Express Lane Network Study (ELNS)
Traffic and Revenue Validation and Forecasting – using Activity Based Model (ABM)

November 8, 2017
NCMUG meeting
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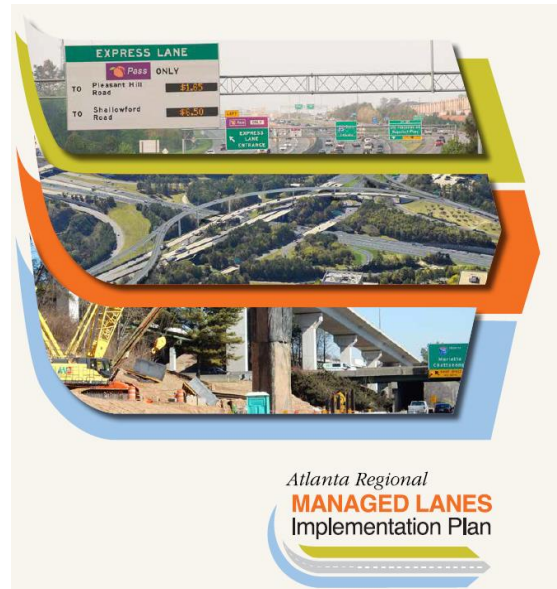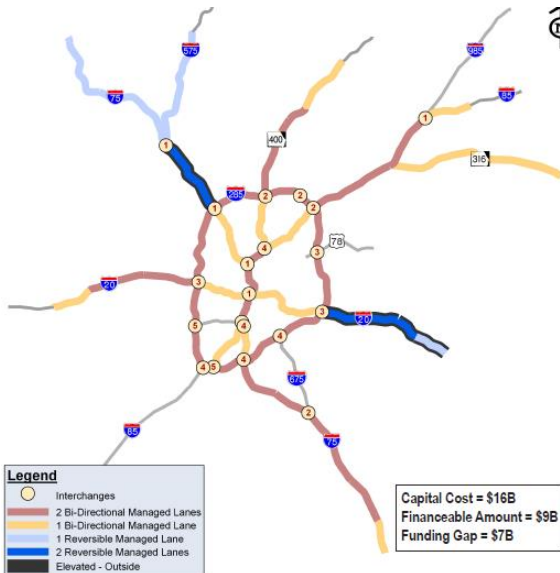
HNTB

AGENDA

- Study Background and History
- Levels of Traffic and Revenue (T&R) Studies
- Express Lane Validation
  - Focus
  - Data
  - Process
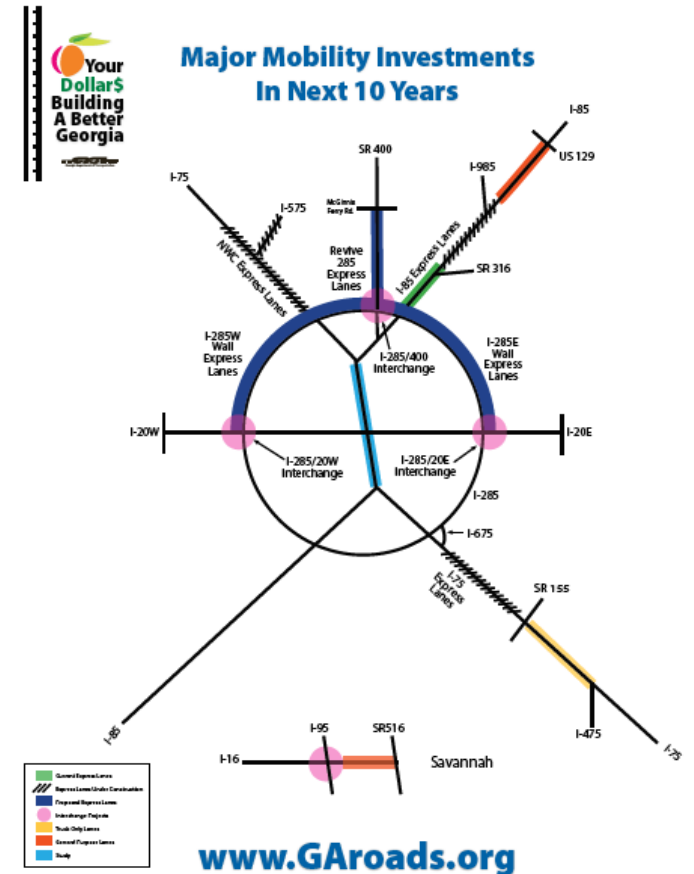- Recommended refinements
- Observations & Lessons Learned

STUDY BACKGROUND AND HISTORY

Mobility Investment Program (MMIP)

Express Lane Network Study

STUDY BACKGROUND AND HISTORY

Studies

| Managed Lane System Plan (MLSP) 2007 -2009 | → | Managed Lane Implementation Plan (MLIP) 2012-2015 | → | Major Mobility Investment Program (MMIP) – Express Lane Network Study (ELNS) |

Model Used

- ARC 4-Step Model, *Envision6*, with HNTB Toll Diversion Module based on SP survey results

- ARC 4-Step Model, *Plan2040*, with HNTB Toll Diversion Module based on SP survey results

- ARC *ABM* Testing, Toll Diversion in both mode choice and route choice

Express Lane Network Study will conduct a preliminary Traffic and Revenue Study to:

- Support the NEPA process for future managed lane projects
- Support individual project programming decisions

LEVELS OF TRAFFIC AND REVENUE (T&R) STUDIES

- Exploratory T&R Study (Level I)
  - Assess whether the corridor is a candidate for additional study of toll application
  - Off model investigation

- Concept T&R Study (Level II)
  - Detailed T&R forecasts and operational plan
  - Provide corridor/system level impacts and performance measures
  - Existing regional model with moderate enhancements

LEVELS OF TRAFFIC AND REVENUE (T&R) STUDIES

- Investment Grade T&R Study (Level III)
  - Extensive modifications to existing tools
  - Assess potential risks for revenue variation, including independent evaluation of economic conditions and growth
  - Detailed implementation plan with technology assessment and operations
  - Provide sufficient details and confidence to secure finance

KEY REVENUE DRIVERS AND RISKS/UNCERTAINTY

- Access and Policies
- Overall travel demand and travel patterns
- Future economic and demographic growth
- Travel time savings - tolled vs. free
- Value of Time
- Transit frequency
- Alternate/Competing transportation investment
- Off-Peak/Weekend traffic
- Technology and travel behavior change

EXPRESS LANE VALIDATION FOCUS

- System-wide level II T&R based on regional travel demand Model

- Express Lane Network Study needs to provide reasonable projections on

  - Express Lane Volume

  - Toll Rates by different time periods

  - Toll Revenue (corresponding to different toll policies)

- 2015 I-85 HOT lanes Traffic and Revenue Validation

Volume ✓

Toll Rates ✓

Toll Revenue ✓

I-85 HOT LANE OBSERVED DATA
- PROVIDED BY SRTA

- **Trip toll and trip data:** Average of 2015 January, March, August, and October weekdays, obtained from State Road Tollway Authority (SRTA) online dashboard data

https://public.tableau.com/views/I-85_Performance_Statistics_2015/I-85ExpressLanesPerformanceStatisticsDashboard?:showVizHome=no

- **HOT lane total volume:** average of 2015 October weekday 15-minutes incremental volume data provided by SRTA May 2016

- **Daily toll revenue:** average of 2015 annual data provided by SRTA July 2016

- **Toll rates:** calculated based on average of tolls by trip, trip distance and toll segment volumes.

I-85 HOT LANE TRAFFIC AND REVENUE OBSERVED DATA - PROVIDED BY SRTA

Average of 2015 January, March, August, and October Toll Rate Information

Time of Day / Direction	AM NB	AM SB	PM NB	PM SB	Off-Peak NB	Off-Peak SB
Toll Rates Per Mile	$0.01	$0.56	$0.54	$0.02	$0.15	$0.04

2015 October weekday I-85 HOT Lane Volume

Segment	2015 Average Weekday HOT Lane Volume						
	AM NB	AM SB	PM NB	PM SB	Off-Peak NB	Off-Peak SB	Today Daily
I-285 to Pleasantdale Rd	458	3,913	3,869	1,265	1,855	2,103	**13,463**
Pleasantdale Rd to Jimmy Carter Blvd	818	5,396	4,949	1,817	3,111	3,084	**19,175**
Jimmy Cater Blvd to Indian Trail Rd	871	5,059	4,662	1,749	3,181	2,993	**18,515**
Indian Trail Rd to Pleasant Hill Rd	741	2,711	3,894	925	2,770	1,662	**12,703**
Pleasant Hill Rd to Old Peachtree Rd	305	1,256	2,015	478	1,340	1,053	**6,447**

I-85 HOT Lane Traffic and Revenue Observed Data - Provided by SRTA

Percent of Total Weekday (Mon – Fri) Revenue by Direction and by Time Period for 2015

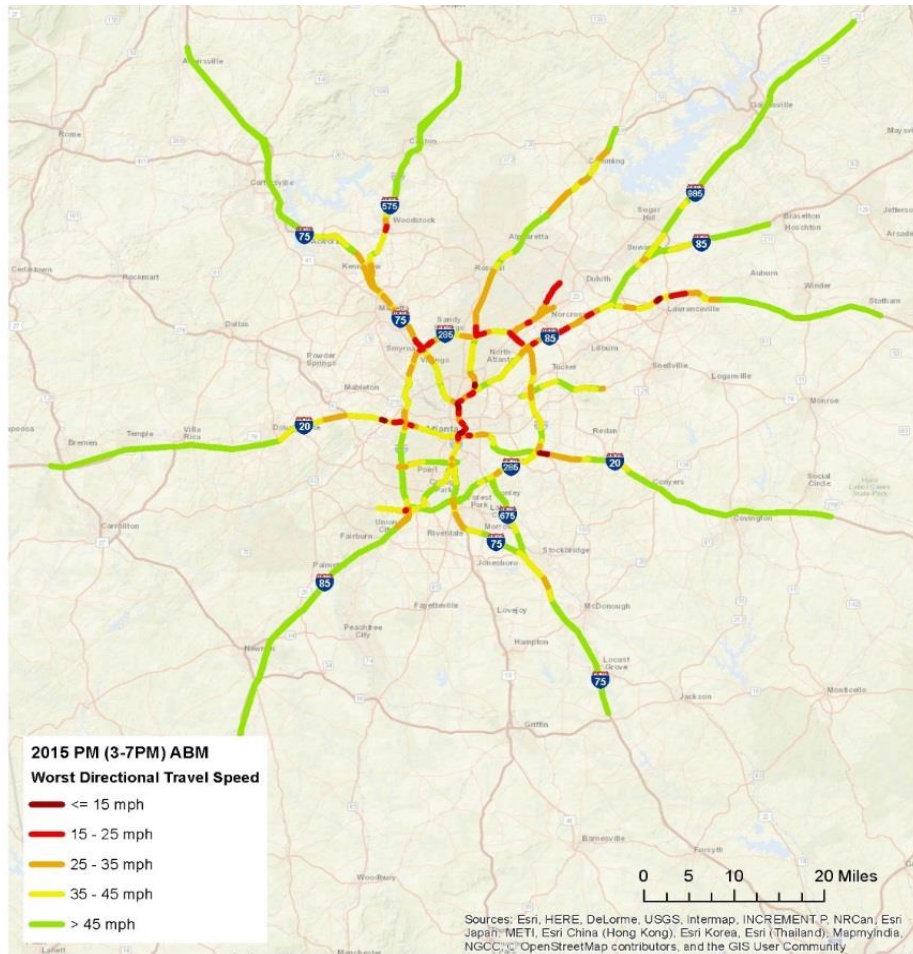| Time	January 2015		March 2015		August 2015		October 2015	
	North	South	North	South	North	South	North	South
0 - 6 AM	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%
6 AM - 10 AM	0.1%	46.3%	0.1%	45.5%	0.2%	42.3%	0.2%	45.0%
10 AM - 3 PM	1.7%	0.5%	1.8%	0.4%	2.2%	2.9%	2.2%	2.6%
3 PM - 7 PM	46.5%	0.4%	46.3%	0.5%	46.3%	0.5%	44.3%	0.5%
7 PM - Midnight	4.3%	0.1%	5.3%	0.1%	5.3%	0.1%	5.1%	0.1%
Grand Total	52.7%	47.3%	53.5%	46.5%	54.1%	45.9%	51.7%	48.3%

2015 Average Weekday Gross Revenue	
Entire Corridor	$59,800

Calculated based on toll rates per mile and volume: $59,092

SPEED DATA - NPMRDS

2015 PM Peak Period Speed

2015 PM (3-7PM) ABM
Worst Directional Travel Speed

- <= 15 mph
- 15 - 25 mph
- 25 - 35 mph
- 35 - 45 mph
- > 45 mph

0   5   10   20 Miles

PM Peak Period Speed Comparison

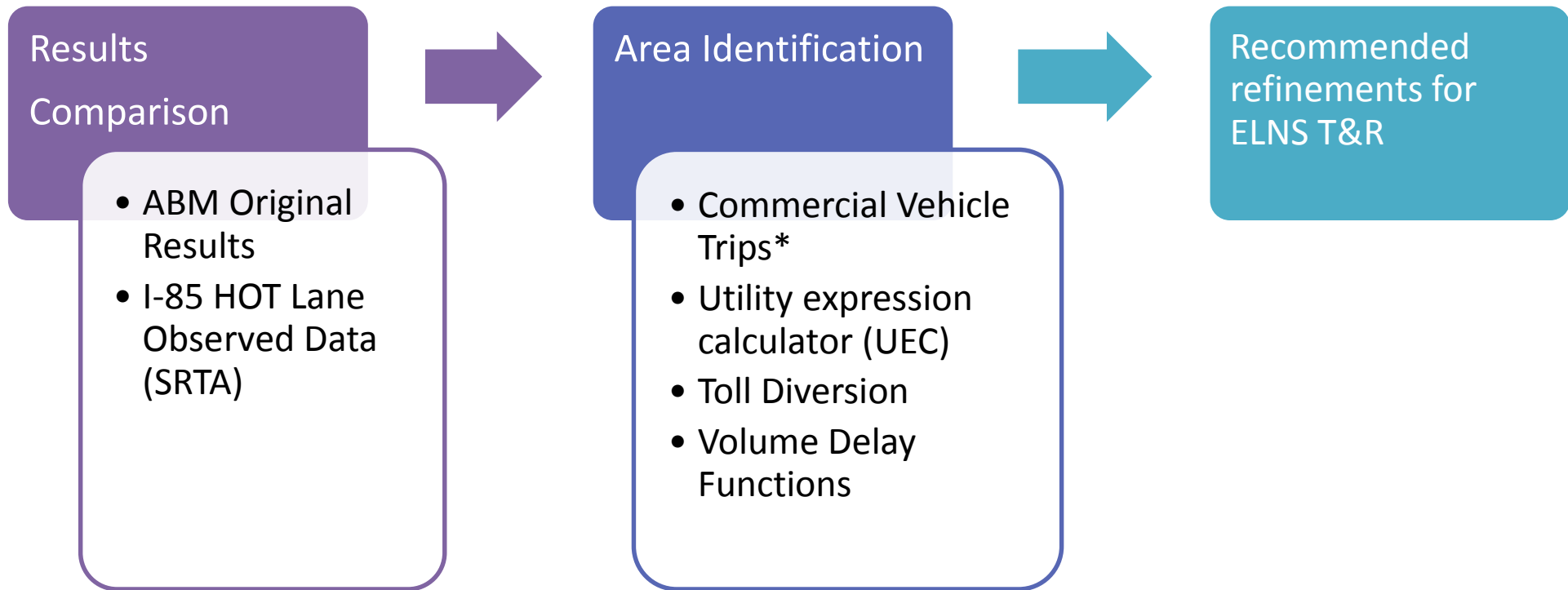| Corridor	Location	Time	2015 Hourly Speed Observed*	Average Speed 2015**	Model Speed 2015
I-285 West Wall	SB at SR 280	3-4PM	54	37	44
		4-5PM	36		
		5-6PM	25		
		6-7PM	34		
I-285 East Wall	SB at US 29	3-4PM	44	31	41
		4-5PM	28		
		5-6PM	22		
		6-7PM	31		
I-285 Top End	WB at GA 400	3-4PM	39	30	43
		4-5PM	24		
		5-6PM	22		
		6-7PM	34		
GA 400	NB at I-285	3-4PM	25	19	20
		4-5PM	18		
		5-6PM	14		
		6-7PM	18		

*Based on National Performance Management Research Data Set (NPMRDS) – 2015 average of all weekdays Tuesday – Thursday
**Simple average across 4, 1-hour periods. Not weighted by hourly volumes.

Georgia Department of Transportation

EXPRESS LANE VALIDATION PROCESS

- 2015 I-85 HOT lanes Traffic and Revenue Validation

Results Comparison

→

Area Identification

→

Recommended refinements for ELNS T&R

- ABM Original Results
- I-85 HOT Lane Observed Data (SRTA)

- Commercial Vehicle Trips*
- Utility expression calculator (UEC)
- Toll Diversion
- Volume Delay Functions

*Commercial vehicle trips refer to those trips that are mainly business-oriented and are not personal transportation, but do not involve a medium truck (F4 – F7 in the FHWA Vehicle Classification) or heavy truck (F8 – F13 in the FHWA Vehicle Classification).

EXPRESS LANE VALIDATION PROCESS

Results Comparison

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- I-85 HOT Lane Observed Data (SRTA)

Area Identification

- Commercial Vehicle Trips
- Utility expression calculator (UEC)
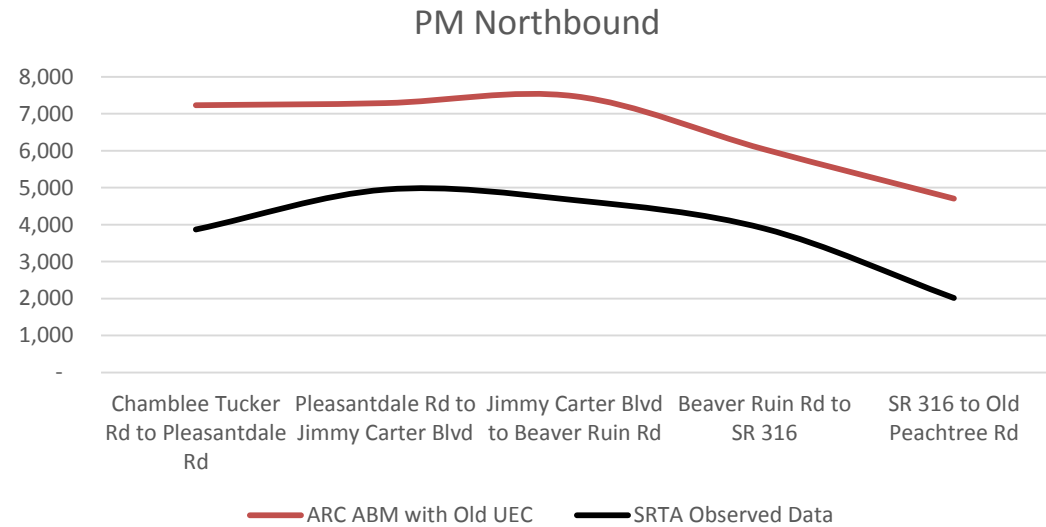- Toll Diversion
- Volume Delay Functions

Recommended refinements for ELNS T&R

TRAFFIC & REVENUE VALIDATION ON I-85 HOT LANES

Toll Rates per Mile
ABM vs. SRTA Observed Data

HOT Lane Total Volumes
ABM vs. SRTA Observed Data

Northbound

- Chamblee Tucker Rd to Pleasantdale Rd
- Pleasantdale Rd to Jimmy Carter Blvd
- Jimmy Carter Blvd to Beaver Ruin Rd
- Beaver Ruin Rd to SR 316
- SR 316 to Old Peachtree Rd
- SRTA Observed Data

PM Northbound

- ARC ABM with Old UEC
- SRTA Observed Data

EXPRESS LANE VALIDATION PROCESS

Results

Comparison

- ABM Original Results
- I-85 HOT Lane Observed Data (SRTA)

Area Identification

- Commercial Vehicle Trips
- Utility expression calculator (UEC)
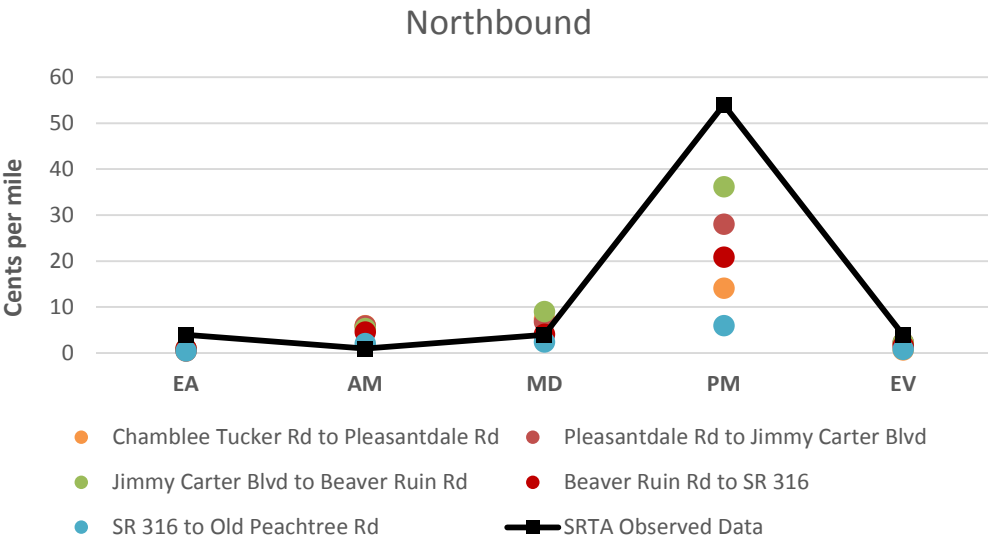- Toll Component
- Volume delay functions

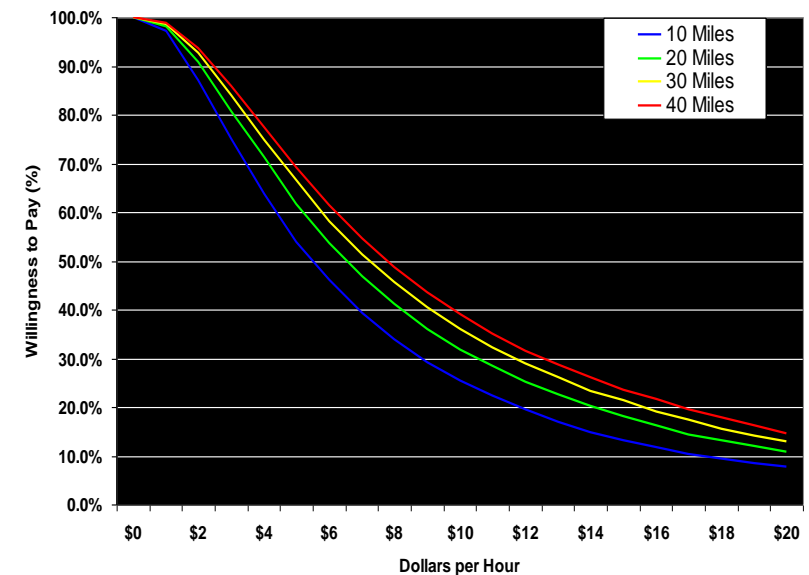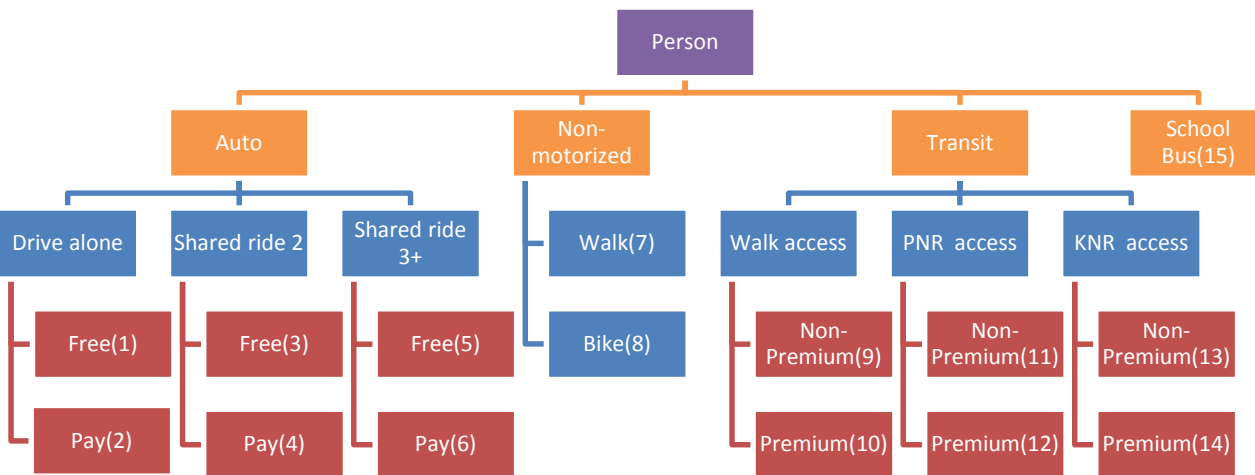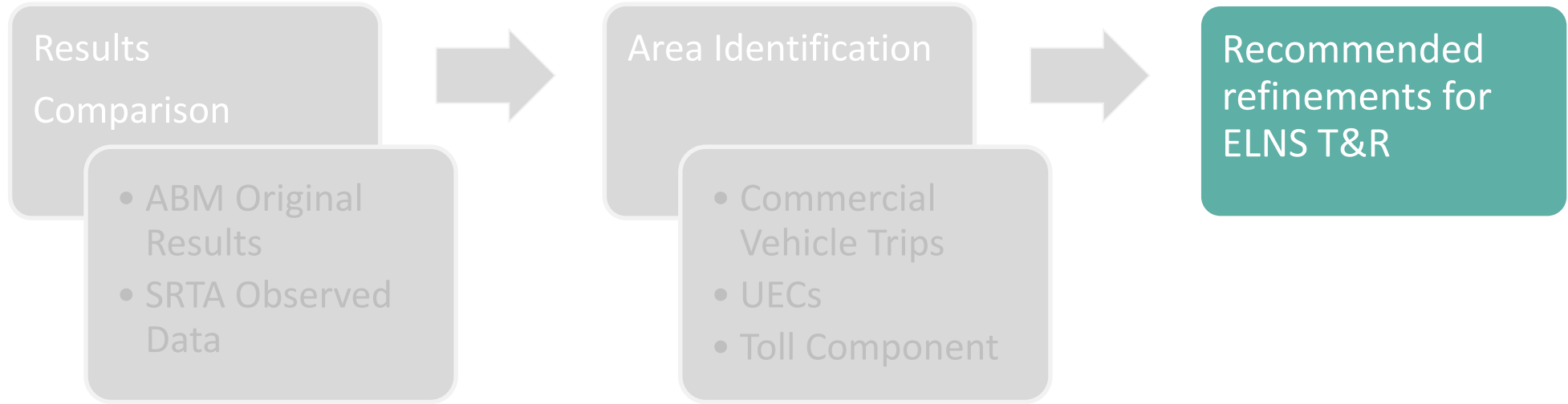Recommended refinements for ELNS T&R
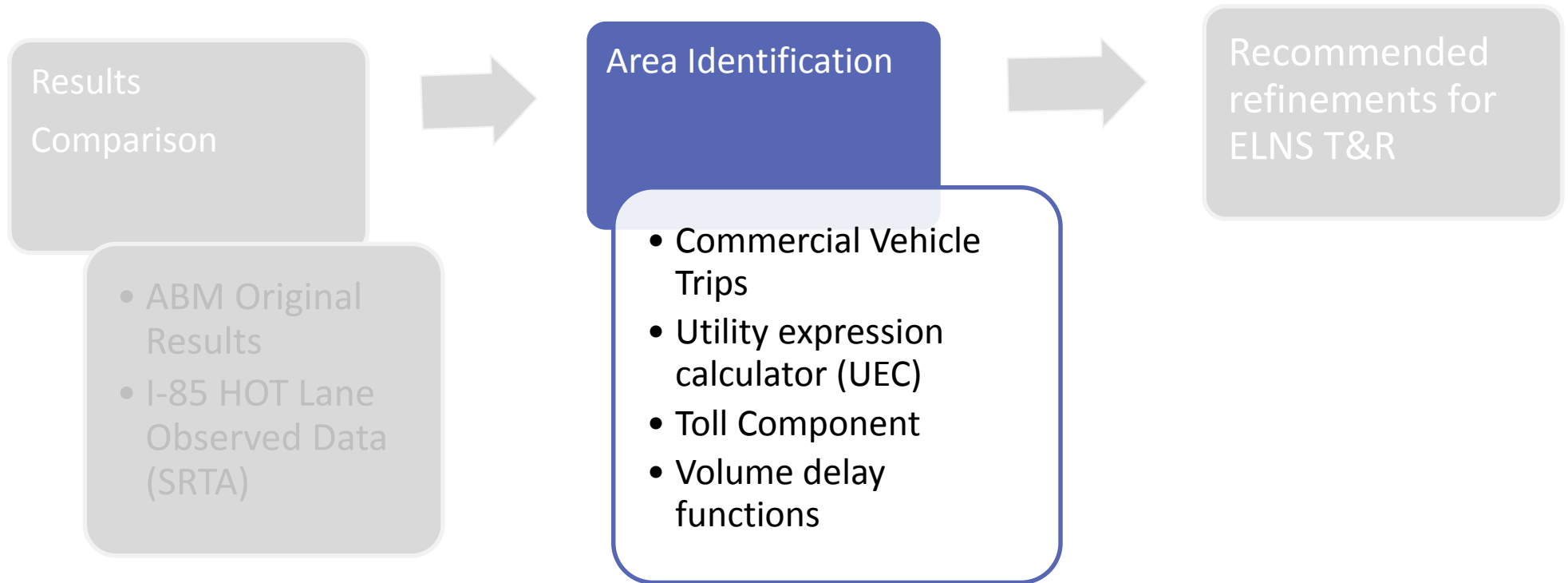
EXPRESS LANE VALIDATION PROCESS

- Vehicle eligibility – commercial vehicles
- Parameter sensitivity analysis for utility expression calculator (UEC) in tour mode choice
- Toll rate validation with I-85 observed toll rates and sensitivity runs
- Volume-delay functions
- Willingness to pay curve in the toll diversion model
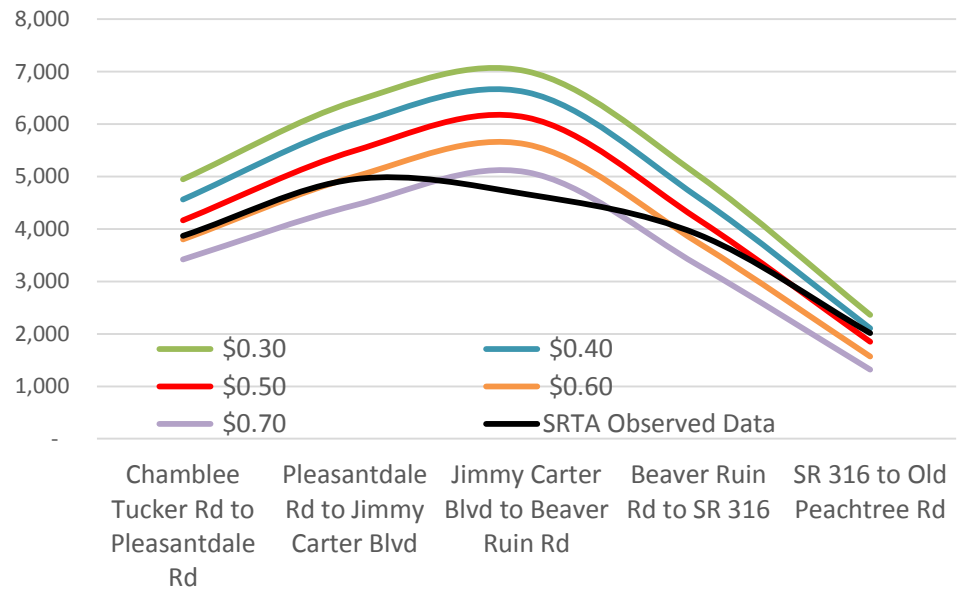
EXPRESS LANE VALIDATION PROCESS

Results Comparison
- ABM Original Results
- SRTA Observed Data

→

Area Identification
- Commercial Vehicle Trips
- UECs
- Toll Component

→

Recommended refinements for ELNS T&R

RECOMMENDED REFINEMENTS FOR ELNS T&R

- Allow commercial vehicles* to use express lanes and HOT3+ lanes

- Remove tour/trip mode choice restriction and allow all eligible vehicles to use express lanes

- Revise toll diversion curves and refine the volume delay curves based on the I-85 HOT lane observed data

- Use toll segments instead of corridor as the toll optimization basis

- Revise toll optimization to estimate the range of different revenue reflecting tolling policies
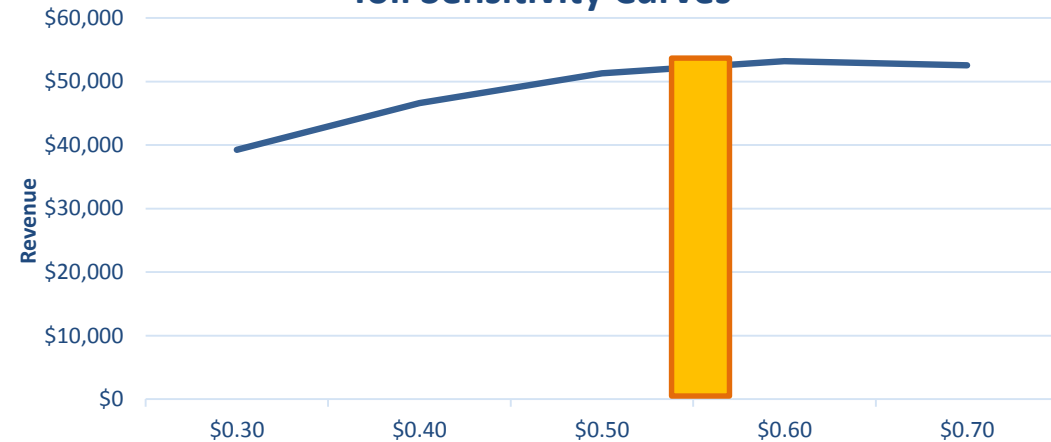
TRAFFIC & REVENUE VALIDATION ON I-85 HOT LANES

Northbound PM — traffic volume curves for toll rates $0.30, $0.40, $0.50, $0.60, $0.70, and SRTA Observed Data across segments: Chamblee Tucker Rd to Pleasantdale Rd, Pleasantdale Rd to Jimmy Carter Blvd, Jimmy Carter Blvd to Beaver Ruin Rd, Beaver Ruin Rd to SR 316, SR 316 to Old Peachtree Rd.

Toll Sensitivity Curves

Observed Revenue
$53,820
at toll rates
of $0.55/mile

OBSERVATIONS AND LESSONS LEARNED

- Focus on validating the key drivers for managed lane utilization
  - Three dimensions of congestion (duration, extent, and intensity)
  - Travel time savings and travel speed
- Empirically check all modeling assumptions based on the observed data to the extent possible
  - Willingness to pay
  - Measurement of reliability
  - Benchmark forecasts against managed lanes under operation