4	4.9	7.3	7.7	4.5	4.5
MD	Box	6.5	7.1	7.1	6.2	5.8	9.7	6.5	8.7	5.3	6.8
	Outside	8.0	6.8	5.7	5.1	5.1	7.5	6.8	5.8	4.9	5.3
PM	Box	5.0	6.1	5.2	5.1	7.0	7.9	8.2	8.5	5.2	5.1
	Outside	7.9	7.8	6.5	5.7	7.8	7.5	6.0	5.4	6.6	5.9

PE = Pre Existing Control, RT = Real Time Control

- Highlighted cells show improvement

Number of Stops Comparison

Madison Ave (42nd to 49th) Midday (11AM to 1PM)



5th Avenue Discussion

- The changes to the signals (NBP, AC1) between 72St and 57St (outside the zone) do not have any noticeable impact:
 - 5th Ave between 59St and 63St is metering the flow into zone.
 - 5th Ave has an extra lane south of 59St; therefore natural bottleneck at 59St
 - Spillback from 59St onto 5th Ave occasionally affecting the discharge on the arterial;
 - TEAs do override the signal settings that counters the effect of the planned signal changes

Level 2 Control

- Intersection specific
- *Split adjustment only* not changing progression along the avenues
- Uses the microwave sensor data on each approach
- Considers the travel time data on the avenue segment as an additional constraint --- systematic control feedback component
- Objective is to balance the conditions on the approaches to the extent feasible

Level 2 Control Decision Matrix

SI = Severity Index

Level 2 Control Matrix 1b - SI and Travel Time

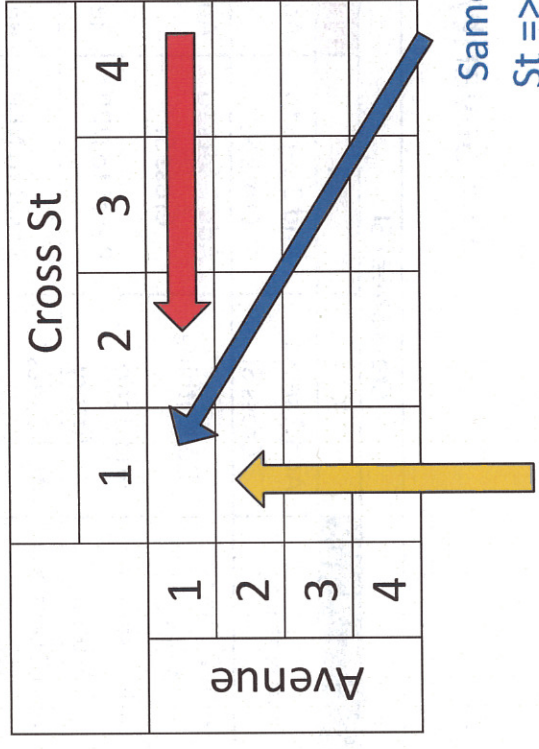
		Cross Street SI			
		1	2	3	4
Arterial SI	1	Do Nothing	Add 2 secs to Cross St	Add 3 secs to Cross St	Add 3 secs to Cross St
	2	Add 2 secs to Artery	Do Nothing	Add 2 secs to Cross St	Add 2 secs to Cross St
	3	Add 3 secs to Artery	Add 2 secs to Artery	Reset to NBP	Reset to NBP
	4	Add 3 secs to Artery	Add 2 secs to Artery	Reset to NBP	Reset to NBP

		Cross Street SI			
		1	2	3	4
Arterial SI	1	Reset to NBP	Reset to NBP	Reset to NBP	Reset to NBP
	2	Add 2 secs to Artery	Reset to NBP	Reset to NBP	Reset to NBP
	3	Add 3 secs to Artery	Add 2 secs to Artery	Reset to NBP	Reset to NBP
	4	Add 3 secs to Artery	Add 2 secs to Artery	Reset to NBP	Reset to NBP

1 stop: if median travel time of the given segment over the last 15 min is greater than 180 seconds
Adjusted split should meet minimum requirement

Severity Index With/Without Level 2 Control

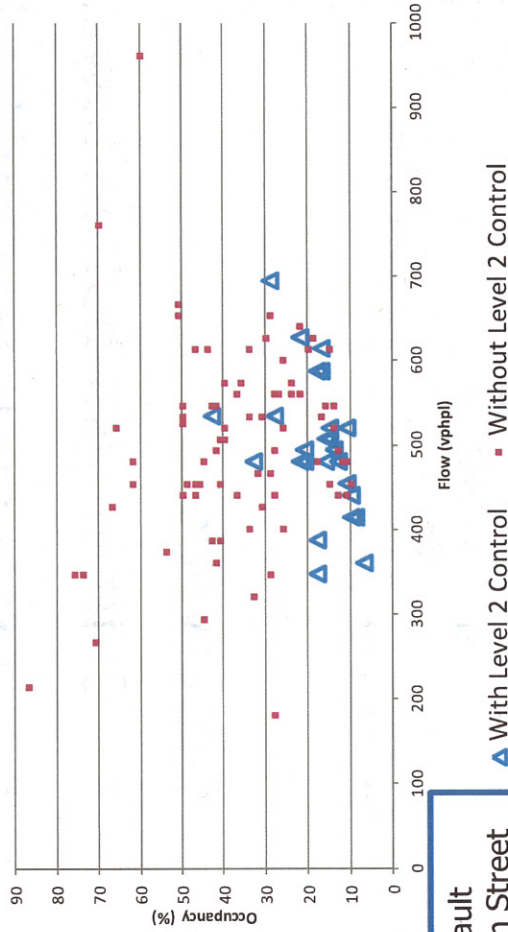
- Compare the distribution of SI_{Avenue} and $SI_{Cross Street}$
- Calculate the percentage of time by each pair of SI ($4 \times 4 = 16$ possible combinations)
- Objective of L2 to balance queues between approaches, if feasible
- Also to minimize SI on both approaches, if feasible



Lower SI, Shorter Queues on Avenue
Midtown in Motion

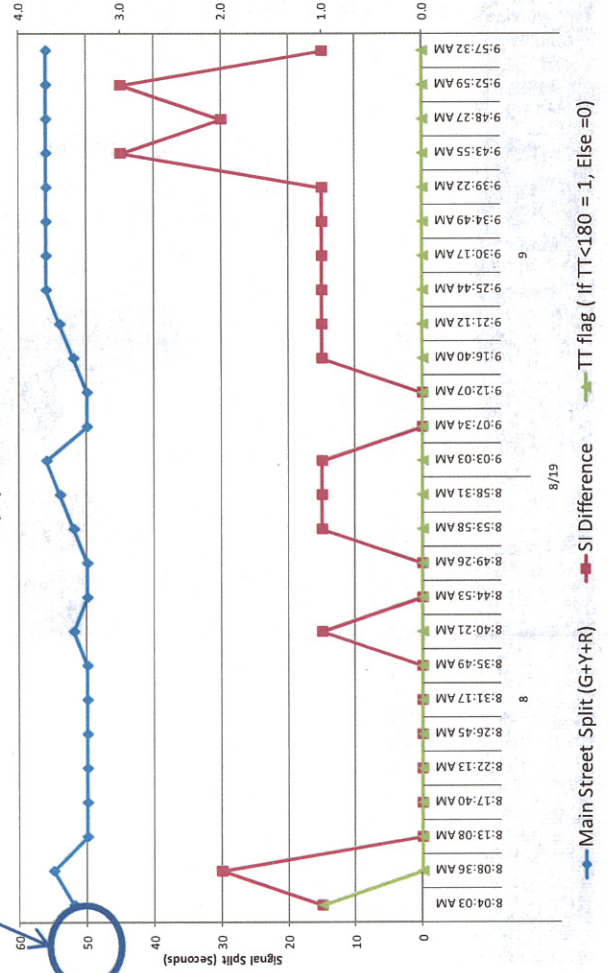
Flow/Occupancy and Travel Time Comparison

Lex Ave: 55St to 54St
8AM to 10AM



Default
Main Street
Split (50s)

L2 Testing -- Lex/54 St
8/19/2011



Mean/Std.Dev	Without L2	With L2
Flow (vphpl)	498/115	497/81
Occupancy (%)	37%/17%	18%/8%
Travel Time 57St-49St (sec)	357/109	238/85

Comparable flows with lower occupancies and lower travel time along the segment

Lex Ave: 57St - 49St
8AM-10AM

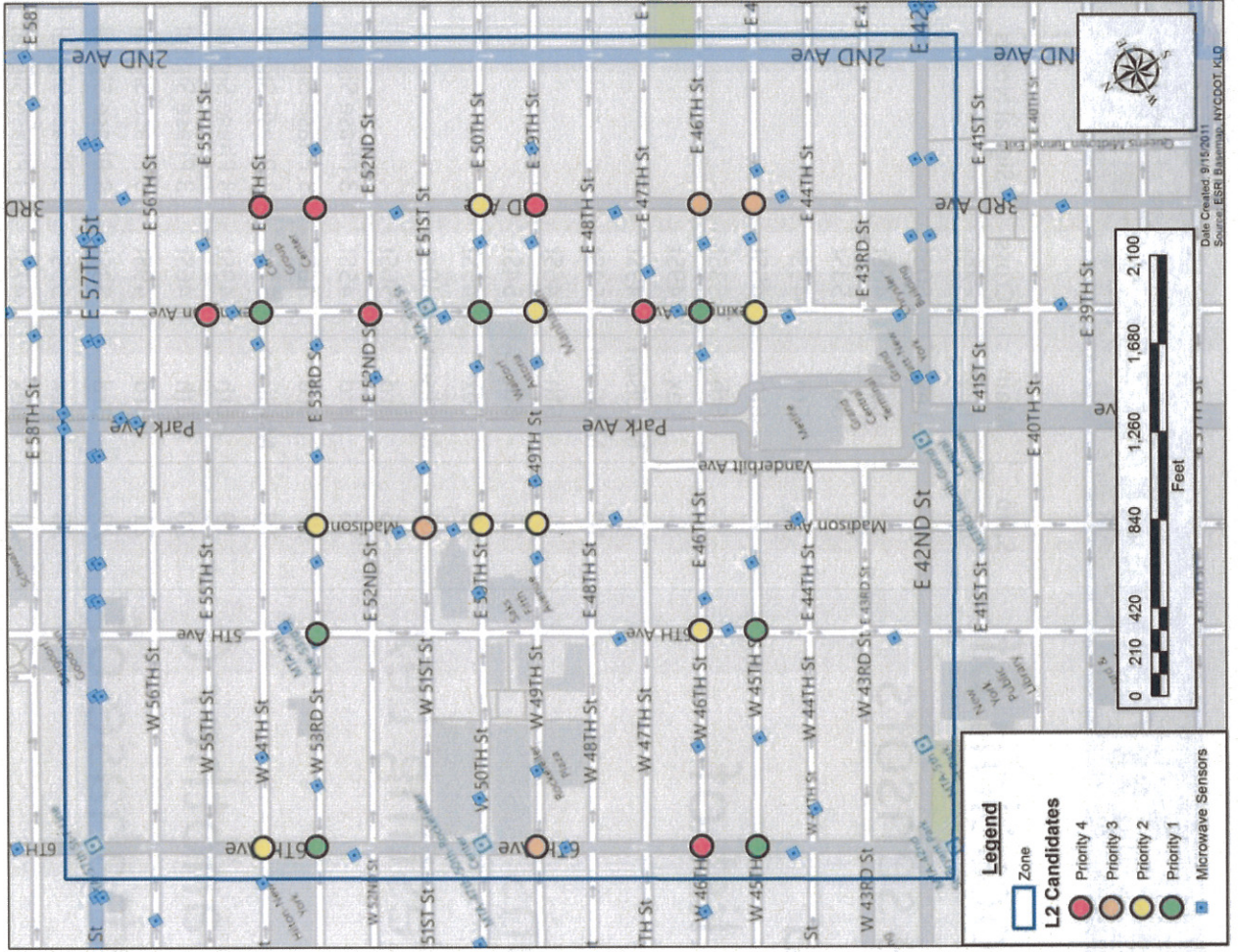


Candidate Intersections

- Based on location of microwave sensors identified a prioritized list of candidate intersections
- Currently testing Lex and 54 St
- Will select another 6 for the next phase of testing

S.No	Main	Cross	Signal Notes	Detector Location Notes	Ranking
1	Lex	54St			1
2	Lex	50St			1
3	Lex	46St			1
4	5th	53St			1
5	5th	45St			1
6	6th	45St			1
7	6th	53St			1
8	Lex	49St		Ave Det 1 block upstream	2
9	Madison	49St		Ave Det 1 block upstream	2
10	Madison	53St		Ave Det 1 block upstream	2
11	5th	46St		Ave Det 1 block upstream	2
12	6th	54St		Ave Det 1 block upstream	2
13	Lex	45St		Ave Det 1 block downstream	2
14	Madison	50St		Ave Det 1 block downstream	2
15	3rd	50St		Ave Det 2 blocks upstream	2
16	3rd	45St	3 Phase Signal		3
17	3rd	46St	3 Phase Signal		3
18	Madison	51St	3 Phase Signal		3
19	6th	49St	3 Phase Signal		3
20	6th	46St	3 Phase Signal	Ave Det 1 block upstream	4
21	3rd	49St	3 Phase Signal	Ave Det 1 block upstream	4
22	3rd	53St	3 Phase Signal	Ave Det 1 block upstream	4
23	Lex	55St	3 Phase Signal	Ave Det 1 block downstream	4
24	Lex	47St	3 Phase Signal	Ave Det 1 block downstream	4
25	3rd	54St	3 Phase Signal	Ave Det 2 blocks upstream	4
26	Lex	52St	3 Phase Signal	Ave Det 2 blocks upstream	4

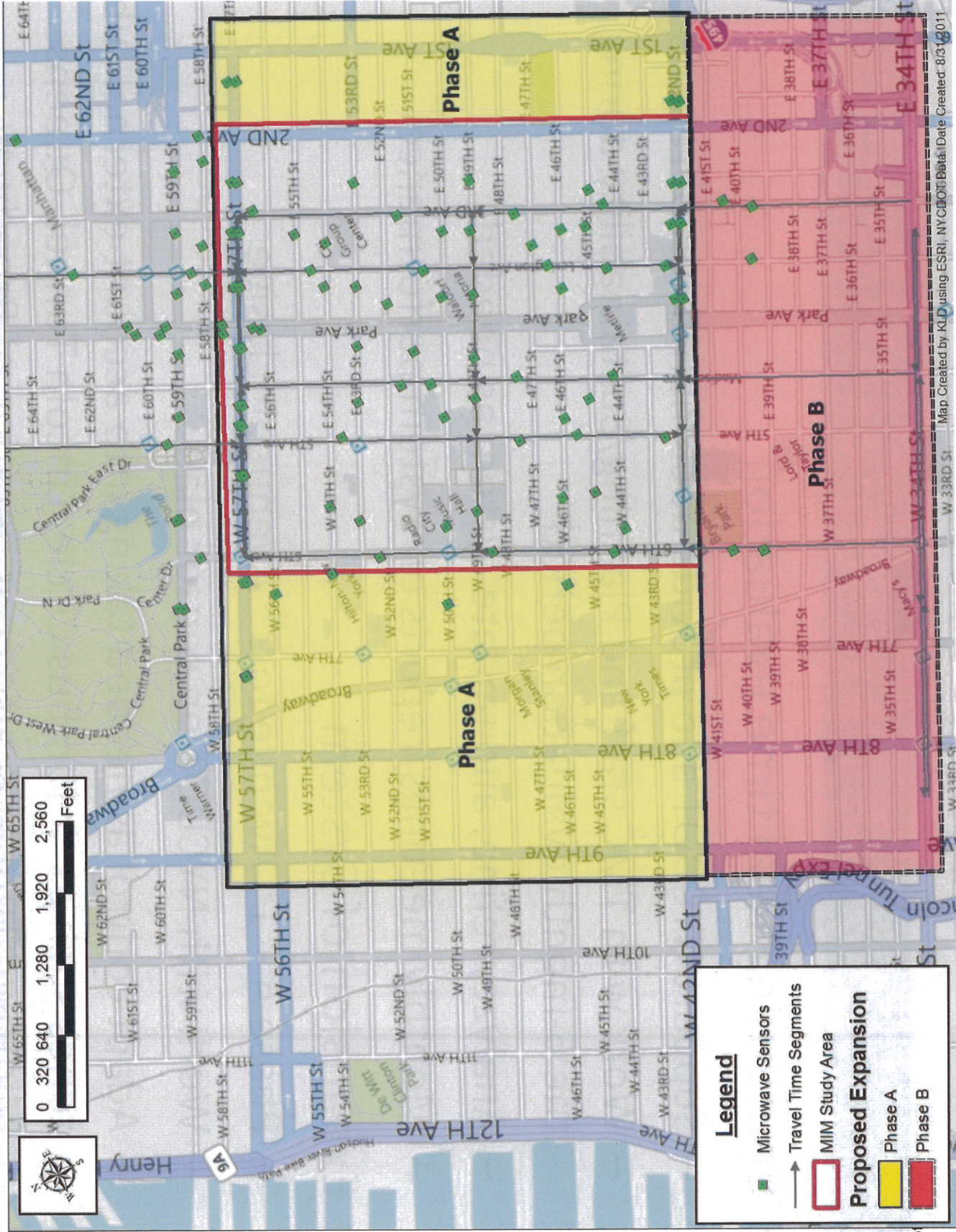
Candidate Intersections



Next Steps

- Continuing Real time evaluation
 - Support NYCDOT and provide documentation of results
 - Work with TMC staff and Planning/Sustainability during the 6-month evaluation period
 - Analyze, refine, and update system as needed
 - Monthly meetings/reports on system performance
- Expansion of System
 - Phase A – 1st Avenue to 9th Avenue, inclusive
 - Work with NYCDOT on sensor plan
 - Adapt control as needed taking into account external sub-zones such as Columbus Circle, Lincoln Tunnel, Queens Midtown Tunnel & also consideration of Broadway
 - Implementation

Study Area



Questions

