PUTTING THE TRANSITION BACK IN TRANSIT

Bringing a market analysis perspective to transit planning using big data.

MNCPPC Winter Speaker Series
January 20th, 2016
Nat Bottigheimer

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Transition.

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Ballston, VA, in the 1970s

Ballston, VA, in 2014

Market Analysis.

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Big Data.

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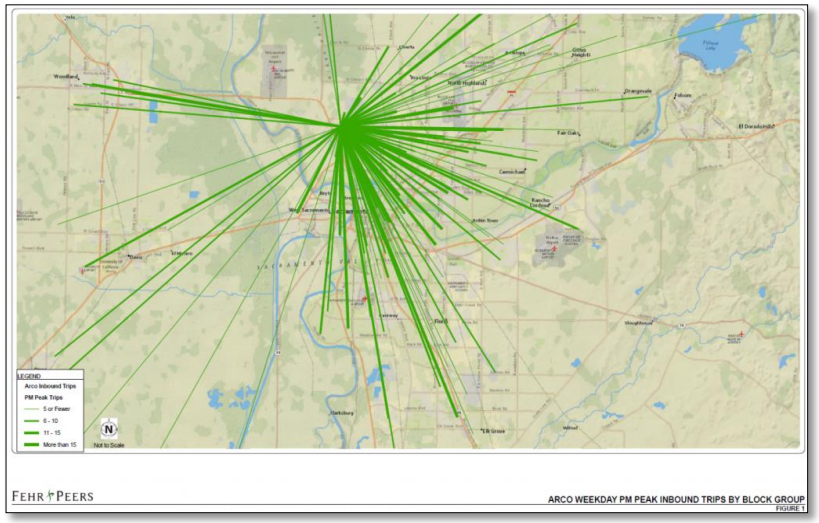

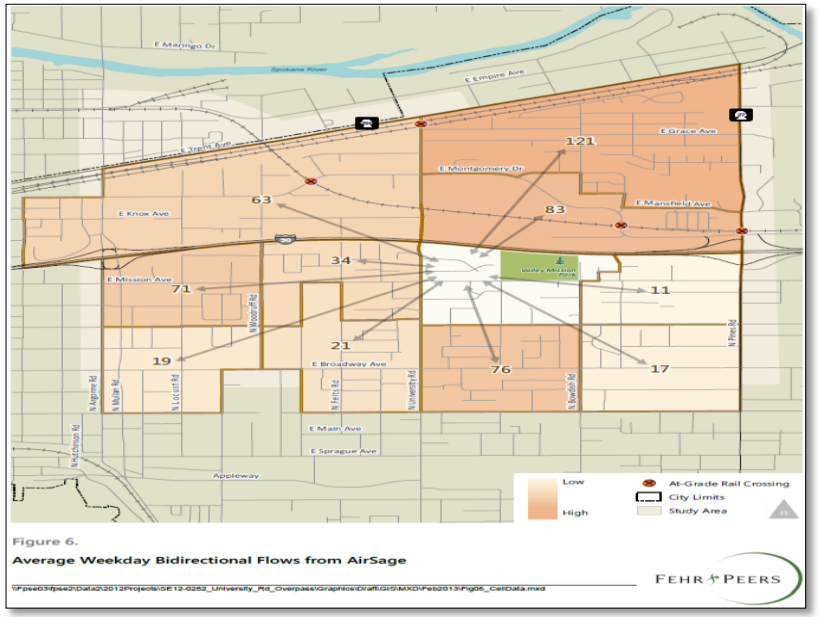

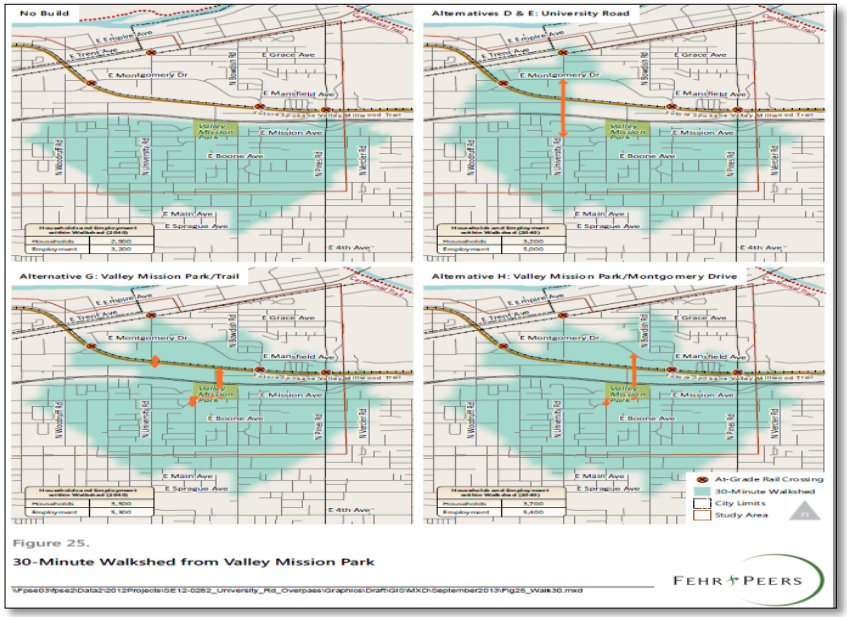

Data Source Examples.

AirSage

City Sourced

PTV/NuStats

ESRI

Miovision

StreetLight

Google

Mygistics

Tom Tom

INRIX

Here
(formerly Navteq)

Goals Today.

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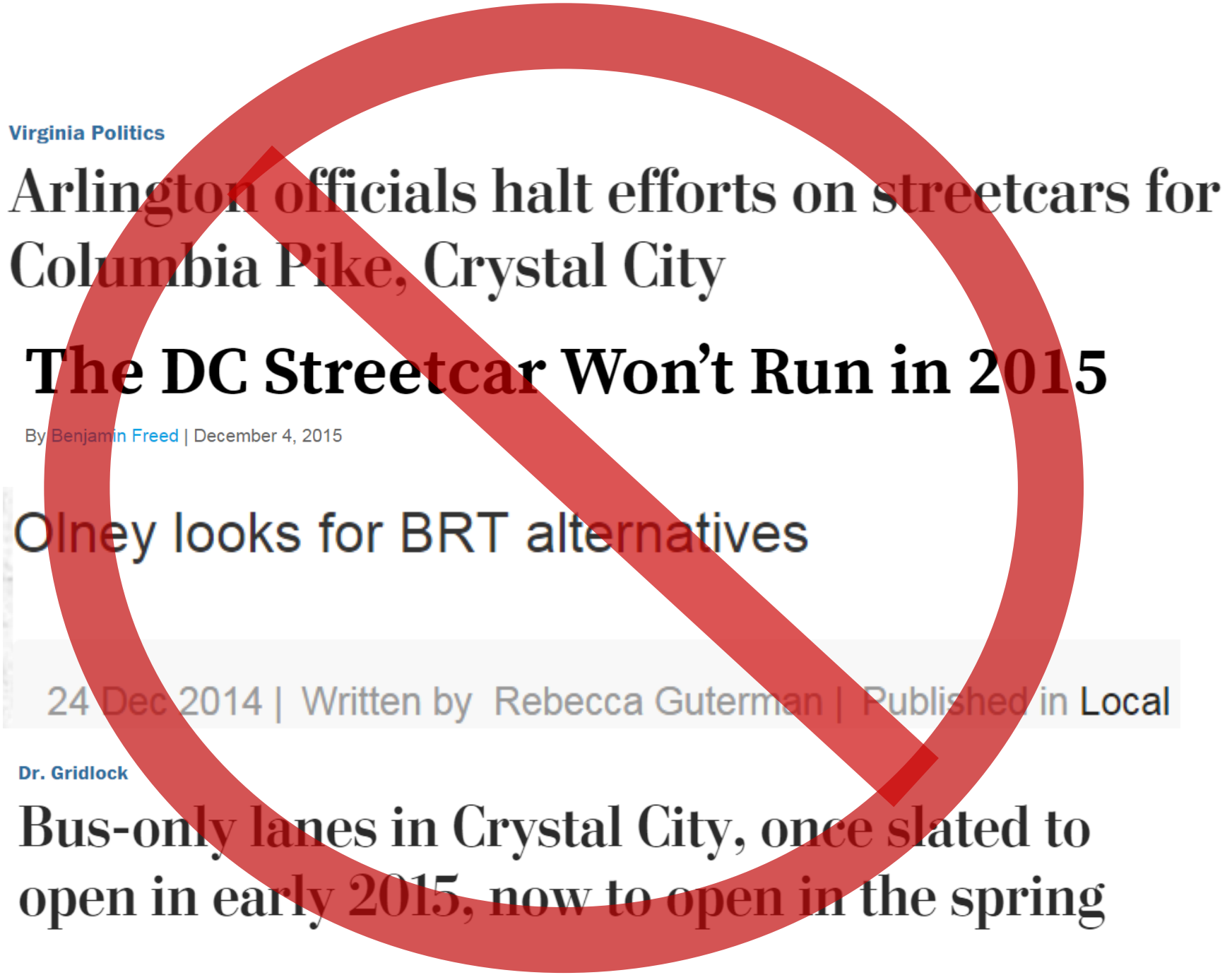
Identify	Propose	Recommend
1 Identify an issue in transit planning practice	2 **Propose an approach and general direction:** • Tailored for transit, and • Adapted from leading-edge practice in highway and traffic analysis	3 **Recommend ways to:** • Design transit to meet ridership and roadway performance goals • Set performance goals to meet ridership objectives • Use new data sources to set and measure goals



Virginia Politics

Arlington officials halt efforts on streetcars for Columbia Pike, Crystal City

The DC Streetcar Won't Run in 2015

By Benjamin Freed | December 4, 2015

Olney looks for BRT alternatives

24 Dec 2014 | Written by Rebecca Guterman | Published in Local

Dr. Gridlock

Bus-only lanes in Crystal City, once slated to open in early 2015, now to open in the spring

Traditional Analysis.

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Baseline Assumptions

- Ten (10)-minute frequencies
- Does not include special events
- Does not restructure corridor bus routes
- Streetcar in shared lane

Alternatives	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Ridership	11,000 to 16,000 (+/-) boardings per day (+/- 30% from existing auto and (+/-) 70% from existing bus)			
Total travel times in minutes (northbound (NB)/southbound (SB)	41 (NB) 41 (SB)	47 (NB) 43 (SB)	41 (NB) 41 (SB)	41 (NB) 41 (SB)
Number of stops	19	20	19	19

Note: For comparative purposes, route 79's scheduled travel time (end to end) from Silver Spring to the National Mall is 40 minutes. The actual travel time ranges from 48-58 minutes.

Baseline Results

Sensitivity Tests Conducted

- Five (5) Minute Frequency (north of - 20%-25% increase)
- Total Travel Time/Speed (Overall 5 minute one-way travel time reduction = 11% ridership increase)
- Minimal restructure of corridor bus routes

Next Steps

- Test stop location adjustments
- Test travel time options
- Test exclusive lane operation (for Alternative 1)
- Test higher frequencies in the Central Business District
- Refine person throughput analysis
- Develop special events factor
- Conduct cost-benefit analysis

Traditional Analysis.

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Table 5. Summary of Alternatives

Metric	Dedicated BRT Alternatives				LRT Alternative	Managed Lane Alternative[1]
	A-B-C-D1-E1	A-B-C-D2-E1	A-B-C-D2-E2	A-B-C-D2-E3		
Length (miles)	12	12	12	12	12	10
Number of Stations	12	12	12	12	12	6 online stations
2030 Daily Ridership: Station to Station BRT[2]	8,600	8,800	8,800	8,900	--	--
2030 Daily Ridership: Total Corridor[3]	13,100	13,300	13,300	13,500	9,300[4, 5]	8,100[4, 5]
Estimated Travel Time (minutes from Union Depot to Manning Avenue)	30.0-30.3	30.2-30.5	29.5-30.3	29.4	28[4]	20[4]
Estimated Capital Cost (millions)	$500-505	$470-475	$460-465	$460	$950[4, 5]	$540[5]

[1] Managed Lane Alternative as defined in the AA Study

[2] Station to station BRT ridership represents zero express riders using the dedicated BRT.

[3] Includes all corridor express riders and potential service extension through downtown Saint Paul. These and other BRT operational refinements are still under consideration but affect all BRT alternatives similarly. FTA Mobility Improvements (ridership) ratings assume an average of 2030 and "current year" ridership estimates for Mobility and Cost-Effectiveness measures.

[4] Estimates based on 2013 Alternatives Analysis

Loaded Evaluation Terms.

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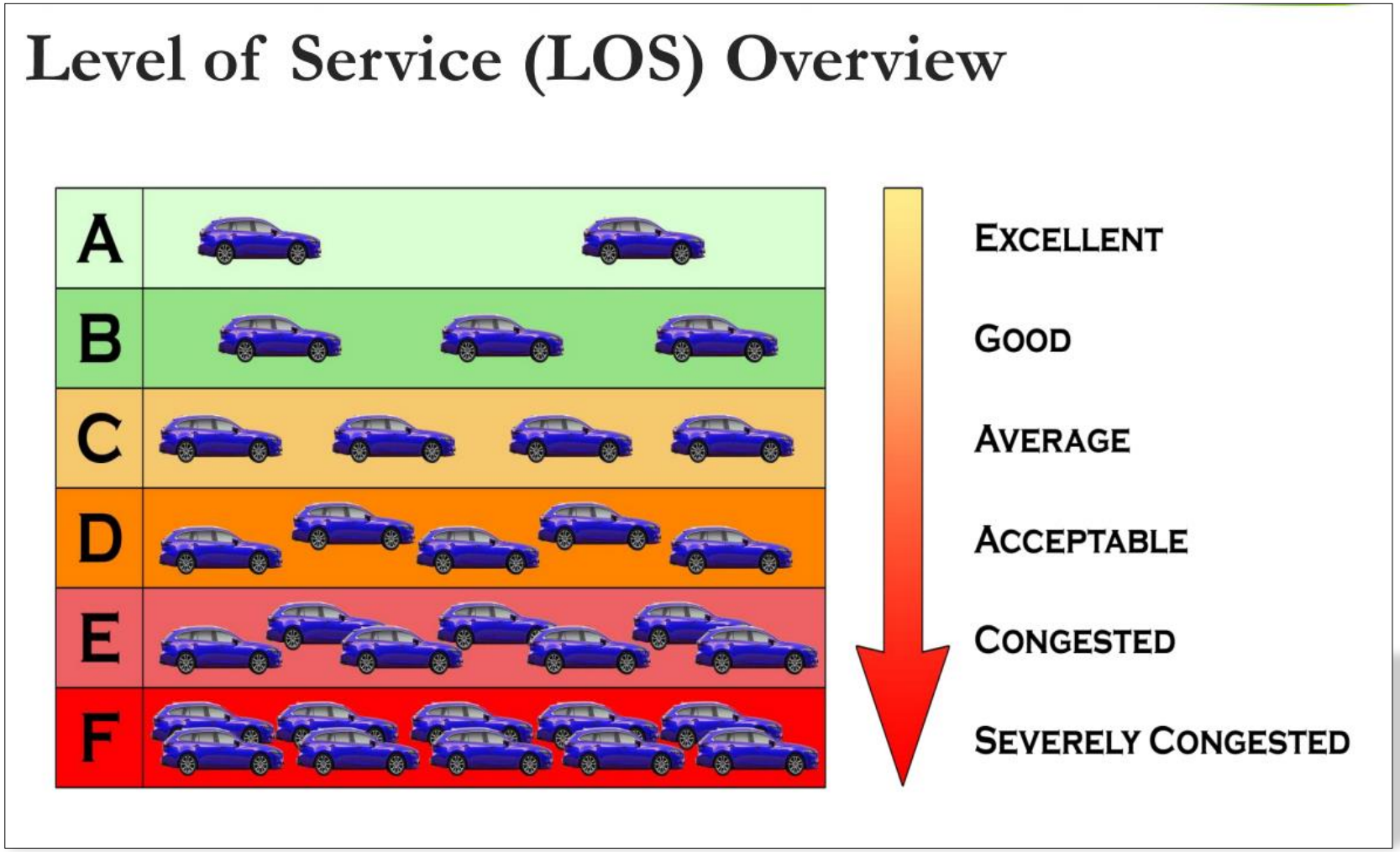

Impacts Identification.

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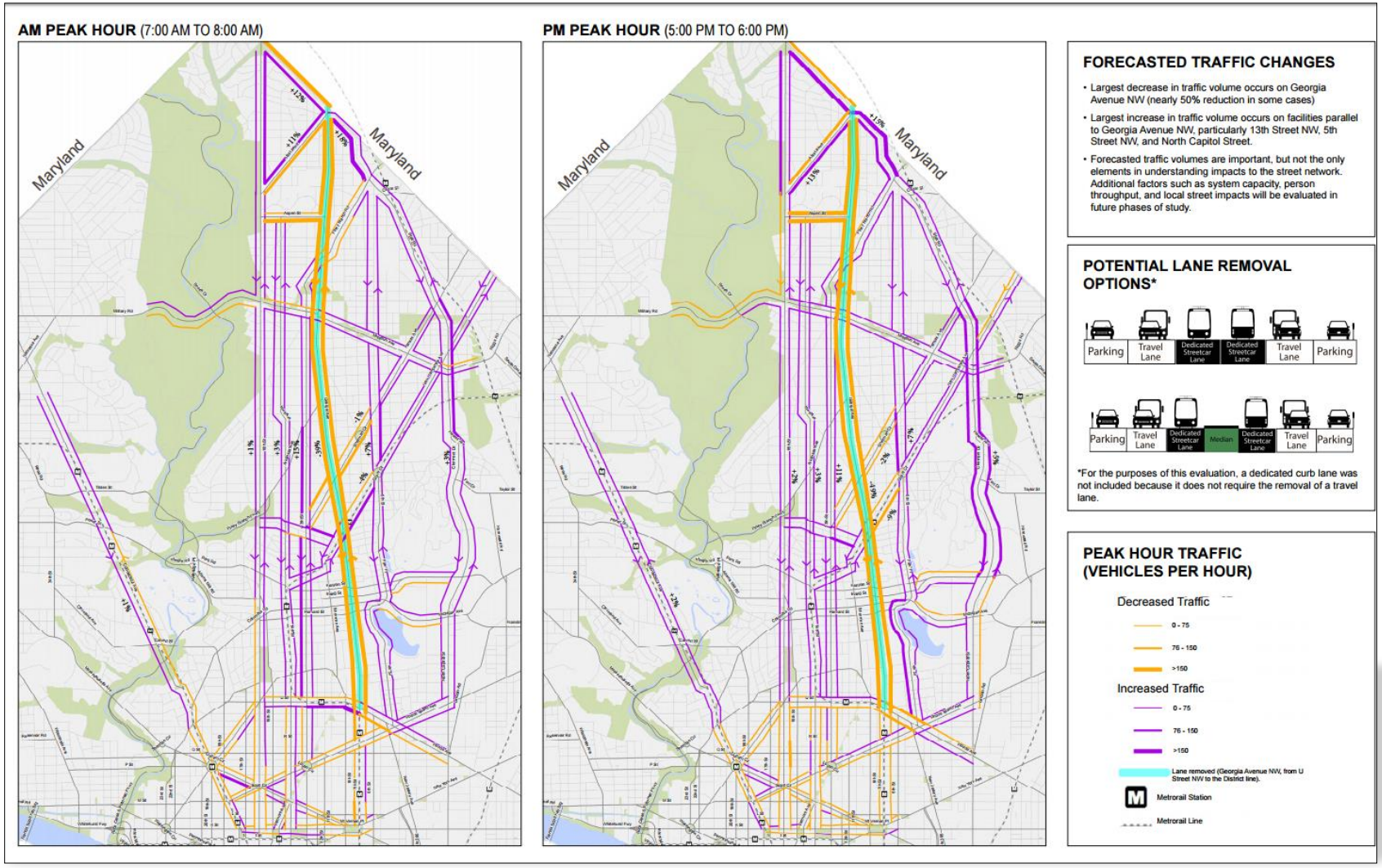

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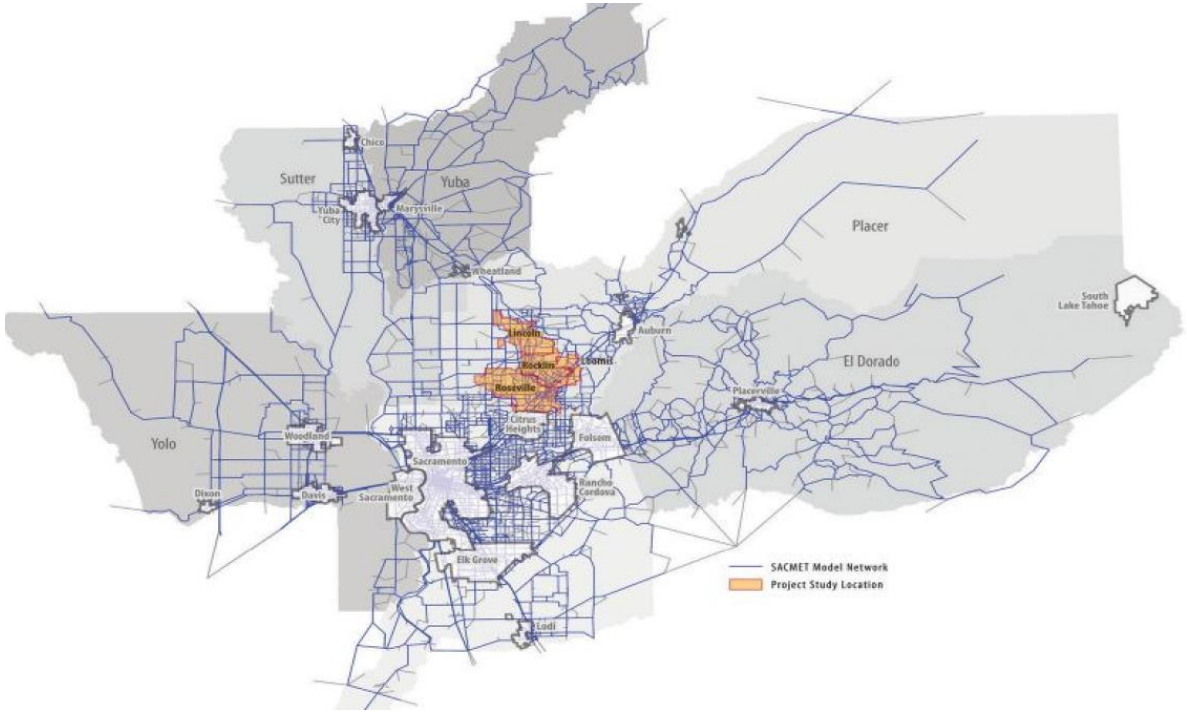
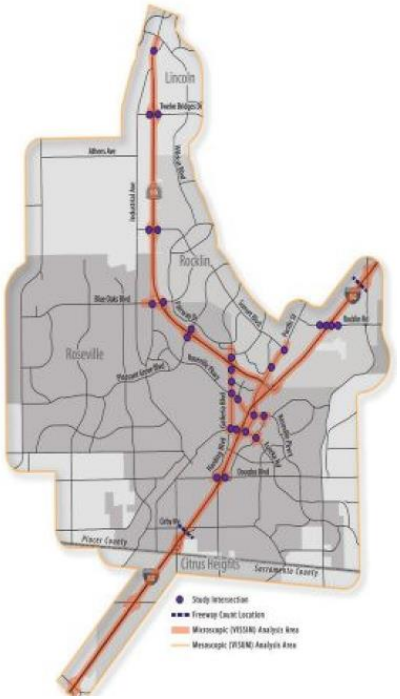
Big Data Helps: Highway Example.





- Faster calibration and validation of meso - & micro-scale models
- Increased confidence
- More alternatives analyzed in less time
- Quick acceptance of results by stakeholders and public
- Investment targeted to correct interchange

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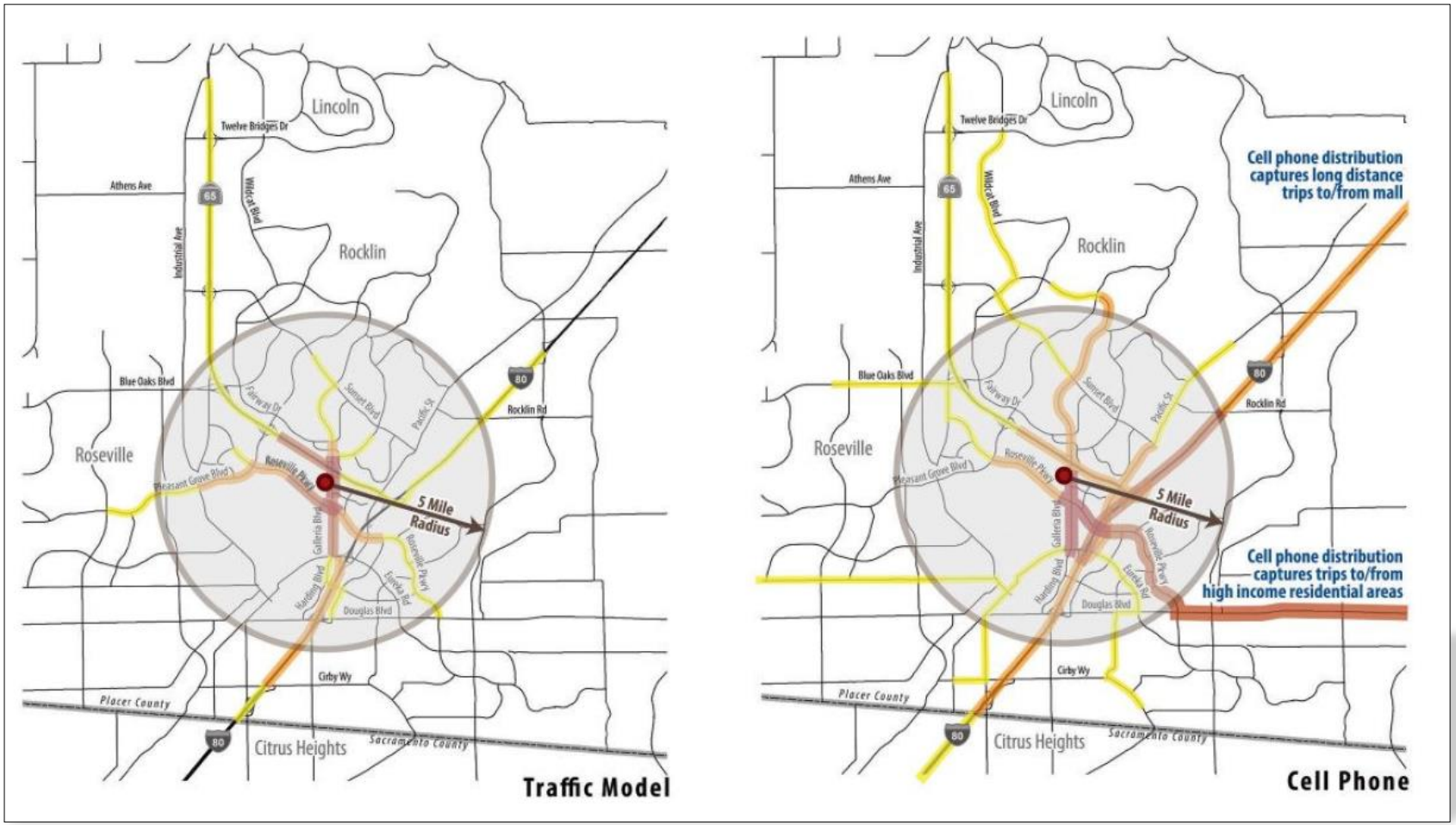
Big Data Helps: Highway Example.



http://onlinepubs.trb.org/onlinepubs/conferences/2012/4thITM/Papers-R/0117-000054.pdf

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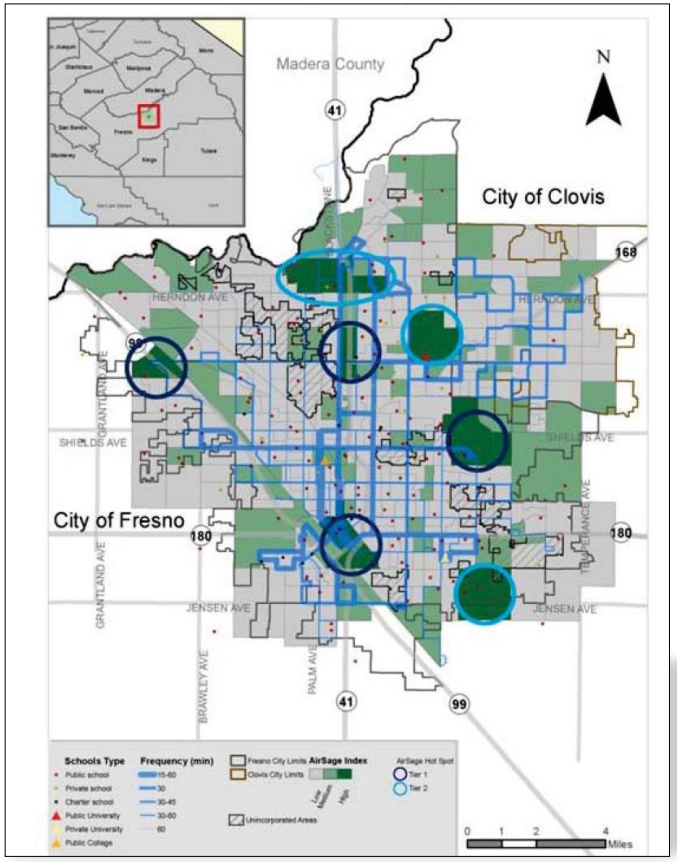
Example: Big Data in Transit Plans.

- Map zone-to-zone trips to find hotspots
- Identify hotspots with low transit use
- Map transit travel times
- Improvements for zones with high potential & poor service

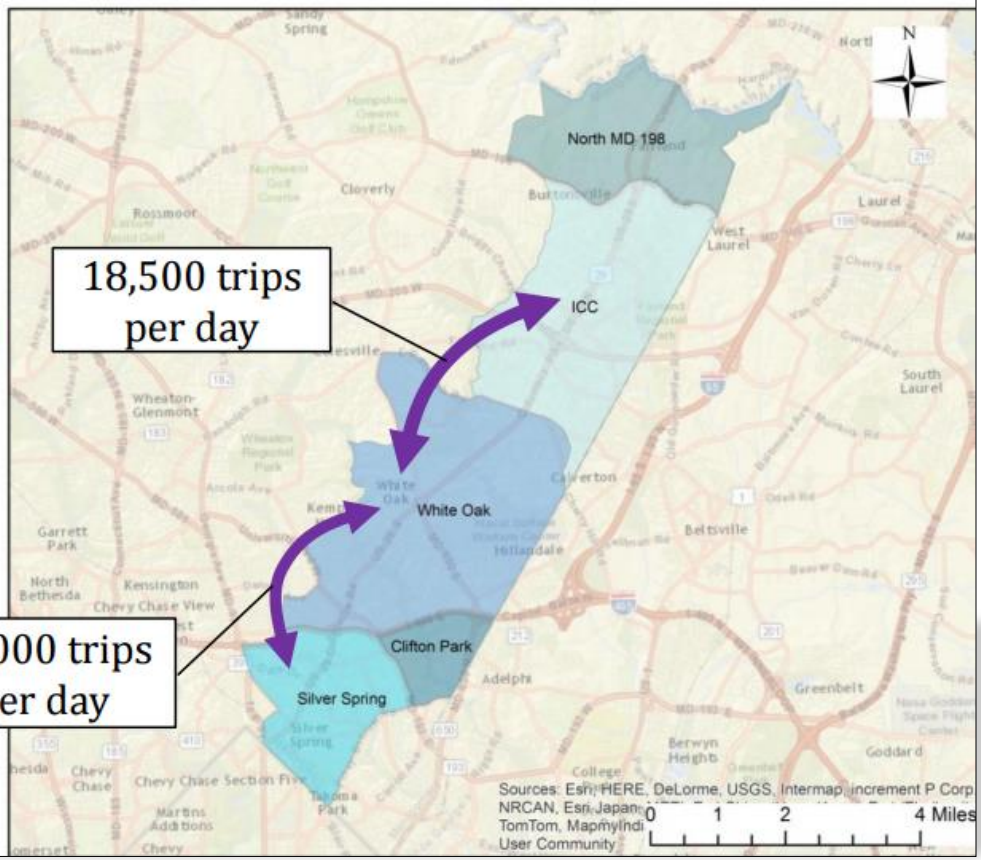


Example of Forecasted Demand.

Model Outputs: Internal Trips (2040)

The highest number of trips occur within zones; however, some noteworthy internal trips are:

- Approximately **18,500** trips per day flow between White Oak and ICC area
- Approximately **14,000** trips per day flow between Silver Spring and White Oak



Source: 2040 forecasts developed using MWCOG regional travel demand model

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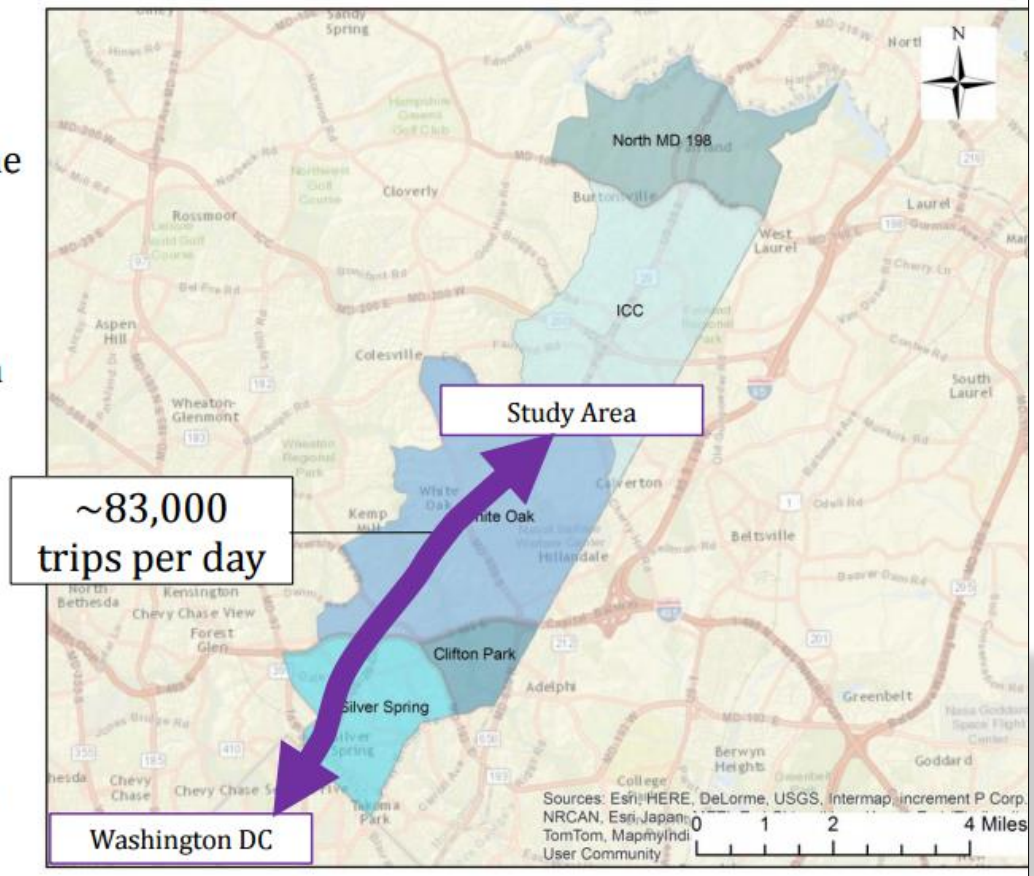
Example of Forecasted Demand.

Travel Markets: External Trips (2040)

Noteworthy are trips that flow to/from Washington D.C. from the Study Area.

Approximately **83,000** trips per day flow between the Study Area and Washington DC.



Source: 2040 forecasts developed using MWCOG regional travel demand model

Zone to Zone Travel.

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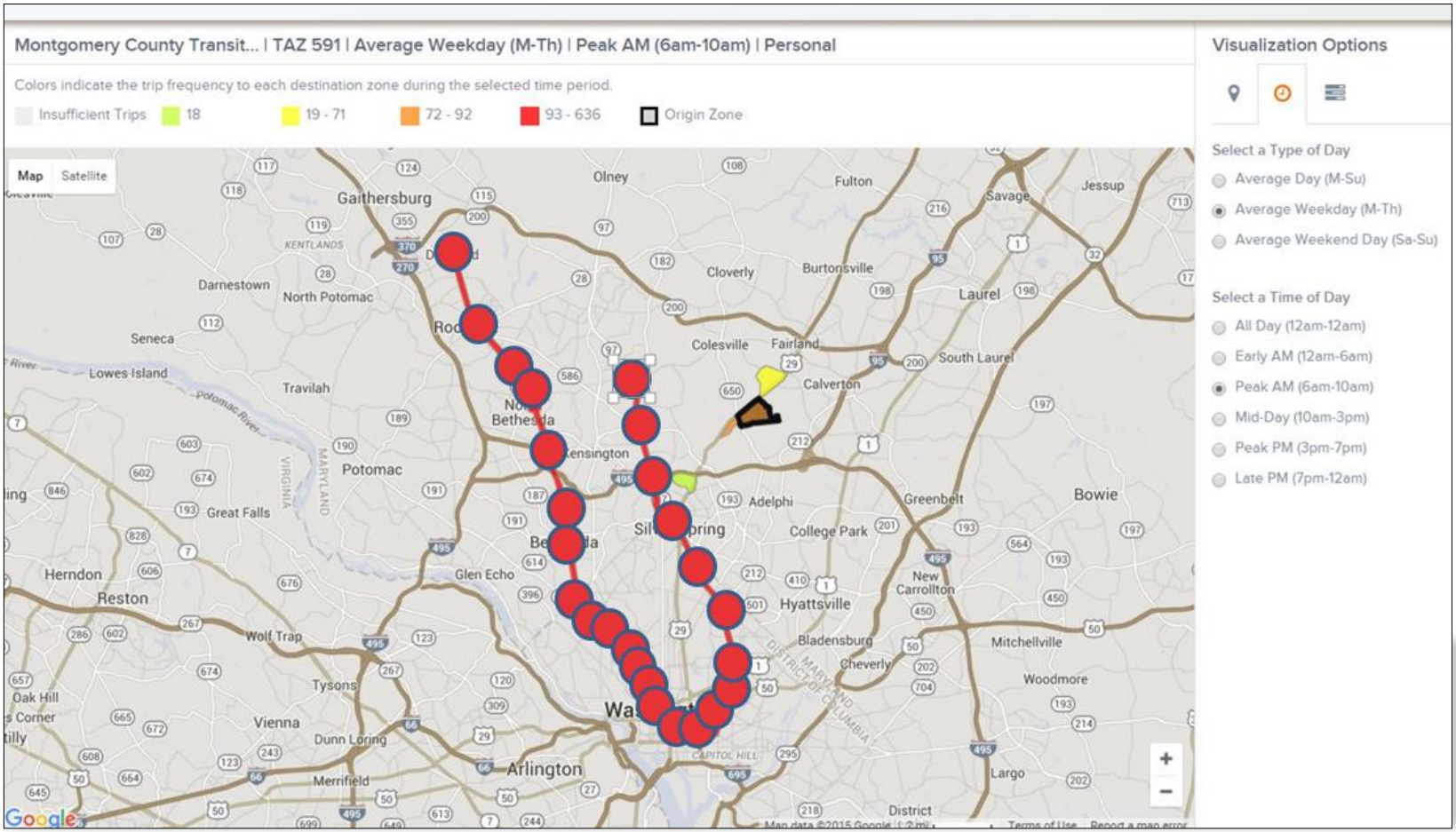

Zone to Zone Travel.

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Destinations	Trips to Red Line Stations			External Trips		
Origins	All Day	AM Peak	PM Peak	All Day	AM Peak	PM Peak
TAZ 604 (North Hill Sligo Park)	18%	24%	14%	82%	76%	86%
TAZ 596 (South of MD 650)	10%	11%	7%	90%	89%	93%
TAZ 591 (North of MD 650)	9%	18%	6%	91%	82%	94%
TAZ 589 (Tech Road Vicinity)	4%	5%	2%	96%	95%	98%

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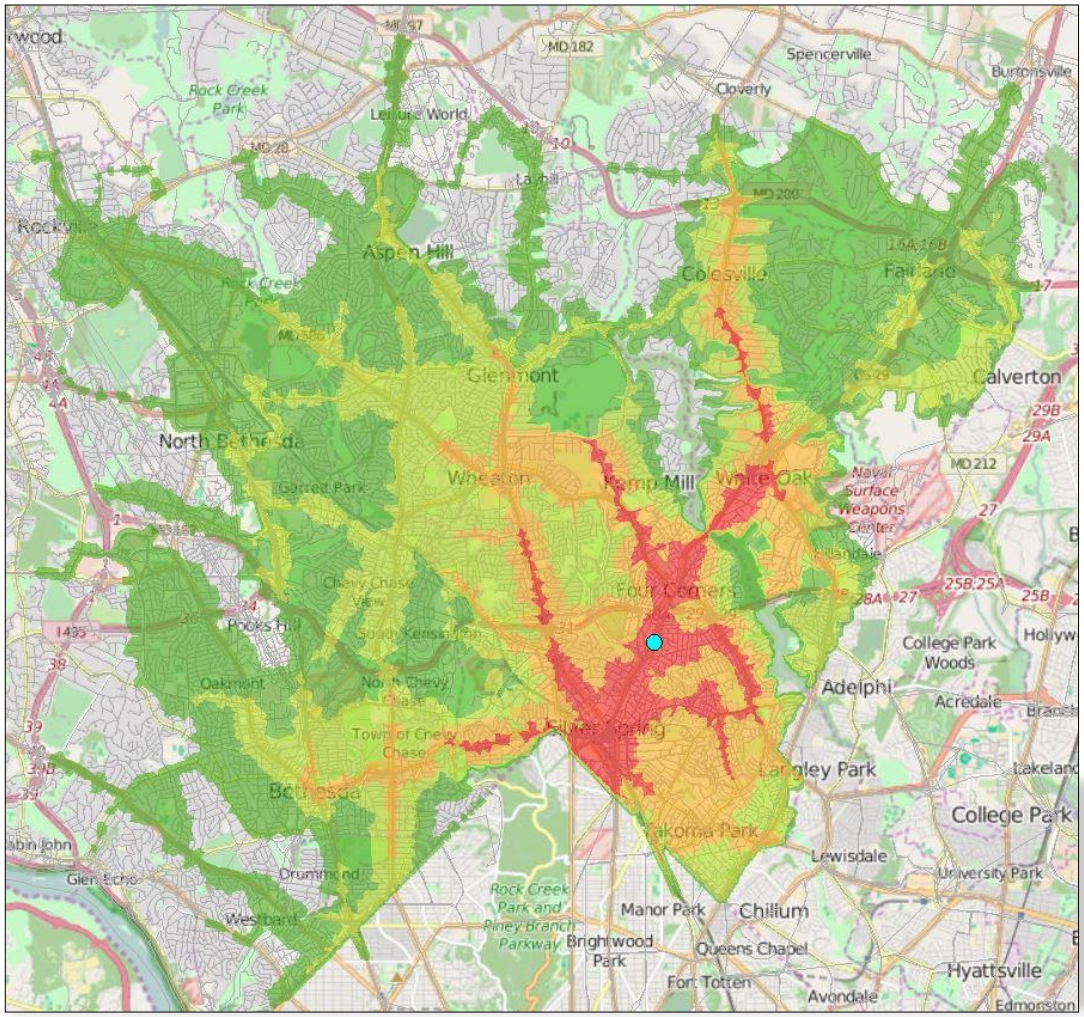
Measuring Transit Accessibility.

Places you can get to by transit:

- Within 30 min
- Within 45 min
- Within 60 min
- Within 75 min



Future of Transit Accessibility.

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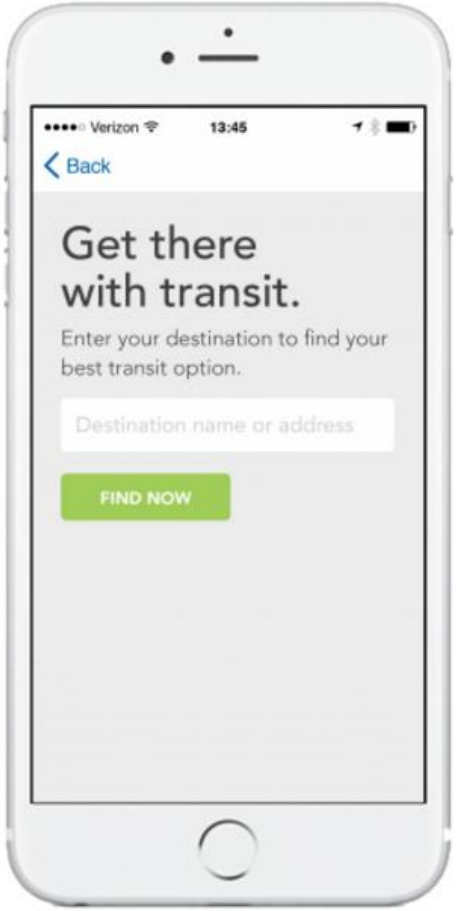
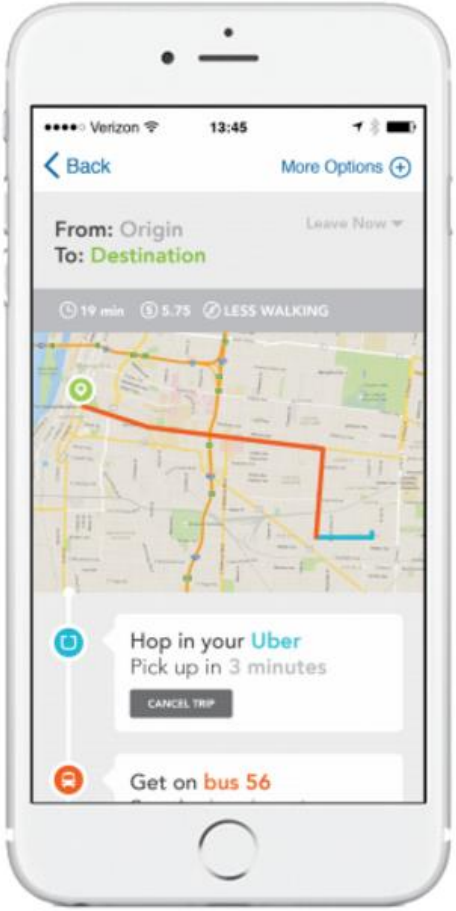
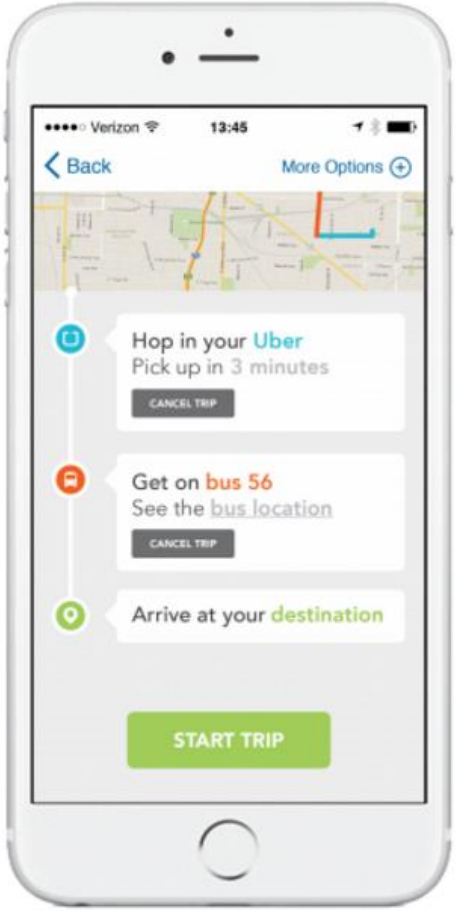
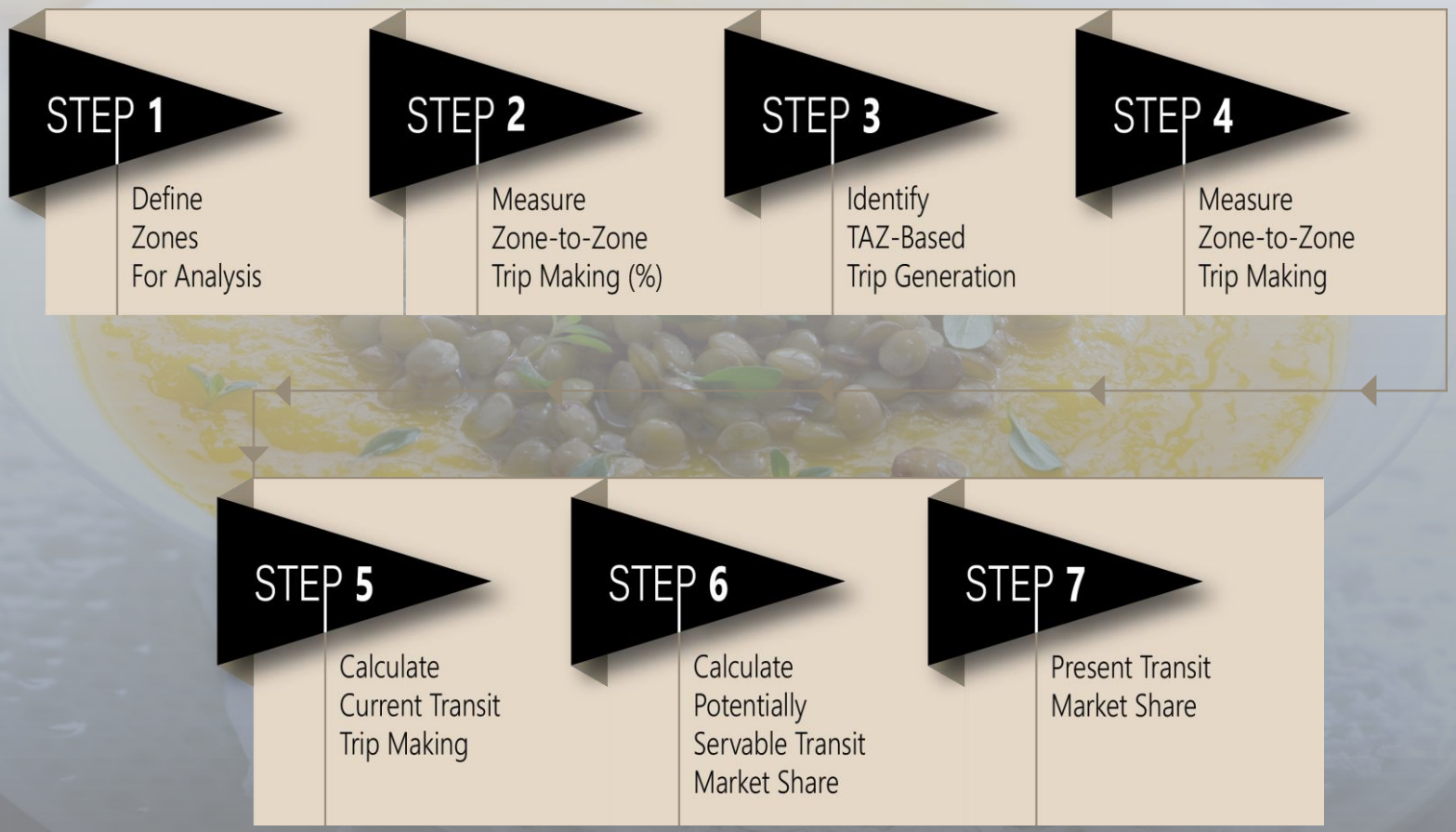






General Approach – Market Definition.



Other Tools Needed.

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Travel Time Reliability

- Transit
- Cars

Traffic Simulation

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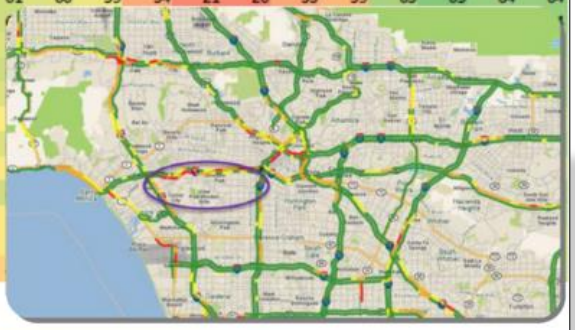
Travel Time Reliability: Roads.

INRIX HTF Profile Statistics

I-10 from I-405 to I-110

Typical Traffic: Monday

	Time of Day / Road Segment	12am	1am	2am	3am	4am	5am	6am	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm	10pm	11pm
Westbound	106N05069	63	63	63	63	63	62	58	55	45	40	55	58	60	61	57	60	60	57	46	57	56	59	63	63
	106N05070	62	62	62	62	62	58	54	49	46	43	50	57	57	58	57	57	56	53	51	51	57	60	62	62
	106N05071	60	60	60	60	60	59	52	30	29	27	33	49	54	59	53	52	55	50	38	43	57	60	60	60
	106N05072	60	60	60	60	60	59	47	26	23	23	35	49	55	57	52	50	53	45	38	50	57	58	60	60
	106N05073	59	59	59	59	59	59	35	17	15	17	28	49	57	56	48	42	47	38	33	47	57	59	59	59
	106N05074	61	61	61	61	61	59	37	13	11	15	27	51	48	53	50	45	52	51	44	47	58	58	61	61
	106N05075	61	61	61	61	61	58	35	13	12	15	31	53	56	55	55	52	53	49	42	49	57	59	61	61
	106N05076	63	63	63	63	63	60	33	13	11	14	32	52	58	59	55	54	51	44	36	53	59	61	63	63
	106N05077	65	65	65	65	67	62	25	10	9	13	30	59	60	61	60	60	59	38	30	48	62	63	65	62
	106N05078	64	64	64	64	64	61	28	10	9	19	38	61	61	59	63	60	57	47	36	52	60	61	64	64
	106N05079	63	63	63	63	63	60	29	12	16	26	39	58	63	58	61	60	57	38	38	52	61	62	63	63
	106N05080	64	62	64	64	64	61	32	19	24	31	42	54	63	54	60	63	55	34	25	43	61	60	64	64
	106N05081	64	64	64	64	64	62	39	32	36	43	45	53	61	61	60	60	56	35	31	48	60	60	64	64
	106N05082	60	60	60	60	60	59	54	56	57	44	52	56	59	60	58	58	57	56	32	58	58	58	60	60
Eastbound	106P05070	63	63	63	63	63	61	61	58	42	50	55	58	59	59	53	38	25	26	31	52	60	58	63	63
	106P05071	64	64	64	64	64	65	62	56	47	49	56	59	61	60	59	34	21	20	33	39	63	65	64	64
	106P05072	64	64	64	64	64	62	60	55	36	51	54	59												
	106P05073	64	64	64	64	64	61	57	42	30	44	53	58												
	106P05074	63	63	63	63	63	60	59	41	28	47	53	58												
	106P05075	63	63	63	63	63	64	56	38	27	34	53	60												
	106P05076	62	62	62	62	62	62	57	35	27	40	51	58												
	106P05077	63	63	63	63	63	61	58	38	24	41	56	60												
	106P05078	61	61	61	61	61	60	55	32	22	36	55	56												
	106P05079	63	63	63	63	63	62	58	28	19	35	59	60												
	106P05080	62	62	62	62	62	61	56	22	18	26	55	52												
	106P05081	61	61	61	61	61	63	53	22	18	26	49	51												
	106P05082	61	61	61	61	61	65	56	21	17	21	46	47												



INRIX

Bus Performance Data.

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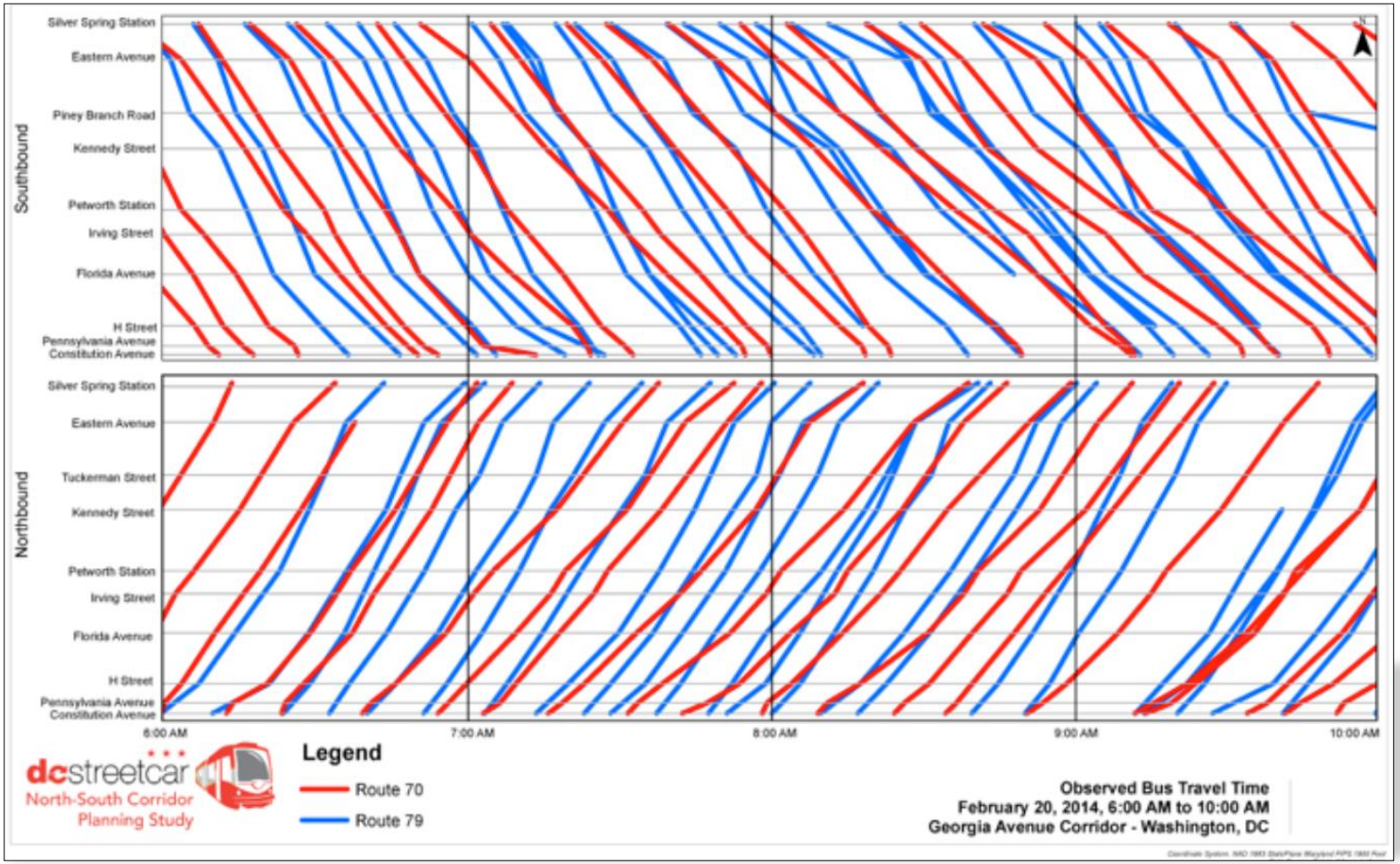

Transit Reliability Analysis.

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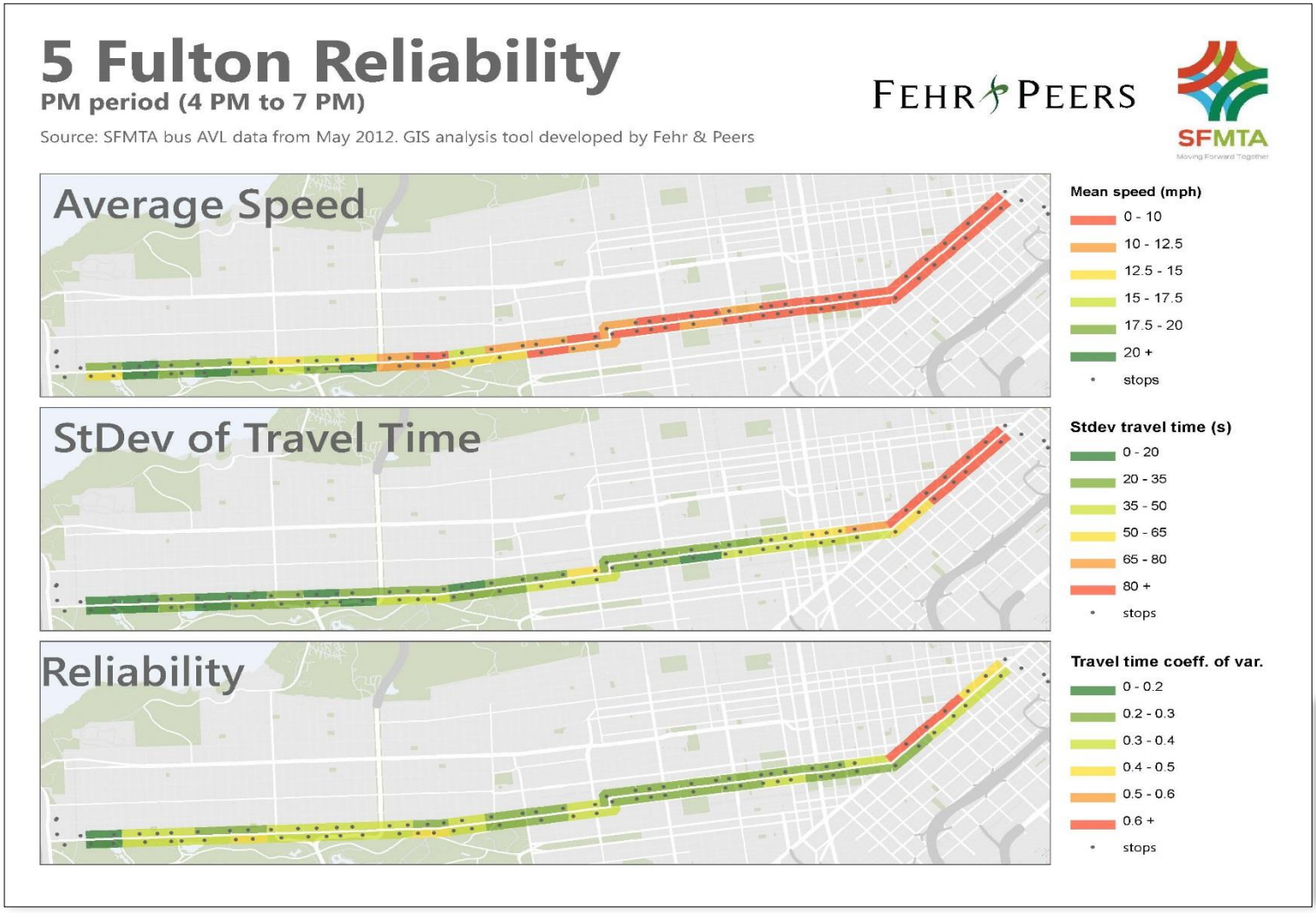

Transit Reliability Analysis.

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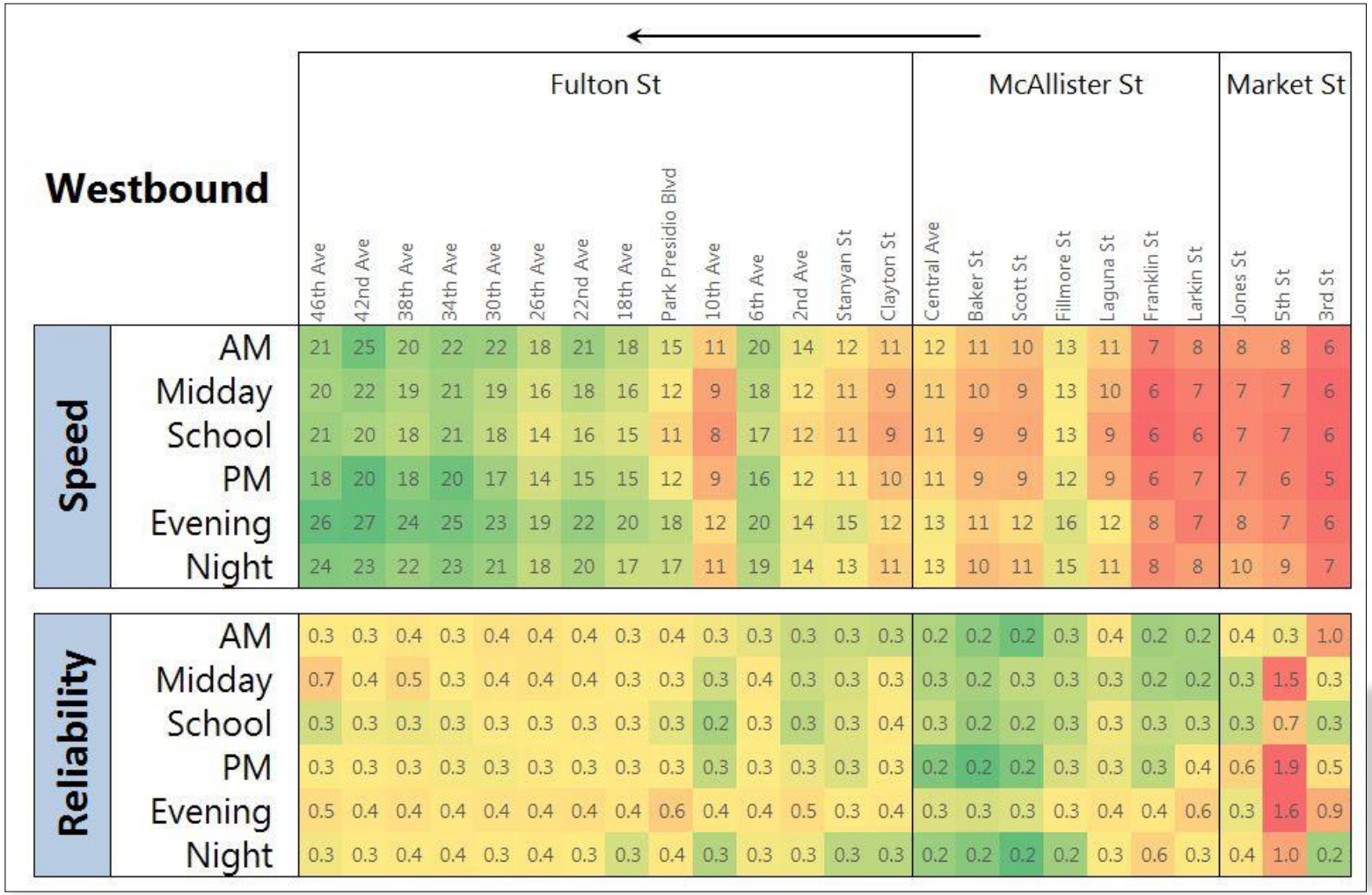

Westbound

		Fulton St														McAllister St							Market St		
		46th Ave	42nd Ave	38th Ave	34th Ave	30th Ave	26th Ave	22nd Ave	18th Ave	Park Presidio Blvd	10th Ave	6th Ave	2nd Ave	Stanyan St	Clayton St	Central Ave	Baker St	Scott St	Fillmore St	Laguna St	Franklin St	Larkin St	Jones St	5th St	3rd St
Speed	AM	21	25	20	22	22	18	21	18	15	11	20	14	12	11	12	11	10	13	11	7	8	8	8	6
	Midday	20	22	19	21	19	16	18	16	12	9	18	12	11	9	11	10	9	13	10	6	7	7	7	6
	School	21	20	18	21	18	14	16	15	11	8	17	12	11	9	11	9	9	13	9	6	6	7	7	6
	PM	18	20	18	20	17	14	15	15	12	9	16	12	11	10	11	9	9	12	9	6	7	7	6	5
	Evening	26	27	24	25	23	19	22	20	18	12	20	14	15	12	13	11	12	16	12	8	7	8	7	6
	Night	24	23	22	23	21	18	20	17	17	11	19	14	13	11	13	10	11	15	11	8	8	10	9	7
Reliability	AM	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.4	0.2	0.2	0.4	0.3	1.0
	Midday	0.7	0.4	0.5	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.3	1.5	0.3
	School	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.7	0.3
	PM	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.6	1.9	0.5
	Evening	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.4	0.4	0.5	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.6	0.3	1.6	0.9
	Night	0.3	0.3	0.4	0.4	0.3	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.6	0.3	0.4	1.0	0.2

Technical Questions.

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Route taken versus trip origin

- Study purpose (funding responsibility? Making a physical improvement? Measuring VMT/GHG?)
- Cell phone (towers) versus GPS

Sizes of grids that generate data

- How precisely do you need to know origins and destinations? *Elementary school? HS? Arena?*

Figuring out which mode is generating data

- Speed and route characteristics

Imputing trip purpose

- Commuting to work or going home to sleep?
- Work-arounds, post-processing often needed

Pros and Cons of Big Data.

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Traditional data is Irregularly Available, Expensive, and Often Sampled

Big Data is fast, frequent, and relatively cheap

- But sometimes not exactly what you want
- Work-arounds, post-processing, "key assumptions" often required

Comprehensiveness of big data can buttress sampled data that may be discounted in public mind

Better Framed Debates.

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Less Debate about Forecast Transit Ridership

- Tighter relationship between ridership and travel patterns already in place

More Emphasis on Details of Transit Experience

- Less "faith-based ridership" bus versus rail
- Mode neutral

Concluding Thoughts.

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Target real issues, not concerns

Quantified performance goals and public-private partnerships

"Outpatient procedures" versus radical surgery

More Research

- Effect of Travel Time and Reliability on Transit Ridership
- Forecasting Transit and Roadway Reliability

Begin adapting and refining tools

Thank you for your time.

For more information, please contact:

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