SERPM 8 Model Status

presented to

RTTAC-MS

presented by

*Cambridge Systematics, Inc.*

Marty Milkovits

October 16, 2019

Outline

- Model status and schedule

- 2045 SE data update and utility review

- Shadow pricing update

- Traveler characteristics update

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Model Status

➔ Latest model version released for use - January 30, 2019

➔ Developer version enhancements completed
  » **Fixes**: TNC repositioning trip mechanism, shadow pricing enhancements, select link volumes
  » **PopSyn:** MAZ to TAZ map corrected (TAZ 4404)
  » **Enhancements:** Default to utilize all threads in Cube Catalog
  » **Reports**: SE Data; PopSyn; TNC & C/AV summaries
  » **Utilities**: seed skim generation; free-flow network; voyager.exe check; PopSyn checker, site impact preparation
  » **Catalog**: scenario key defaults; key names
  » **Inputs**: highway network updated with D6 feedback and removed unused fields

➔ Pending enhancements
  » Update JPPF (to utilize all processors on Windows 10 systems)
  » Calibration based on D4 feedback
  » Additional model utilities

➔ Model approval schedule: February 1, 2020

➔ Bi-weekly maintenance calls
  » Next call Monday October 28, 3 - 3:45pm

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Model Work Schedule

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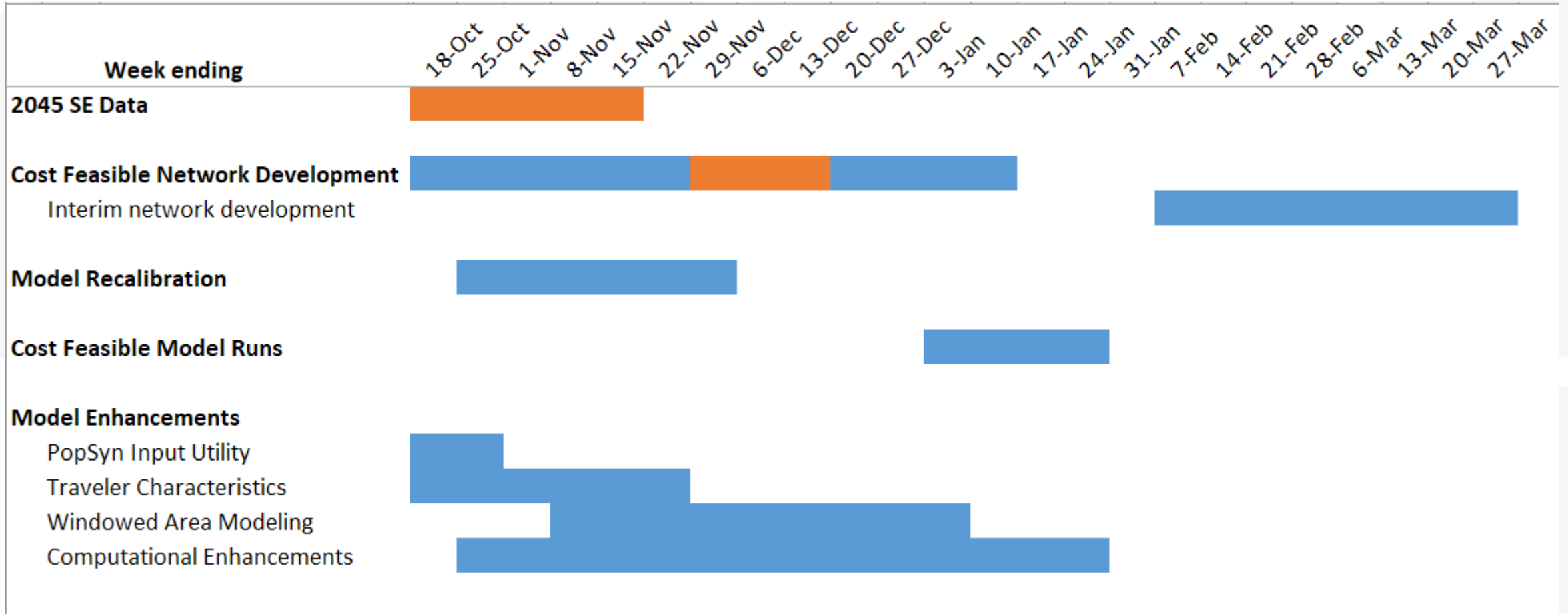
2045 SE data update and utility review

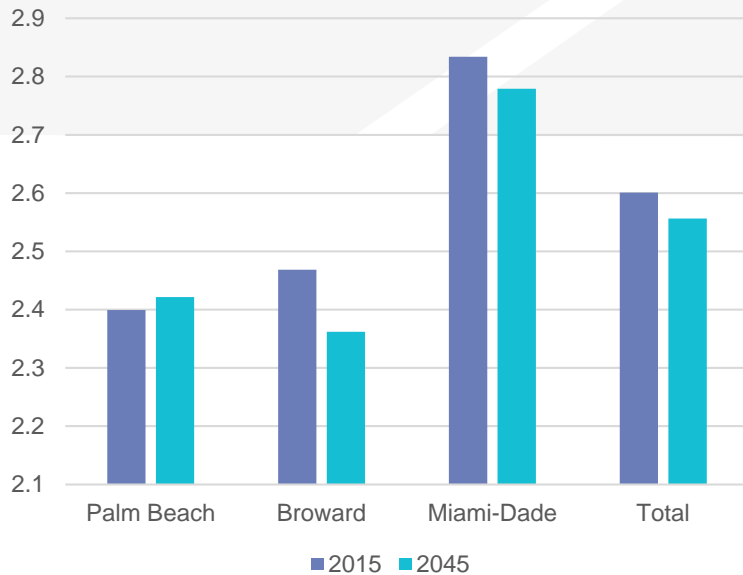# Summary

- Review updated 2045 population summaries

- Popsyn utility mechanism and thresholds

- Request for approval by next RTTAC-MS

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Non-GQ Population Summary

Population	2015	2045
Palm Beach	1,378,411	1,762,334
Broward	1,809,357	2,193,882
Miami-Dade	2,587,383	3,475,847
Total	5,775,151	7,432,063

Average Household Size

Worker Ratio

Child Ratio

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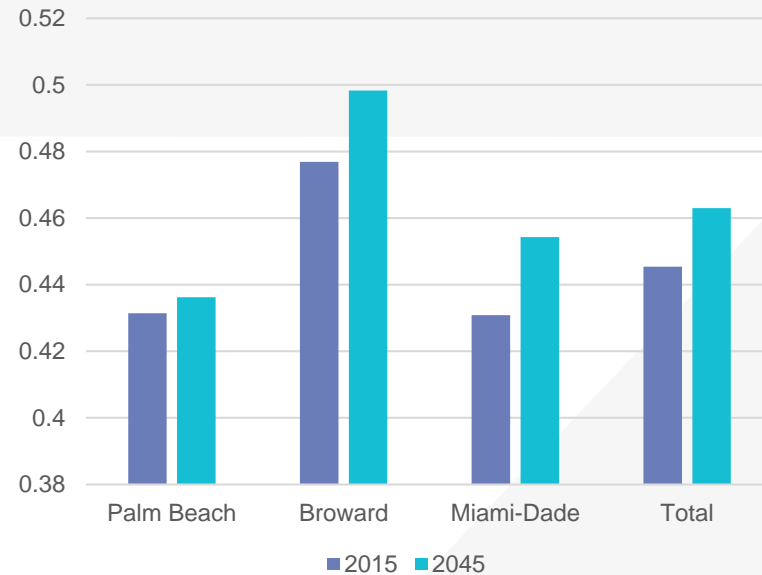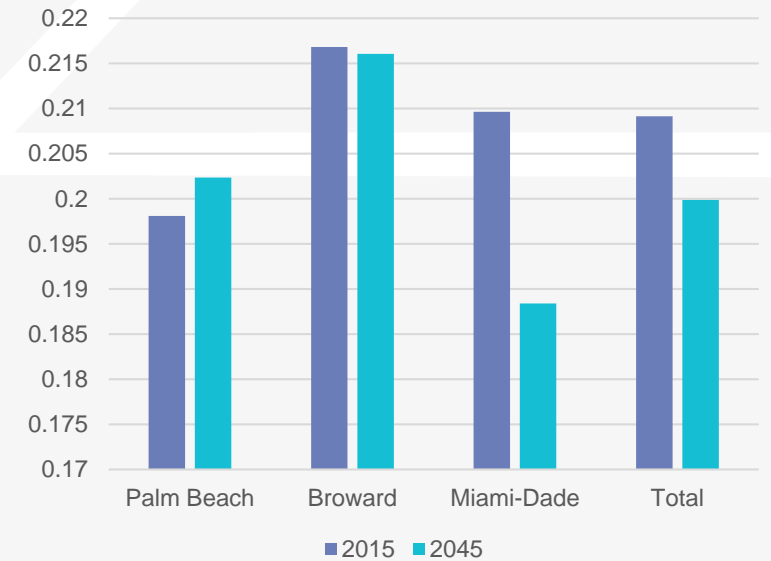
Non-GQ Household Summary

Households	2015	2045
Palm Beach	574,466	727,728
Broward	732,986	928,773
Miami-Dade	912,963	1,250,659
Total	2,220,415	2,907,160

Households with Children
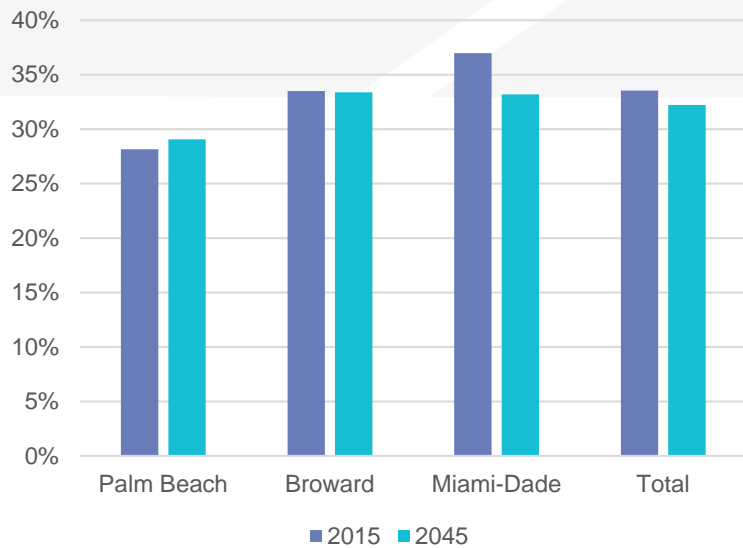
Households with Workers
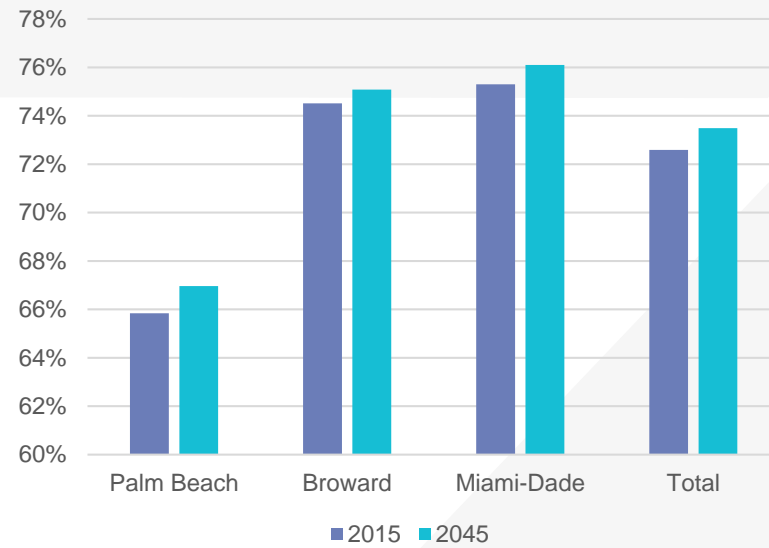
Average Household Income (2010 $)

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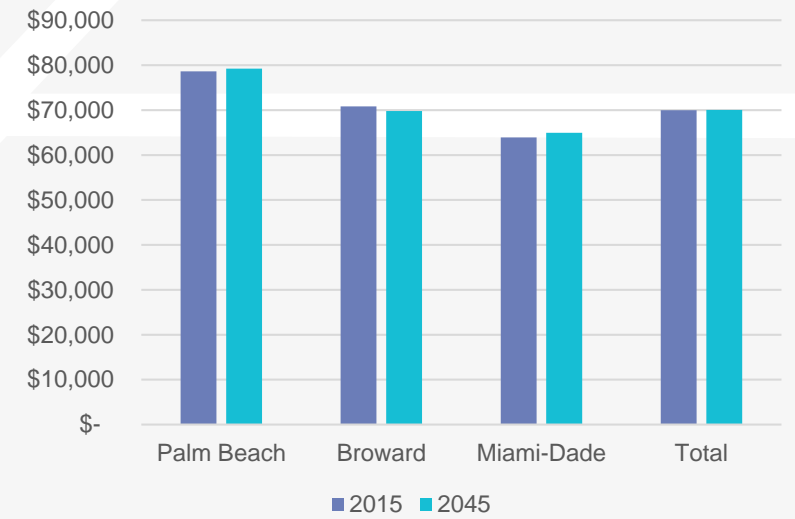
Non-GQ Population to Employment Summary

Population	2015	2045
Palm Beach	1,378,411	1,762,334
Broward	1,809,357	2,193,882
Miami-Dade	2,587,383	3,475,847
Total	5,775,151	7,432,063

Jobs	2015	2045
Palm Beach	720,801	931,149
Broward	961,607	1,241,642
Miami-Dade	1,353,345	1,833,291
Total	3,035,753	4,006,082

Worker per Job

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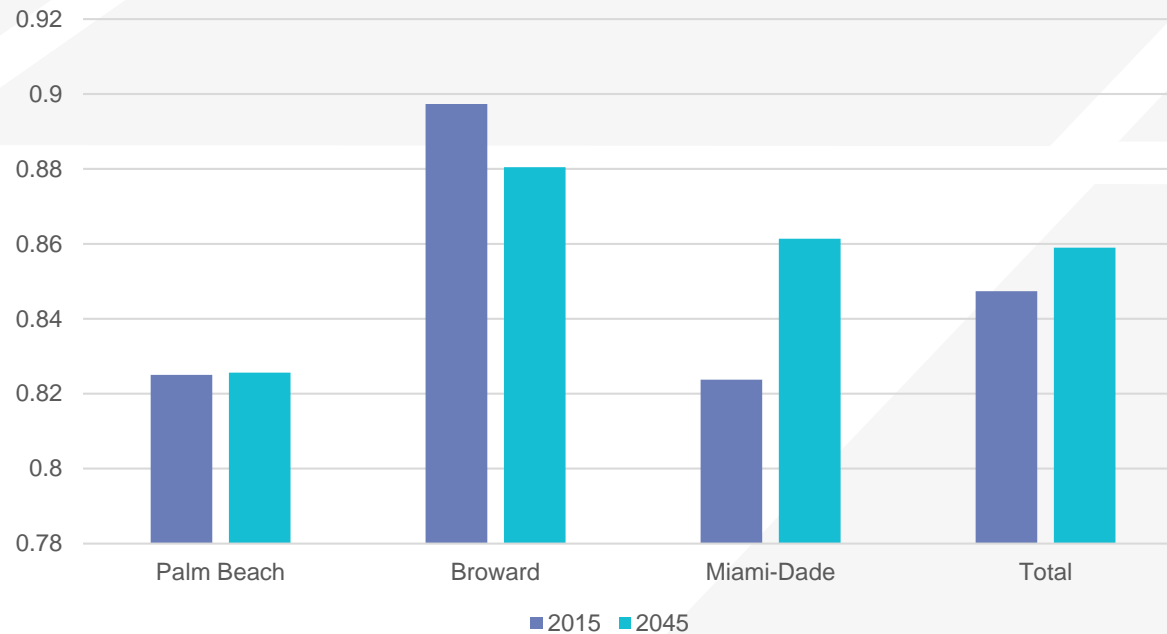
PopSyn Performance against Targets – HH Size

County_Name	HHSIZE_1	HHSIZE_2	HHSIZE_3	HHSIZE_4PLUS	TOTAL_HOUSEHOLDS
Palm Beach North	-0.1%	0.1%	0.2%	0.3%	0.1%
Palm Beach CBD	0.2%	0.0%	0.1%	0.6%	0.2%
Palm Beach Central	0.1%	0.2%	0.3%	0.2%	0.2%
Palm Beach West	0.6%	0.9%	-0.5%	0.2%	0.3%
Palm Beach South	0.1%	0.1%	0.3%	0.3%	0.2%
Broward North	0.2%	0.1%	-0.1%	-0.3%	0.0%
Broward CBD	0.1%	0.4%	-0.1%	-1.5%	0.0%
Broward Central	0.0%	-0.1%	0.0%	0.1%	0.0%
Broward South-West	0.1%	0.1%	0.0%	-0.1%	0.0%
Broward South-East	0.3%	0.0%	-0.2%	-0.4%	0.0%
Miami-Dade North	-0.2%	0.0%	0.0%	0.2%	0.0%
Miami-Dade CBD	-0.1%	0.0%	0.3%	-0.1%	0.0%
Miami-Dade NorthWest	-0.3%	0.1%	0.2%	0.0%	0.0%
Miami-Dade Central	-0.1%	-0.1%	0.0%	0.3%	0.0%
Miami-Dade West	0.0%	0.0%	-0.1%	0.1%	0.0%
Miami-Dade South	-0.3%	-0.1%	0.1%	0.1%	0.0%
Total	0.0%	0.0%	0.1%	0.1%	0.0%

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PopSyn Performance against Targets – HH Income

County_Name	INCOME_25K	INCOME_50K	INCOME_75K	INCOME_100K	INCOME 100KPLUS	TOTAL_HOUSEHOLDS
Palm Beach North	0.6%	1.2%	2.0%	-0.5%	-1.8%	0.1%
Palm Beach CBD	-0.9%	2.7%	1.3%	-1.0%	-1.8%	0.2%
Palm Beach Central	0.7%	1.1%	1.8%	0.6%	-3.4%	0.2%
Palm Beach West	2.4%	-5.5%	15.9%	1.2%	-7.8%	0.3%
Palm Beach South	1.2%	0.8%	1.5%	1.1%	-2.5%	0.2%
Broward North	1.2%	0.4%	0.8%	0.1%	-2.7%	0.0%
Broward CBD	-0.2%	1.3%	1.9%	-3.9%	-0.6%	0.0%
Broward Central	1.9%	-0.5%	1.5%	0.6%	-3.5%	0.0%
Broward South-West	1.3%	0.6%	1.3%	0.4%	-2.2%	0.0%
Broward South-East	1.2%	-0.2%	1.9%	-1.6%	-3.4%	0.0%
Miami-Dade North	0.6%	1.2%	-1.0%	-1.5%	-1.8%	0.0%
Miami-Dade CBD	1.5%	1.5%	-0.8%	-1.0%	-1.9%	0.0%
Miami-Dade NorthWest	0.7%	1.5%	0.2%	-2.1%	-2.7%	0.0%
Miami-Dade Central	0.5%	1.0%	0.4%	-0.5%	-2.1%	0.0%
Miami-Dade West	2.4%	0.6%	1.4%	-1.1%	-3.1%	0.0%
Miami-Dade South	0.2%	3.6%	-2.1%	0.9%	-3.0%	0.0%
Total	0.9%	0.9%	0.7%	-0.2%	-2.5%	0.0%

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PopSyn Performance against Targets – HH Workers

County_Name	WORKERS_0	WORKERS_1	WORKERS_2	WORKERS 3PLUS	TOTAL HOUSEHOLDS
Palm Beach North	0.1%	0.1%	0.1%	0.1%	0.1%
Palm Beach CBD	0.1%	0.2%	0.4%	0.4%	0.2%
Palm Beach Central	0.1%	0.2%	0.2%	0.2%	0.2%
Palm Beach West	1.0%	0.1%	-0.1%	0.4%	0.3%
Palm Beach South	0.2%	0.1%	0.1%	0.2%	0.2%
Broward North	0.0%	0.0%	0.0%	0.1%	0.0%
Broward CBD	0.5%	0.0%	-0.2%	-2.0%	0.0%
Broward Central	-0.2%	0.0%	0.1%	0.2%	0.0%
Broward South-West	0.0%	0.0%	0.0%	-0.1%	0.0%
Broward South-East	0.0%	0.0%	0.0%	0.1%	0.0%
Miami-Dade North	-0.5%	0.3%	0.2%	-0.2%	0.0%
Miami-Dade CBD	1.1%	-0.4%	-0.5%	0.4%	0.0%
Miami-Dade NorthWest	0.0%	0.0%	0.0%	0.0%	0.0%
Miami-Dade Central	-0.1%	0.0%	0.0%	0.2%	0.0%
Miami-Dade West	0.0%	0.0%	0.0%	-0.1%	0.0%
Miami-Dade South	0.1%	0.0%	-0.1%	0.1%	0.0%
Total	0.1%	0.0%	0.0%	0.1%	0.0%

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PopSyn Performance against Targets – Person Age

County_Name	AGE0TO17	AGE18TO24	AGE25TO34	AGE35TO49	AGE50TO64	AGE65TO79	AGE80PLUS	TOTAL
Palm Beach North	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Palm Beach CBD	-0.1%	-0.1%	-0.2%	-0.2%	0.2%	0.0%	0.2%	0.0%
Palm Beach Central	0.1%	0.0%	0.1%	0.0%	-0.1%	0.0%	-0.1%	0.0%
Palm Beach West	0.3%	-0.1%	-0.6%	0.1%	0.4%	-1.2%	-0.5%	0.0%
Palm Beach South	0.0%	0.1%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%
Broward North	0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Broward CBD	-0.6%	-0.3%	-0.2%	-0.1%	0.0%	0.1%	0.0%	-0.2%
Broward Central	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Broward South-West	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
Broward South-East	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Miami-Dade North	0.0%	-0.3%	-0.5%	-0.1%	0.0%	0.1%	0.0%	-0.1%
Miami-Dade CBD	0.4%	1.0%	1.0%	0.5%	0.1%	-0.5%	-0.5%	0.2%
Miami-Dade NorthWest	0.1%	-0.1%	0.1%	0.0%	0.1%	-0.1%	-0.1%	0.0%
Miami-Dade Central	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%
Miami-Dade West	-0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
Miami-Dade South	0.1%	-0.2%	-0.3%	-0.2%	-0.3%	-0.4%	-0.6%	-0.2%
Total	0.1%	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.1%	0.0%

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PopSyn Input Requirements

TAZ

Persons			Households		
Age			Income in 2009 dollars		
1	0-17		1	<$25,000	
2	18-24		2	$25,000-$50,000	
3	25-34		3	$50,000-$75,000	
4	35-49		4	$75,000-$100,000	
5	50-64		5	$100,000 or more	
6	65-79		Household Size		
7	80+		1	1	
Gender			2	2	
1	Male		3	3	
2	Female		4	4+	
Race/Ethnicity			Number of Workers		
1	Hispanic		1	0	
2	White Non-Hispanic		2	1	
3	Black		3	2	
4	Indian		4	3+	
5	Asian		Types of Housing Unit		
6	Islander		1	Single-Family	
7	Other Non-Hispanic		2	Multi-Family	
8	Mixed		3	Mobile Home	
			Presence of Children in Household		
			1	No children present	
			2	One or more children	
			Group Quarters[1]		
			1	Institutionalized	
			2	College	
			3	Military	
			4	Other	

MAZ

Total Households
Total Group Quarters

Input Utility Workflow

Reference TAZ / MAZ input files → Build Distribution Table

Use distributions by most detailed level of granularity (TAZ, TAD, SD) meeting:
- Min person [200] &
- Max average 4+ HH Size [7.5];
- Min gq [100]

New TAZ Population Targets → Apply Distributions to new targets

Base TAZ / MAZ input files → Update target zones

Updated TAZ / MAZ input files

Log of modified TAZ/MAZ records

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Data Checks

➤ Process produces updated set that meets the following checks

TAZ Checksum: Child Segment

TAZ Checksum: GQ Segment

TAZ Checksum: Income Segment

TAZ Checksum: Person Age

TAZ Checksum: Size Segment

TAZ Checksum: Unit Segment

TAZ Checksum: Worker Segment

TAZ HH-Person Consistency: HH Children with no Child persons

TAZ HH-Person Consistency: HH Size != Total Persons (Size 4P==0)

TAZ HH-Person Consistency: HH Size > Total Persons (Size 4P>0)

TAZ HH-Person Consistency: HH Workers > Total Persons

TAZ HH-Person Consistency: No HH with Children with Child persons

TAZ HH-Person Consistency: 4P household average size < 8

TAZ Value Check: NA Value

TAZ Value Check: Negative Value

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Wrap

- RTTAC-MS: review and approval of 2045 SE data

- PopSyn utility guidance added to online documentation

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Shadow Pricing Update

Motivation

➤ **Developing guidance for application**

➤ **Scenario specification decisions:**

» Input data

» Model steps to run (PopSyn, Assignment-Only)

» **Model setup**

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Shadow Pricing

➤ Shadow pricing promotes consistency between work and school locations and jobs and enrollment

  » Excludes workers and students from outside the region

➤ Shadow prices are produced through CT-RAMP operation

➤ Barring major network / land use changes – prices should be stable

```
UsualWorkLocationChoice.ShadowPrice.Input.File = /uec/ShadowPricingOutput2045RTN_work_0.csv
UsualSchoolLocationChoice.ShadowPrice.Input.File = /uec/ShadowPricingOutput2045RTN_school_0.csv
uwsl.ShadowPricing.Work.MaximumIterations = 1
uwsl.ShadowPricing.School.MaximumIterations = 1
uwsl.ShadowPricing.OutputFile = /../_abm/ShadowPricingOutput.csv
```

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Maximum MAZ Work Locations to Jobs (>50 jobs)

Maximum Ratio (workers / job)			2045 E+C Shadow Pricing				Alternative Growth SP
SD	COUNTY	2015	2045 E+C	XCF	Flex	AltGrw	AltGrw_SP
Palm Beach North	Palm Beach	1.22	1.25	1.59	1.16	4.90	1.38
Palm Beach CBD	Palm Beach	1.32	1.49	1.65	1.33	2.27	1.38
Palm Beach Central	Palm Beach	2.57	1.59	1.43	1.57	10.76	1.81
Palm Beach West	Palm Beach	1.24	1.35	1.24	1.43	2.53	1.63
Palm Beach South	Palm Beach	1.64	1.69	1.70	1.92	32.81	2.06
Broward North	Broward	1.69	1.52	1.71	1.49	1.60	1.73
Broward CBD	Broward	1.45	1.19	1.26	1.70	1.29	1.19
Broward Central	Broward	1.61	1.65	1.49	1.57	4.01	1.54
Broward South-West	Broward	1.67	1.56	1.60	1.86	1.65	1.57
Broward South-East	Broward	1.76	1.48	1.52	1.69	2.00	1.38
Miami-Dade North	Miami-Dade	1.71	1.69	1.51	1.45	4.91	1.81
Miami-Dade CBD	Miami-Dade	1.41	2.26	2.26	2.26	3.74	3.58
Miami-Dade North-West	Miami-Dade	1.54	1.40	1.62	1.33	2.31	1.50
Miami-Dade Central	Miami-Dade	1.65	2.25	1.86	1.59	4.38	2.19
Miami-Dade West	Miami-Dade	1.49	1.76	1.40	1.40	2.03	1.57
Miami-Dade South	Miami-Dade	2.40	1.89	1.71	1.71	2.62	1.94

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Super-District Average Work Locations to Jobs (>50 jobs)

Average workers / job

SD	COUNTY	2015	2045 E+C Shadow Pricing				Alternative Growth SP
			2045 E+C	XCF	Flex	AltGrw	AltGrw_SP
Palm Beach North	Palm Beach	0.74	0.75	0.75	0.74	0.87	0.76
Palm Beach CBD	Palm Beach	0.75	0.77	0.78	0.79	0.69	0.75
Palm Beach Central	Palm Beach	0.75	0.75	0.74	0.74	0.83	0.77
Palm Beach West	Palm Beach	0.76	0.75	0.74	0.74	0.89	0.76
Palm Beach South	Palm Beach	0.77	0.80	0.79	0.78	0.91	0.78
Broward North	Broward	0.80	0.81	0.81	0.80	0.93	0.80
Broward CBD	Broward	0.81	0.80	0.79	0.81	0.76	0.77
Broward Central	Broward	0.82	0.80	0.80	0.81	0.93	0.83
Broward South-West	Broward	0.80	0.82	0.83	0.82	0.94	0.84
Broward South-East	Broward	0.80	0.83	0.82	0.81	0.92	0.84
Miami-Dade North	Miami-Dade	0.81	0.83	0.83	0.83	0.95	0.84
Miami-Dade CBD	Miami-Dade	0.81	0.84	0.84	0.86	0.88	0.85
Miami-Dade North-West	Miami-Dade	0.81	0.83	0.83	0.82	0.93	0.87
Miami-Dade Central	Miami-Dade	0.82	0.84	0.83	0.83	0.92	0.85
Miami-Dade West	Miami-Dade	0.82	0.85	0.82	0.82	0.92	0.87
Miami-Dade South	Miami-Dade	0.84	0.83	0.81	0.82	1.07	0.86

Super-District %RMSE Work Locations to Jobs (>50 jobs)

%RMSE (workers to scaled* jobs)

SD	COUNTY	2015	2045 E+C Shadow Pricing				Alternative Growth SP
			2045 E+C	XCF	Flex	AltGrw	AltGrw_SP
Palm Beach North	Palm Beach	21%	26%	24%	27%	66%	24%
Palm Beach CBD	Palm Beach	21%	20%	19%	17%	101%	19%
Palm Beach Central	Palm Beach	21%	22%	21%	22%	130%	18%
Palm Beach West	Palm Beach	29%	35%	17%	18%	66%	35%
Palm Beach South	Palm Beach	19%	17%	18%	18%	95%	16%
Broward North	Broward	12%	12%	13%	12%	27%	12%
Broward CBD	Broward	13%	10%	12%	11%	161%	21%
Broward Central	Broward	13%	13%	14%	14%	55%	12%
Broward South-West	Broward	14%	13%	12%	11%	40%	12%
Broward South-East	Broward	13%	13%	12%	12%	32%	14%
Miami-Dade North	Miami-Dade	18%	25%	20%	21%	71%	17%
Miami-Dade CBD	Miami-Dade	11%	11%	11%	14%	121%	9%
Miami-Dade North-West	Miami-Dade	10%	22%	19%	20%	103%	15%
Miami-Dade Central	Miami-Dade	15%	32%	37%	39%	52%	15%
Miami-Dade West	Miami-Dade	14%	15%	14%	13%	47%	15%
Miami-Dade South	Miami-Dade	17%	14%	15%	15%	62%	19%

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Shadow Pricing Impact on Model Results

	Boardings		
Operator	**AltGrw new SP**	**AltGrw E + C SP**	**Difference**
Tri-Rail	94668	72488	31%
MDT	683446	631814	8%
BCT	232370	232109	0%
Palm Tran	197168	188974	4%
Total Transit Boardings	1207652	1125384	7%
Total Transit Linked Trips	817220	757588	8%
Boardings / Linked Trip	1.48	1.49	-1%

VMT	Percentage Difference			
Facility Type	**Total**	**Miami-Dade**	**Broward**	**Palm Beach**
Freeways	-0.37%	-0.79%	-0.52%	0.24%
Uninterrupted Roadways	-4.12%	-1.80%	-2.63%	-5.34%
High Speed Arterials	-1.10%	-1.21%	-1.36%	-0.63%
Low Speed Collectors	-0.39%	-0.59%	-1.23%	1.60%
Ramps	-1.06%	-1.22%	-0.95%	-0.73%
HOV Lanes	0.17%	0.00%	0.00%	0.17%
Toll Roads	-1.86%	-2.05%	-2.31%	-0.73%
All Groups	-1.14%	-1.23%	-1.35%	-0.76%

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Key Application Questions

➤ When to regenerate shadow prices?
"Substantial" changes in SE data – particularly changes where no employment existed previously

» What if **I** don't regenerate shadow prices?
Transit results are most likely to be impacted.

» So should we always regenerate shadow prices? No.

» What if **I**'m unsure? Review summaries of usual workplaces to total jobs.

➤ How to manage shadow prices by scenario?
Generate using scenario and specify with new catalog key

Wrap

- Add report to output distribution of worker / job and student / enrollment ratios

- Add shadow pricing scenario to facilitate generating new shadow prices

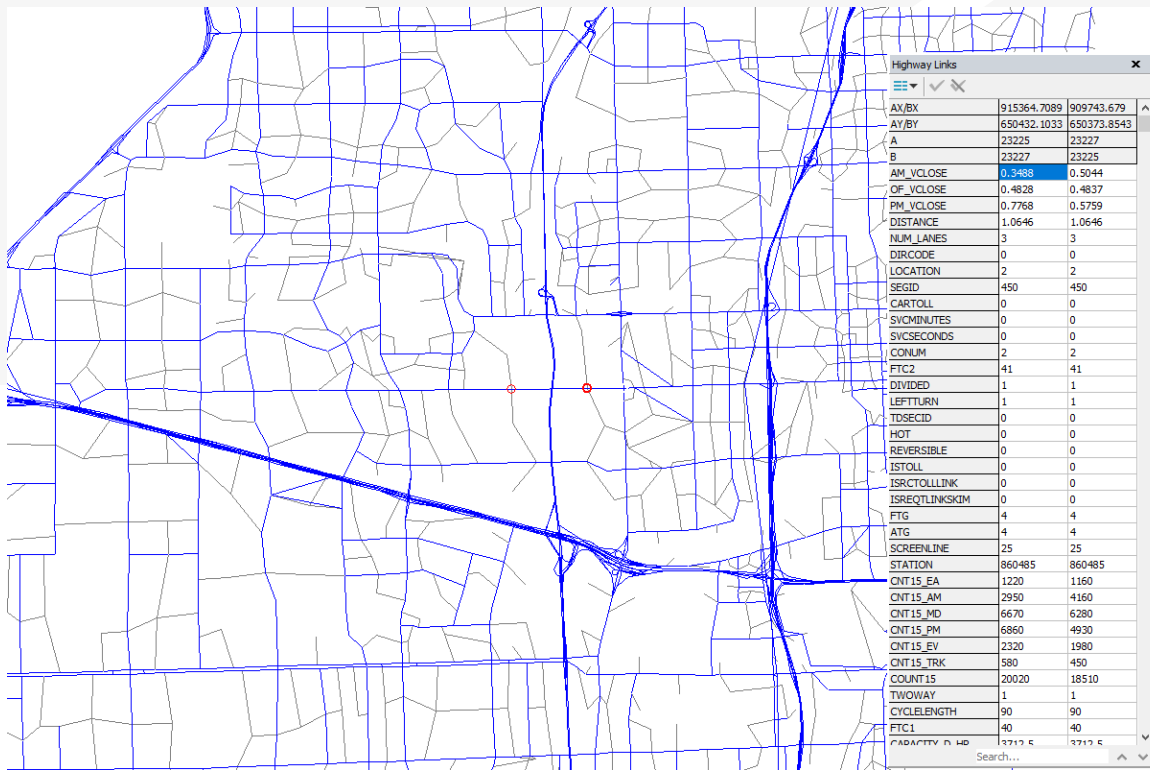- Shadow pricing guide updated in online documentation

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Traveler Characteristics Update
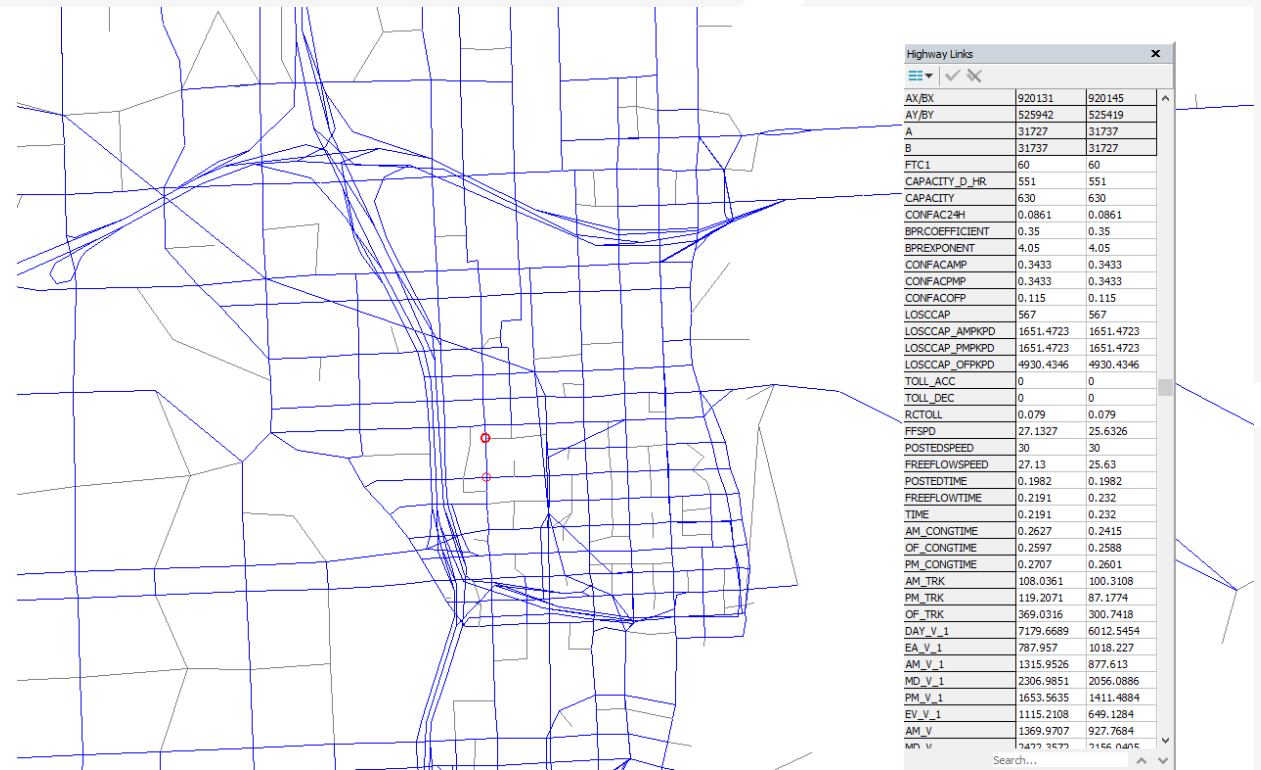
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Traveler Characteristics Utility

➤ Connect highway and transit assignment (aggregate) results to ABM disaggregate outputs

➤ Process:

» Define select link

» Run assignment-only catalog

» Analyze trips on OD-pairs identified through Select Link

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Example Links Selected

Broward Boulevard

2nd Avenue NW

CAMBRIDGE SYSTEMATICS

AM Selection Household Characteristics

Income

Legend: Broward Blvd, 2nd Ave, All Auto Trips

Income bar chart with categories: <25k, 25-50k, 50-75k, 75-100K, > 100K (y-axis 0.00 to 0.40)
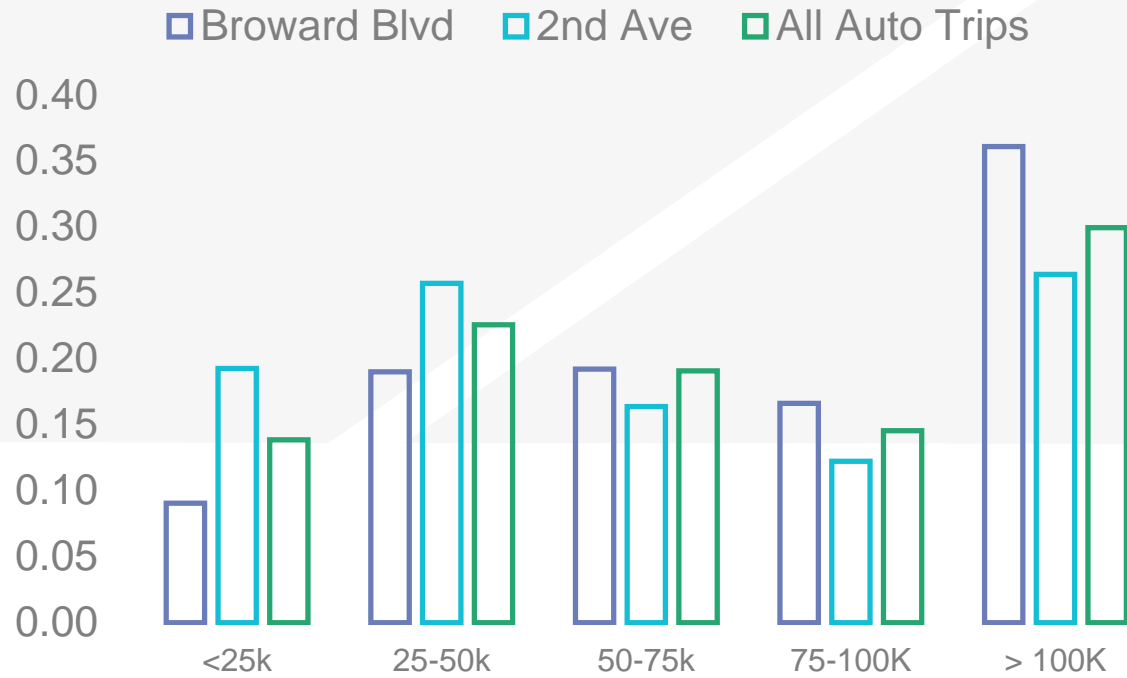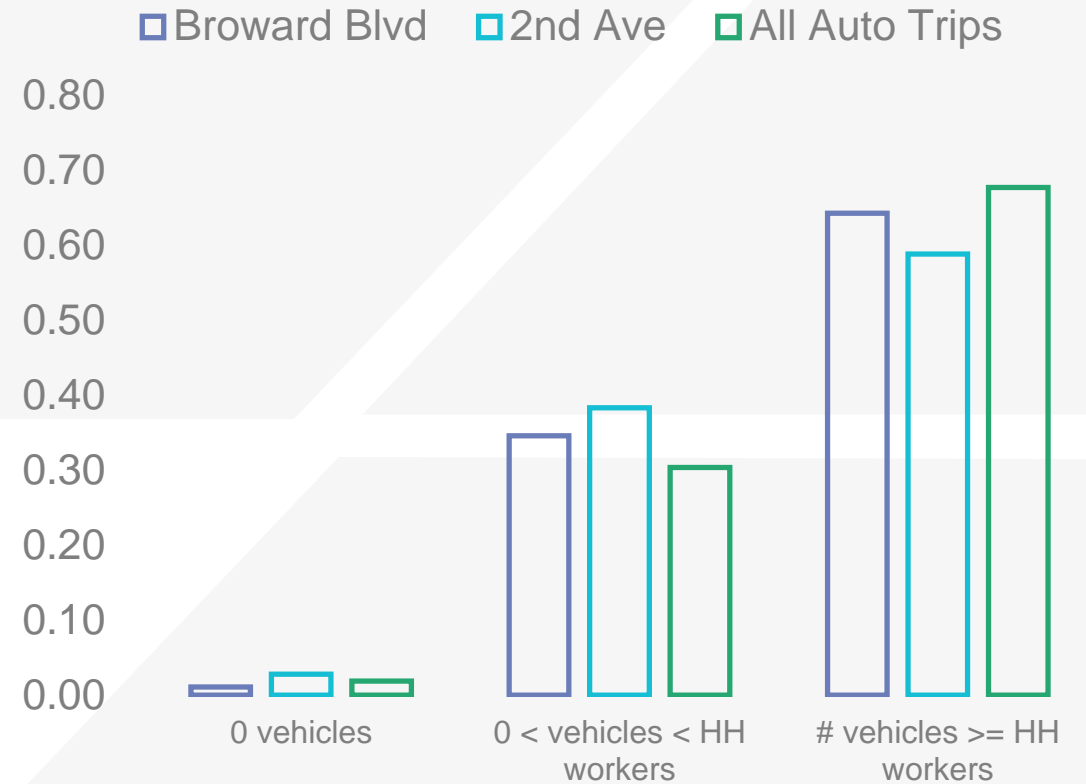
Trip Set	Average Income
AM auto trips	$ 89,202
AM auto trips – Broward Blvd	$ 98,133
AM auto trips – 2nd Ave NW	$ 83,041

Autos

Legend: Broward Blvd, 2nd Ave, All Auto Trips

Autos bar chart with categories: 0 vehicles, 0 < vehicles < HH workers, # vehicles >= HH workers (y-axis 0.00 to 0.80)

CAMBRIDGE SYSTEMATICS

AM Selection Person Characteristics

Person Type

☐ Broward Blvd ☐ 2nd Ave ☐ All Auto Trips

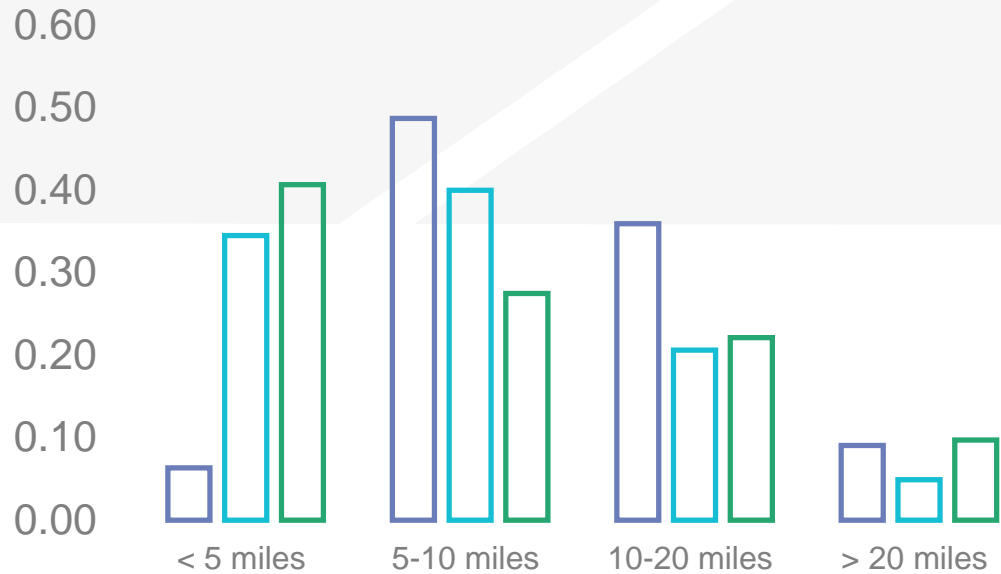|	
0.80	
0.70	
0.60	
0.50	
0.40	
0.30	
0.20	
0.10	
0.00	Child < 6 Child 6-15 Child 16+ University Full-time worker Part-time worker Non-worker Retired

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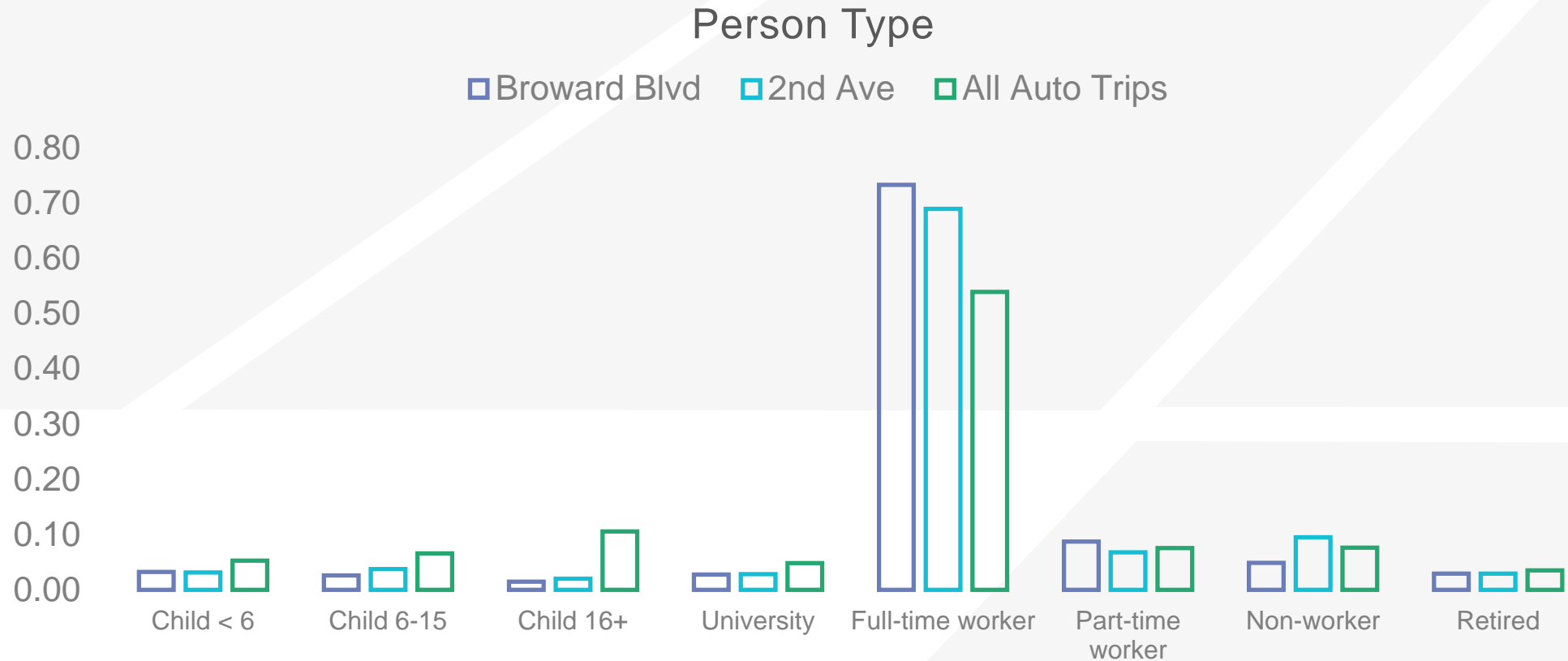
AM Selection Trip Characteristics

Trip Length

□ Broward Blvd   □ 2nd Ave   □ All Auto Trips

Trip Mode

□ Broward Blvd   □ 2nd Ave   □ All Trips

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AM Selection Trip Characteristics

Trip Destination Purpose

□ Broward Blvd □ 2nd Ave □ All Trips
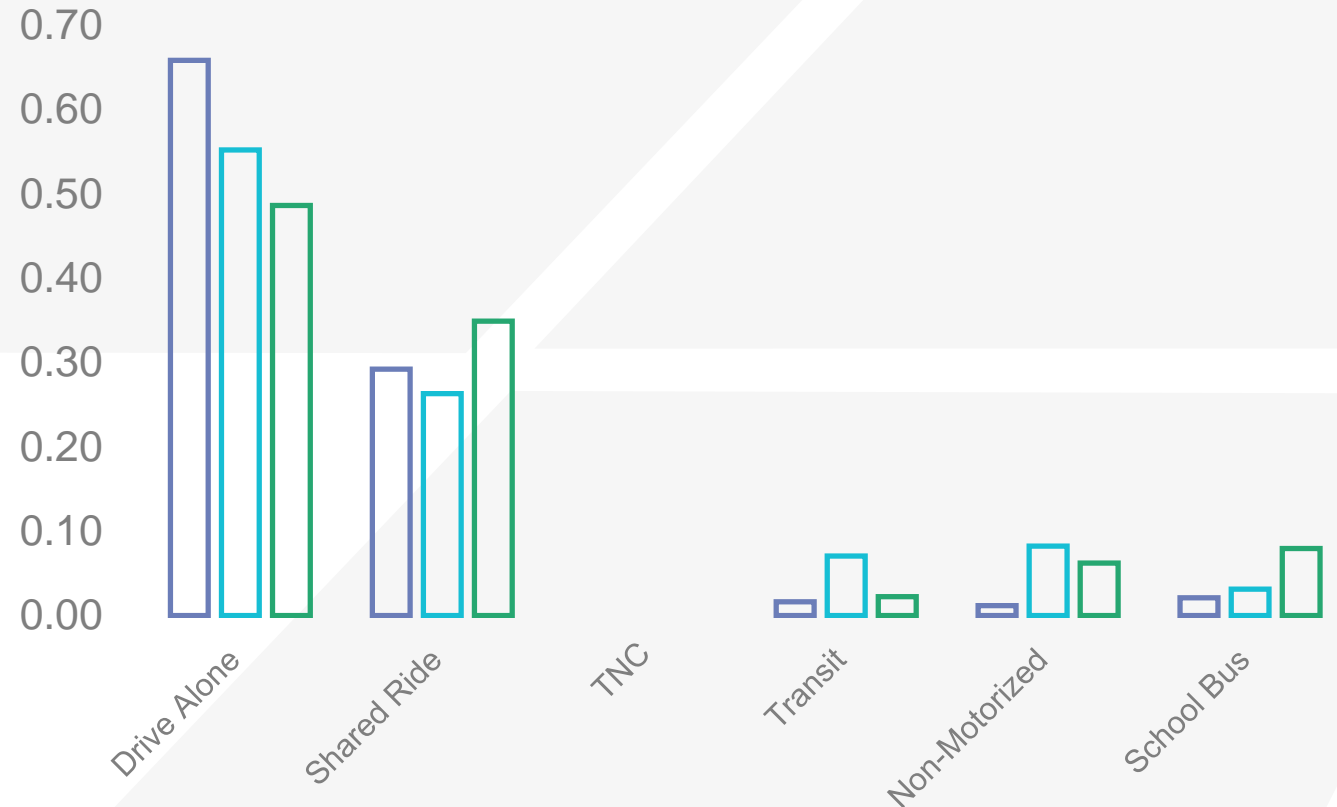
CAMBRIDGE SYSTEMATICS
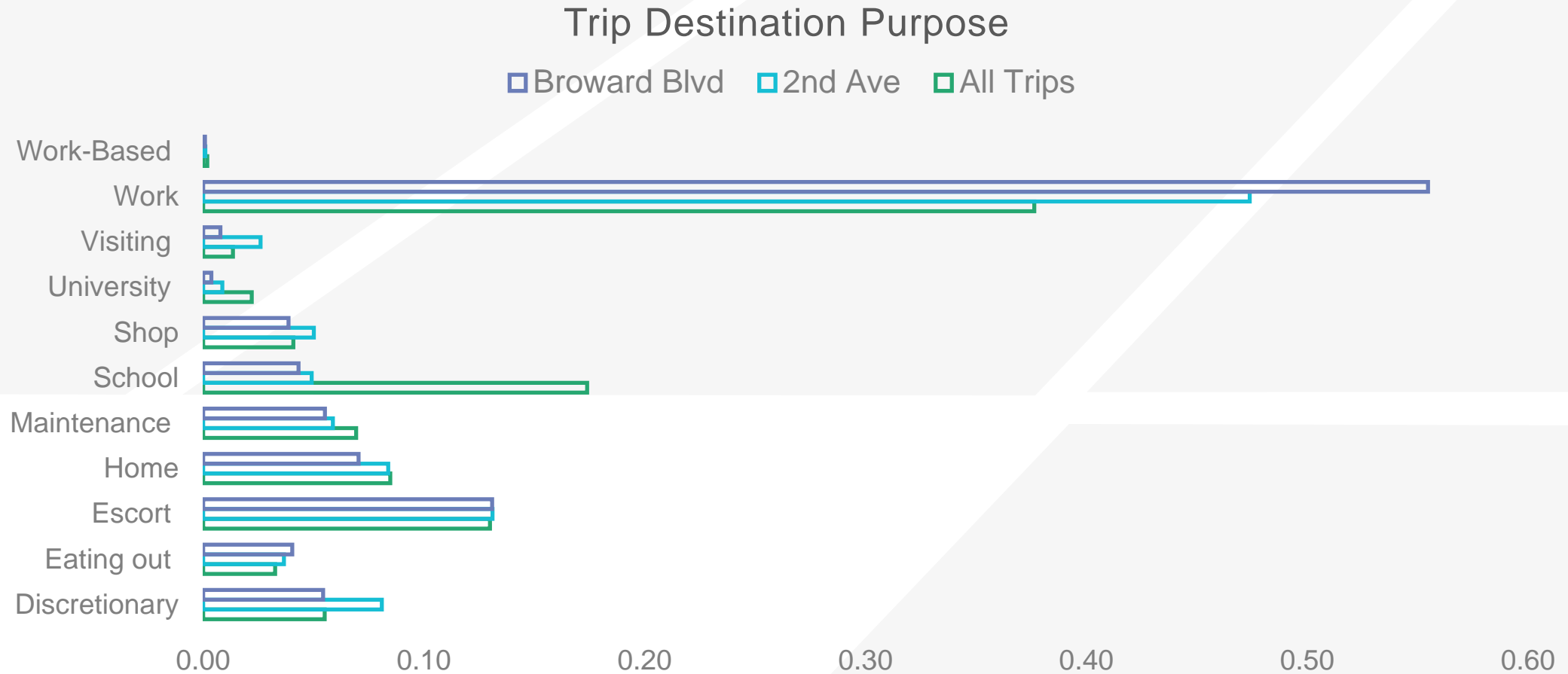
Next Steps

➤ Collect feedback on report contents

➤ Test with transit link selection

➤ Finalize report contents

➤ Integrate into Catalog – automatically generate summary when Select Link is chosen

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