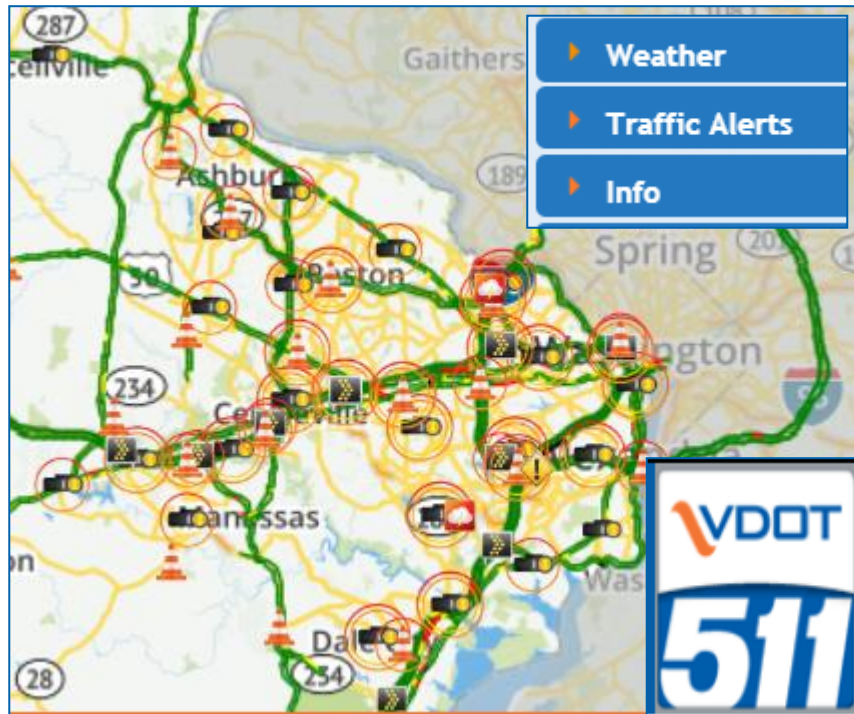# VDOT

Virginia Department of Transportation

USE OF BIG DATA FOR PROJECT PLANNING AND EVALUATION @ VDOT

Amir Shahpar, Modeling Manager,

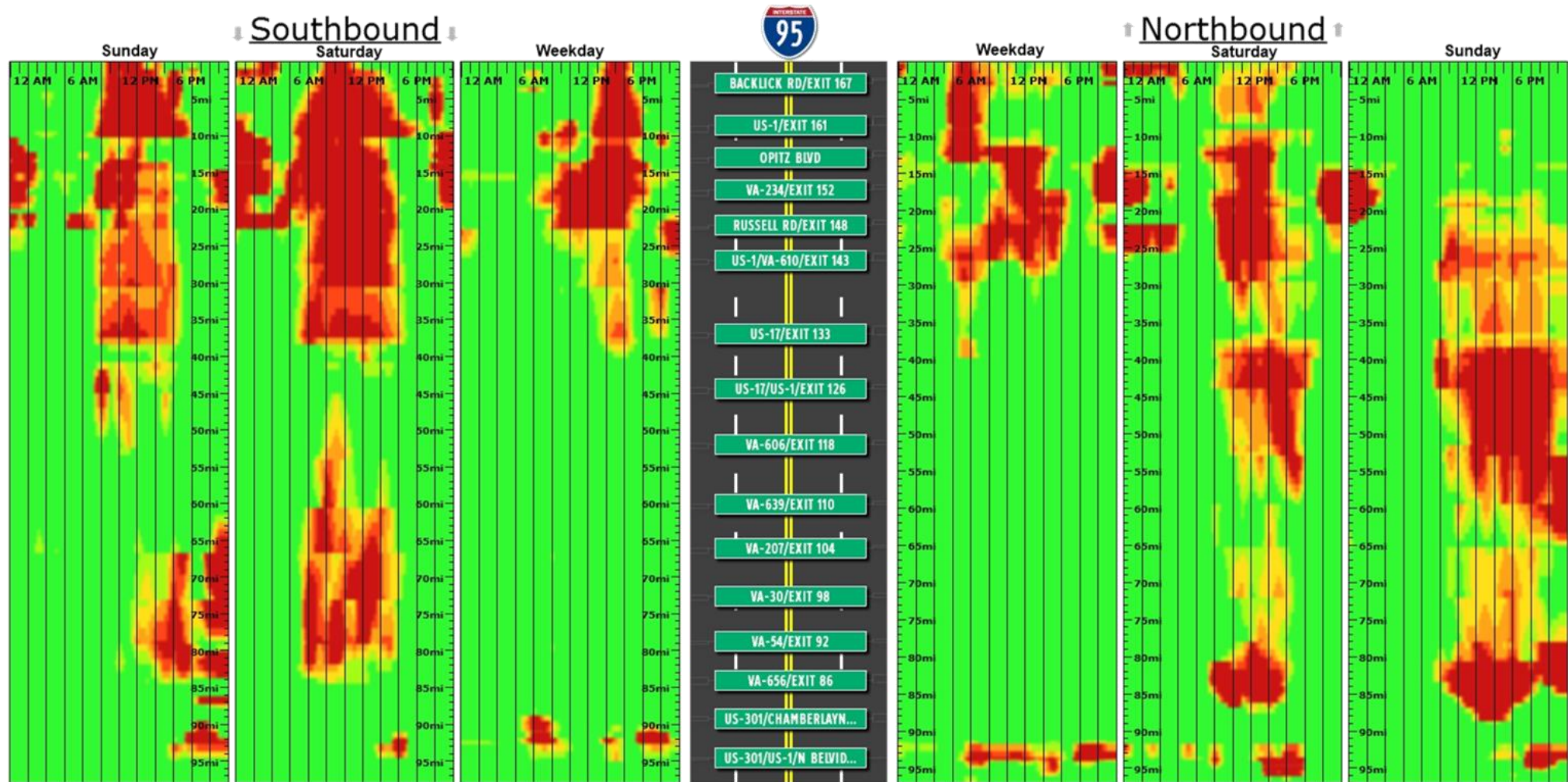Transportation Planning & Investment, VDOT NOVA District

7/20/2018

Use of Big Data to Support Decision Making Process

Travel Time Reliability Scan – INRIX data

Southbound — Northbound — I-95

Sunday | Saturday | Weekday ‖ Weekday | Saturday | Sunday

Exits (I-95):
- BACKLICK RD/EXIT 167
- US-1/EXIT 161
- OPITZ BLVD
- VA-234/EXIT 152
- RUSSELL RD/EXIT 148
- US-1/VA-610/EXIT 143
- US-17/EXIT 133
- US-17/US-1/EXIT 126
- VA-606/EXIT 118
- VA-639/EXIT 110
- VA-207/EXIT 104
- VA-30/EXIT 98
- VA-54/EXIT 92
- VA-656/EXIT 86
- US-301/CHAMBERLAYN...
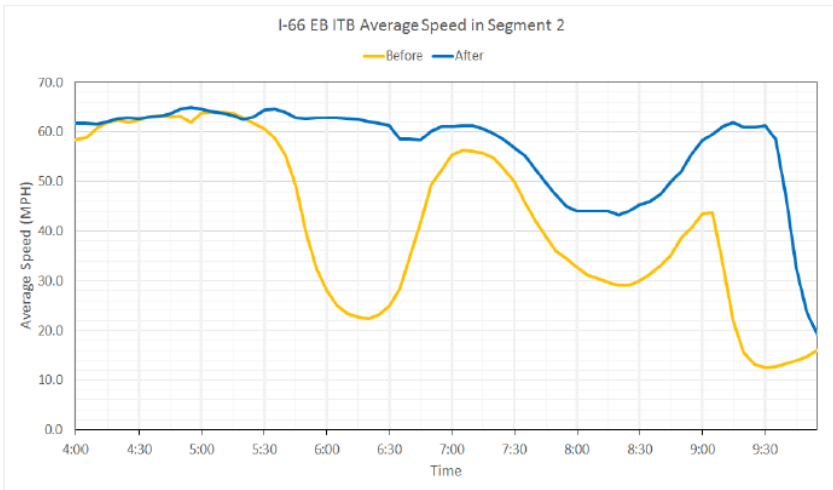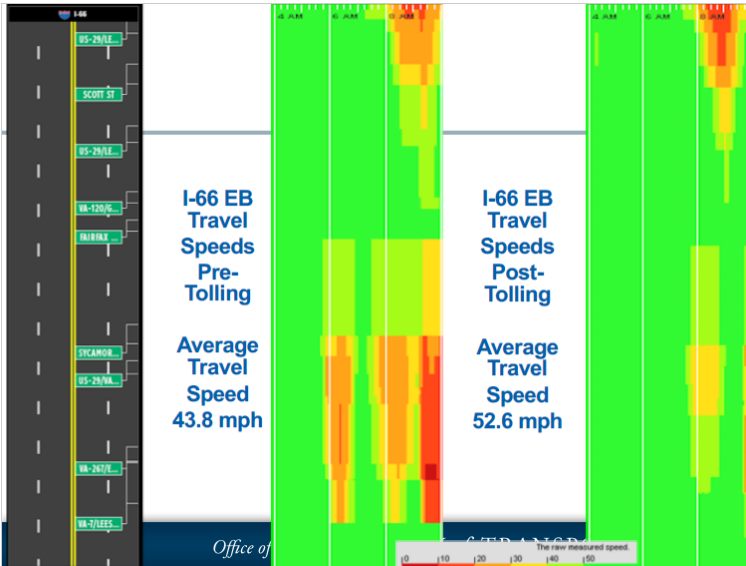- US-301/US-1/N BELVID...

The total travel time that should be planned when an adequate buffer time is included (95% Travel Time / Free-flow Travel Time).

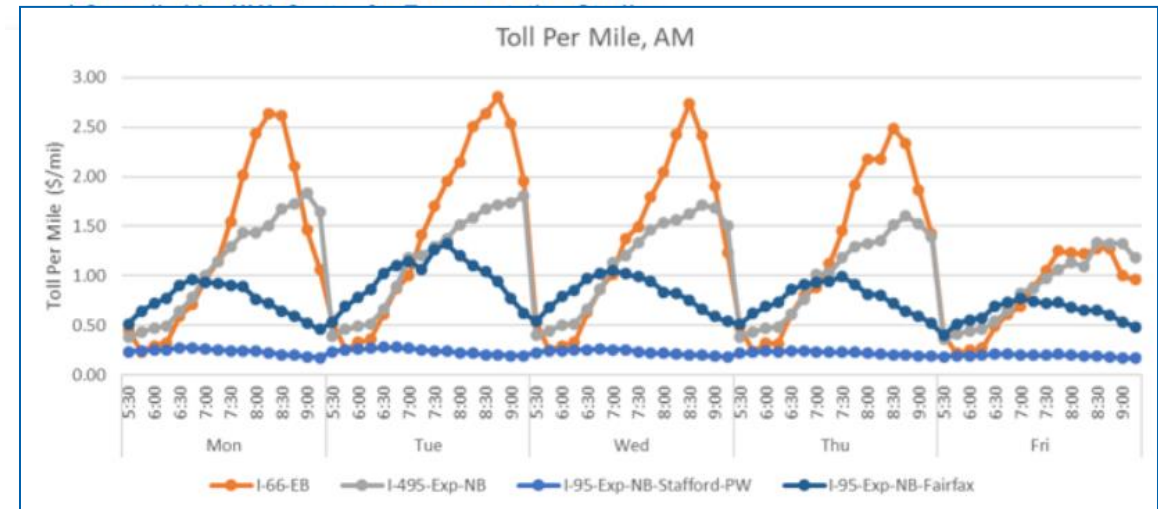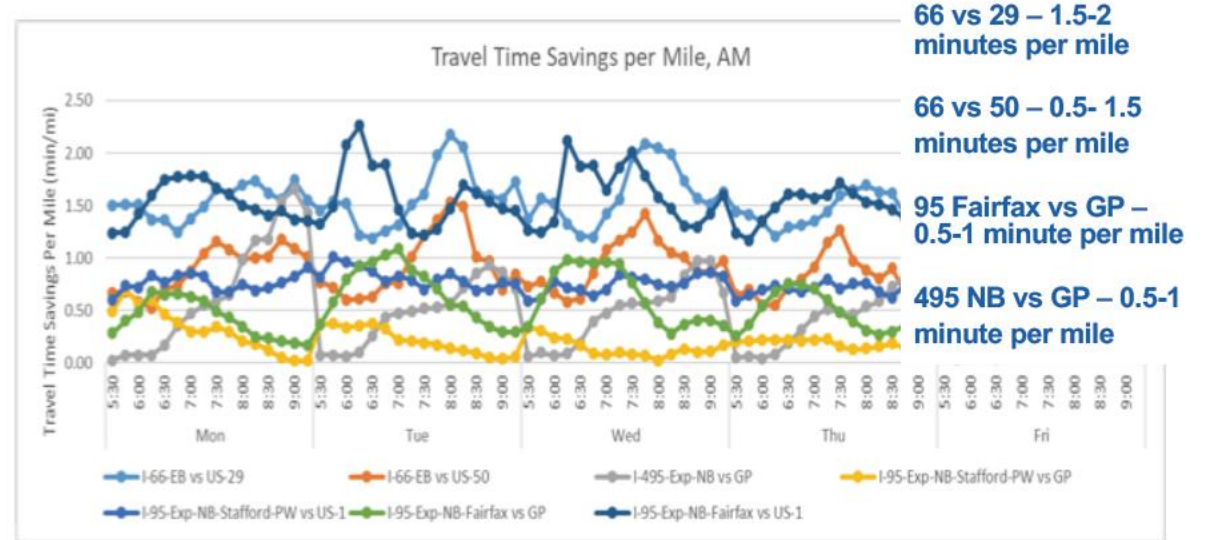| 0 | 1.3 | 1.6 | 2 | 2.5 | 3 |

Transform66 IBT: 6-Month Performance Review

I-66 EB Travel Speeds Pre-Tolling

Average Travel Speed 43.8 mph

I-66 EB Travel Speeds Post-Tolling

Average Travel Speed 52.6 mph

I-66 EB ITB Average Speed in Segment 2
Before — After

Before 37.8 mph

After 56.3 mph

48.9% increase

Travel Time Savings per Mile, AM

- I-66-EB vs US-29
- I-66-EB vs US-50
- I-495-Exp-NB vs GP
- I-95-Exp-NB-Stafford-PW vs GP
- I-95-Exp-NB-Stafford-PW vs US-1
- I-95-Exp-NB-Fairfax vs GP
- I-95-Exp-NB-Fairfax vs US-1

66 vs 29 – 1.5-2 minutes per mile

66 vs 50 – 0.5- 1.5 minutes per mile

95 Fairfax vs GP – 0.5-1 minute per mile

495 NB vs GP – 0.5-1 minute per mile

Toll Per Mile, AM

- I-66-EB
- I-495-Exp-NB
- I-95-Exp-NB-Stafford-PW
- I-95-Exp-NB-Fairfax

VDOT

VTrans 2040 Corridor Transportation Needs
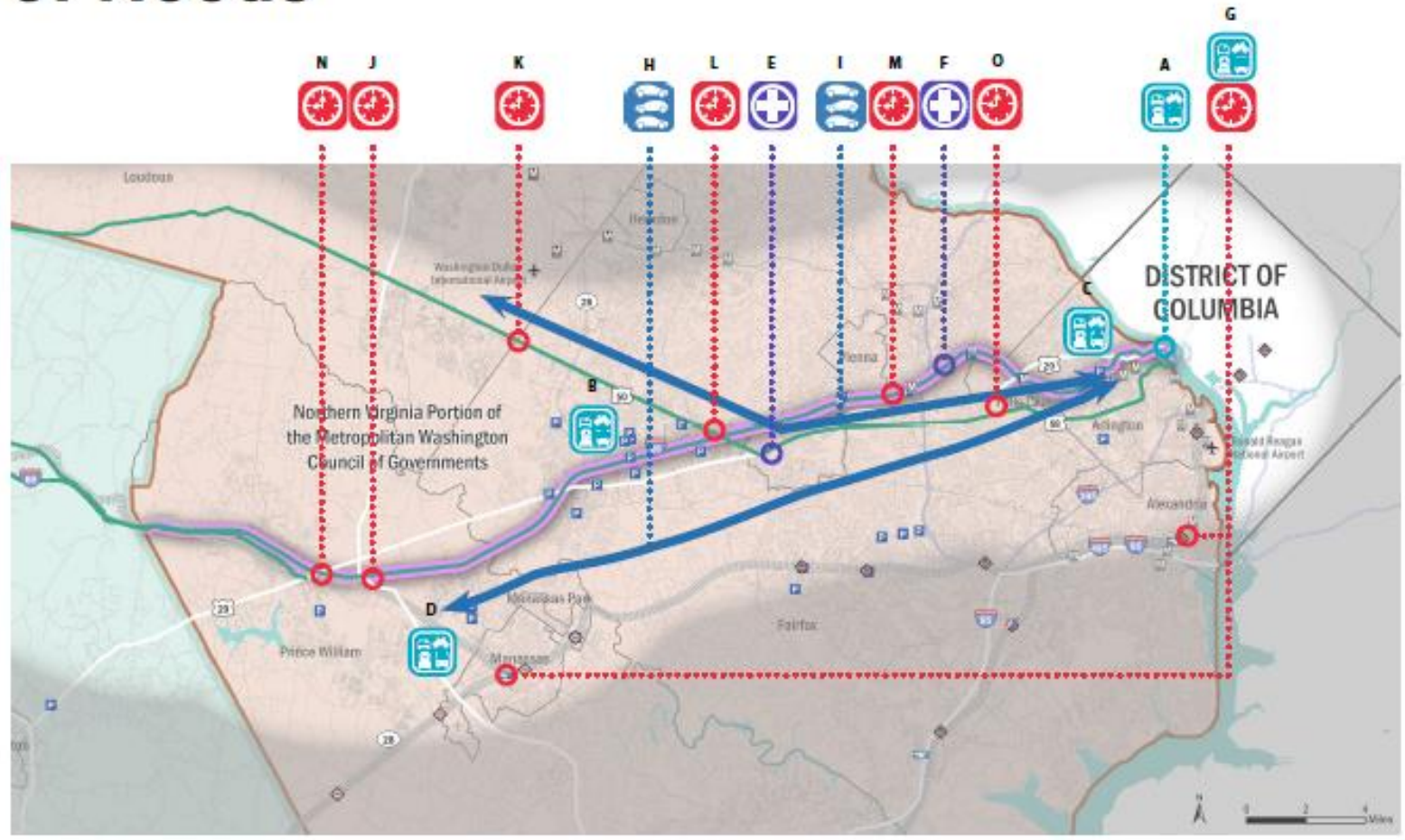
StreetLight Data Big Data Resources

Key Characteristics of Our Locational Big Data	
Multiple Types of Data	• Location-Based Services records • Navigation-GPS records
Sample Size	• Covers ~23% of adult population in US and Canada • Unbiased sample backed up with automated normalization
Spatial Precision and Coverage	• As precise as 5-25 meters, average better than 18 meters • 4-carrier coverage – no rural gaps
Temporal Precision	• One-hour intervals • Weekends vs. weekdays
Archival Data	• Monthly data periods from 2014 through "month before last"
Privacy Protection	• All data is de-identified by our suppliers • No personally identifying information • Metrics are aggregated into groups
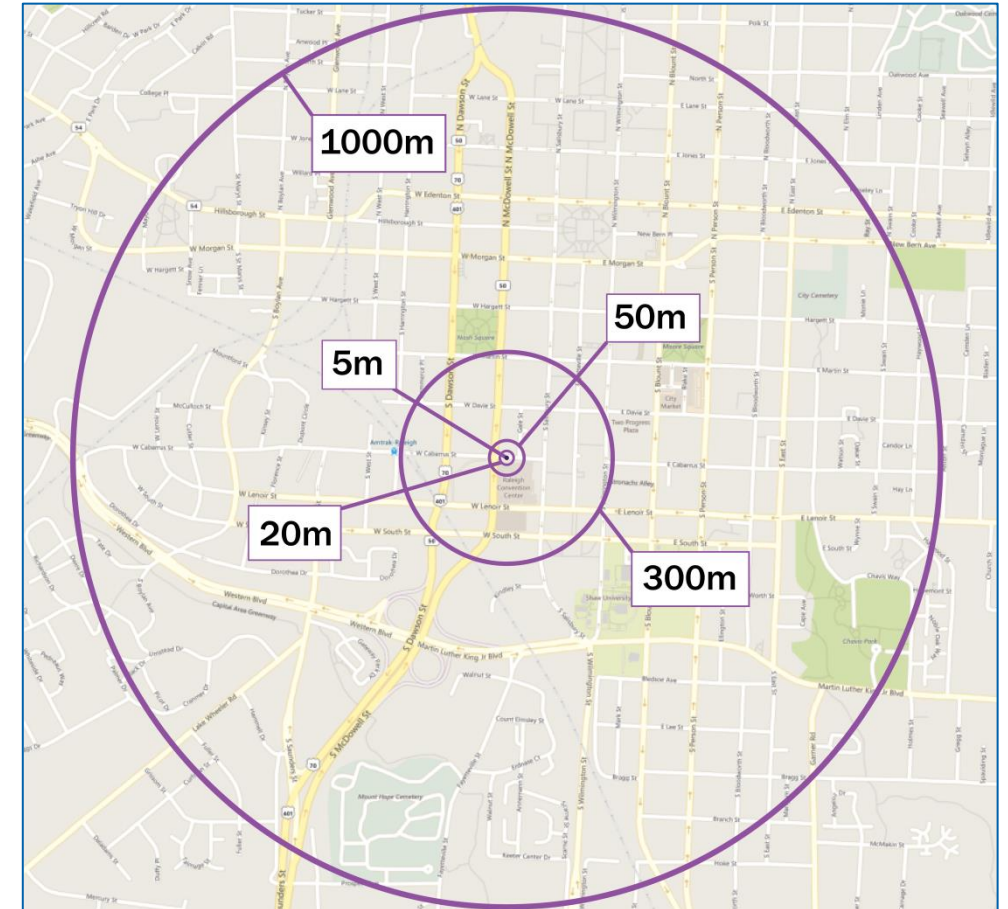
This image shows a location record's potential location at different levels of spatial precision. At 300m to 1000m spatial precision, records cannot provide corridor- or intersection-level insights.

STREETLIGHTDATA

StreetLight's Data Processing Engine

Input:
Big Data

Processing:
RouteScience®

Output:
***StreetLight InSight* Metrics**

Anonymous
and accurate
Big Locational Data

Road network,
land use, parcel,
census and more
Contextual Data

CLEAN

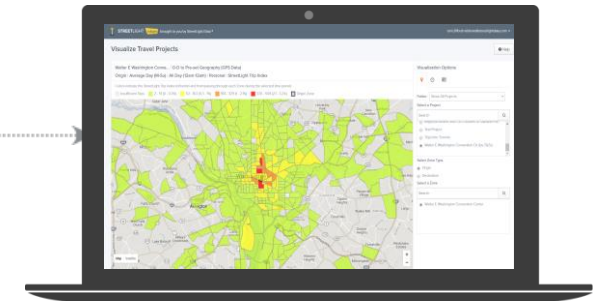STREETL|GHTDATA

CONTEXTUALIZE

AGGREGATE

Basic Metrics:
Origin-Destination, Select Link, Zone Activity

Premium Metrics:
AADT, Trip Attributes, Traveler Attributes, Commercial Tours, Home and Work Analysis

Customization:
Zones, Day Parts, Day Types, Data Period
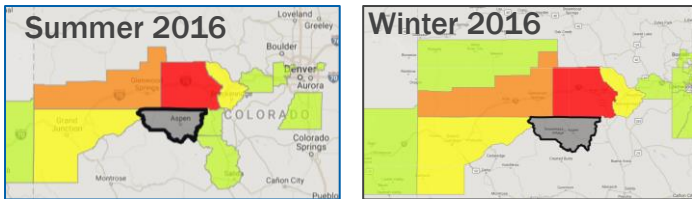
STREETL|GHTDATA

StreetLight Sample Applications
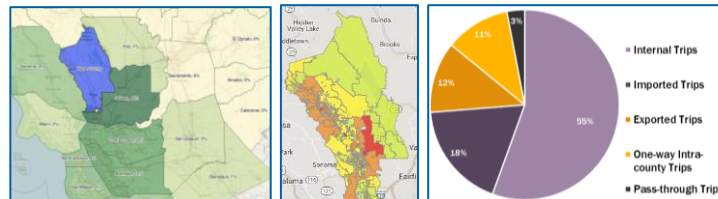
Travel Demand Modeling
Calibrate with Empirical, Comprehensive O-D

Understand Seasonal & Weekday/Weekend Trends
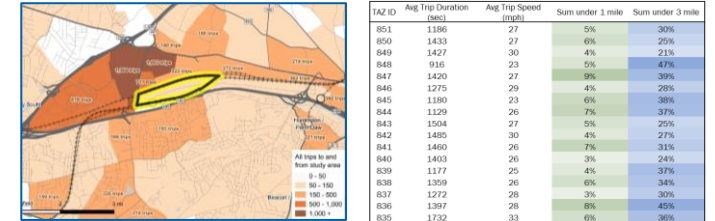
Long-Term Planning
Study Regional Patterns & Engage With the Public

Study Regional Trends
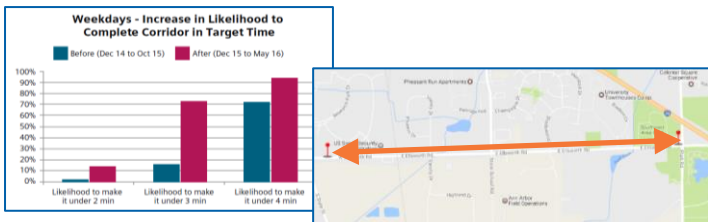
Travel Demand Management
Scan for High-Potential Project Opportunities

Scanned for "Displaceable Vehicle Trips" with StreetLight InSight
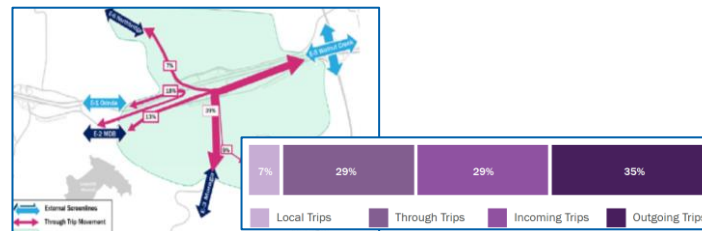
Performance Measurement
Evaluate AADT, Travel Time Reliability, & More

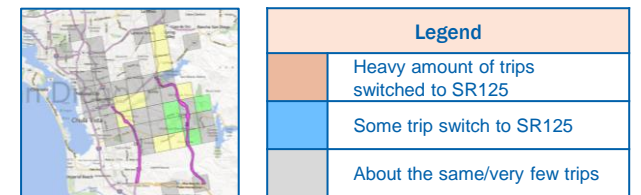*Study the Impact of its ITS Traffic Signals on Travel Time Reliability*

Congestion Studies
Identify the Cause of Congestion

Analyze Downtown Congestion

Project Evaluations
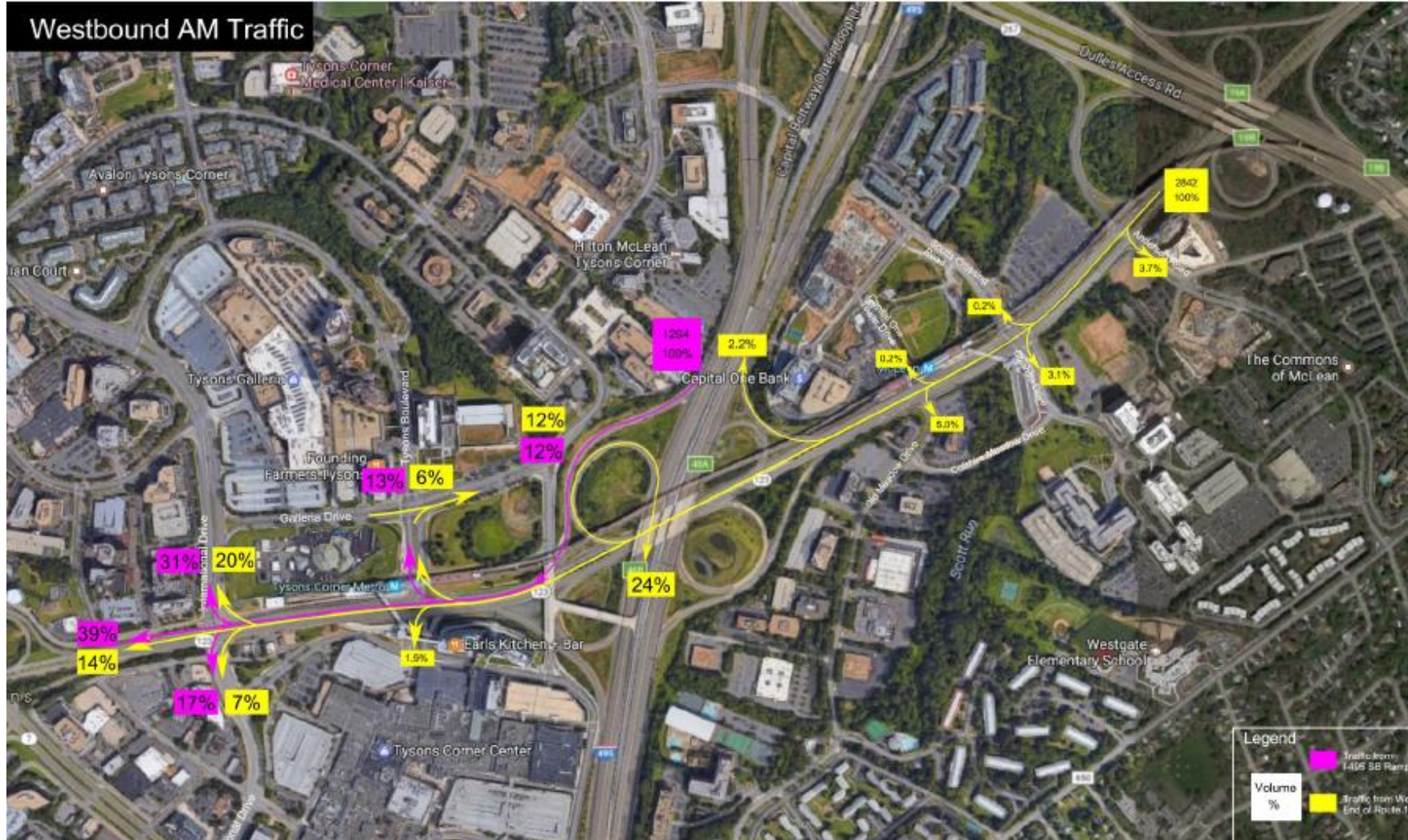### Easily Conduct "Before & After" Studies

Determine the Impact of a Toll on Behavior

STREETLIGHTDATA
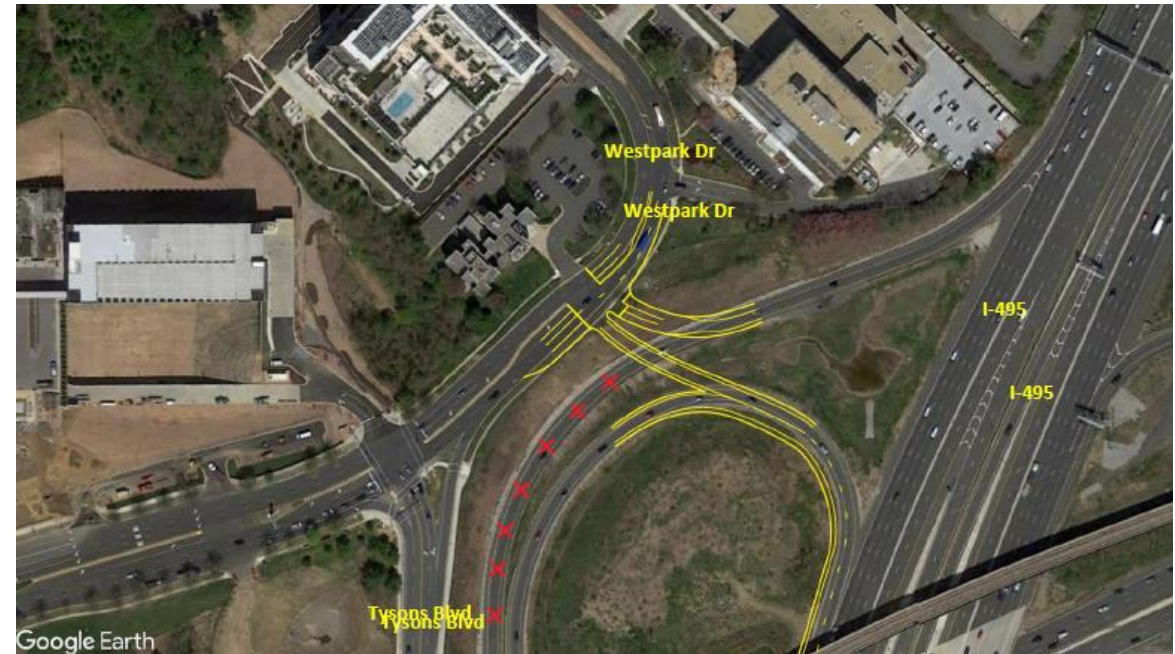
Application of StreetLight Data in VDOT NOVA District

1. Develop Congestion Management Concepts - Chain Bridge Rd Corridor Study

2. Travel Demand Model Validation

3. Develop Traffic Volume for New Facility - Northstar Blvd

4. Origin-Destination Analysis - Horner Rd Park-n-Ride
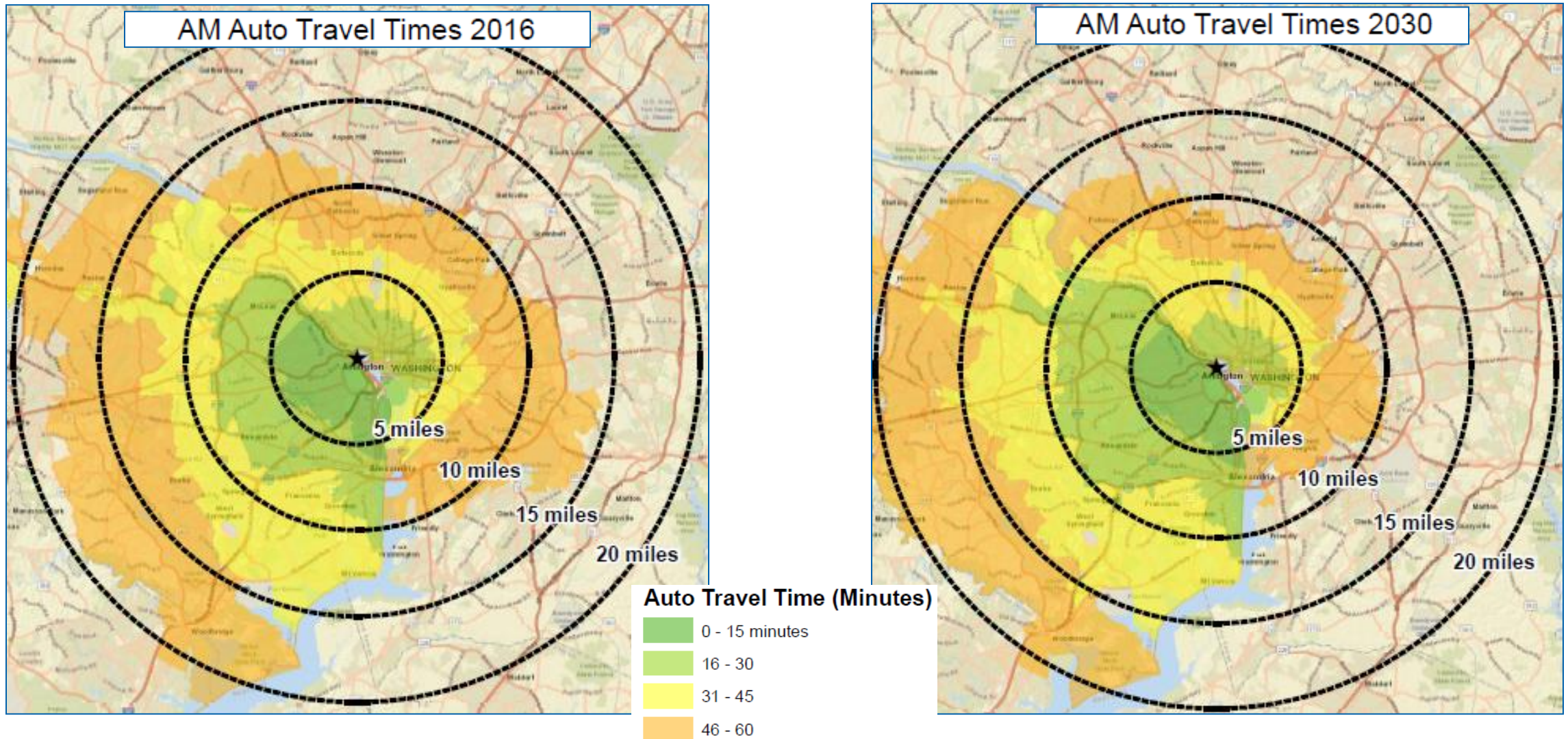
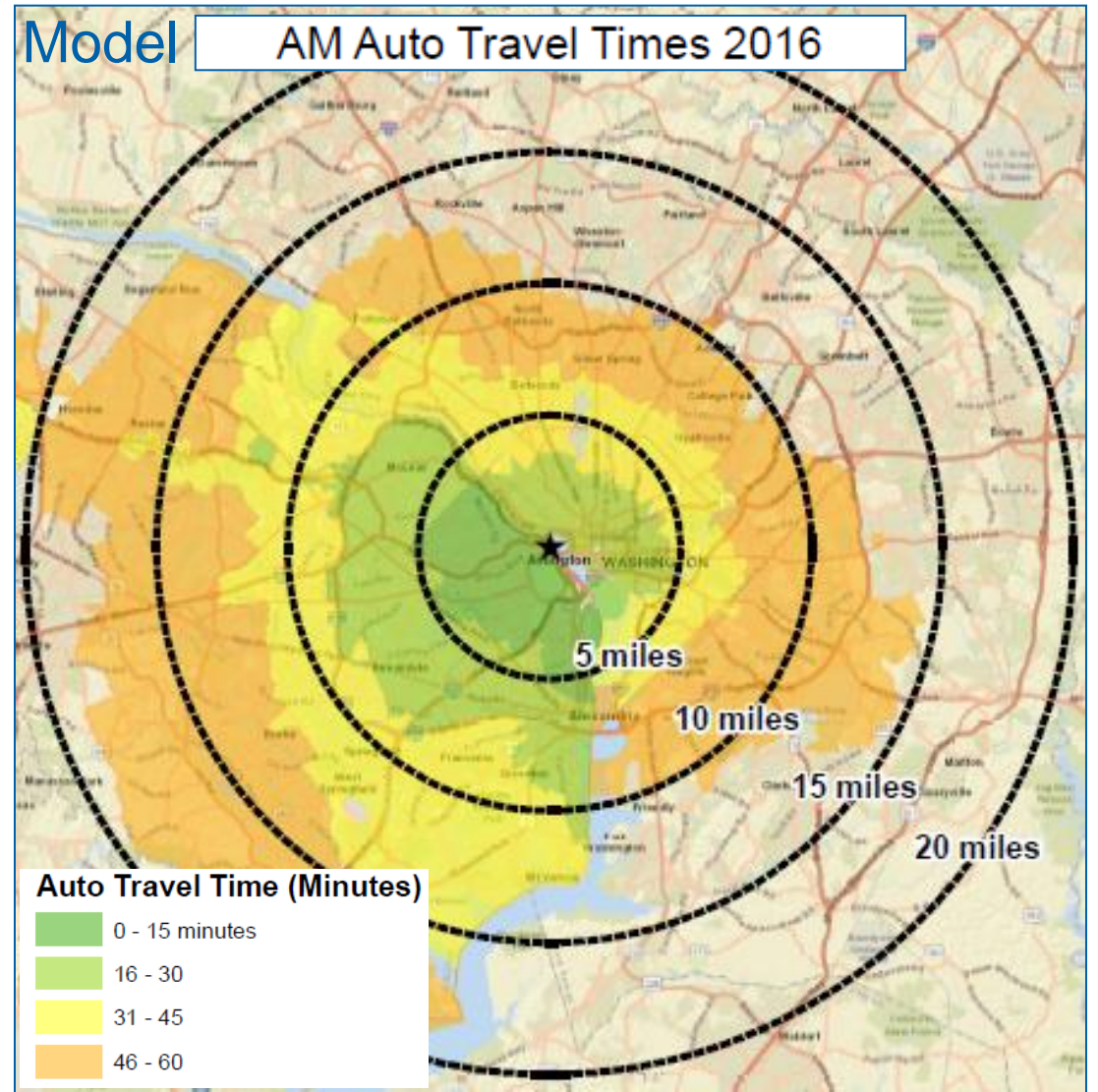# Chain Bridge Rd Corridor Study

Draft Corridor Improvement Concepts

Validate MPO TDM Travel Time

AM Auto Travel Times 2016

AM Auto Travel Times 2030

Auto Travel Time (Minutes)
- 0 - 15 minutes
- 16 - 30
- 31 - 45
- 46 - 60

Validate MPO TDM Travel Time

StreetLight

Model

AM Auto Travel Times 2016

5 miles
10 miles
15 miles
20 miles

Auto Travel Time (Minutes)
- 0 - 15 minutes
- 16 - 30
- 31 - 45
- 46 - 60
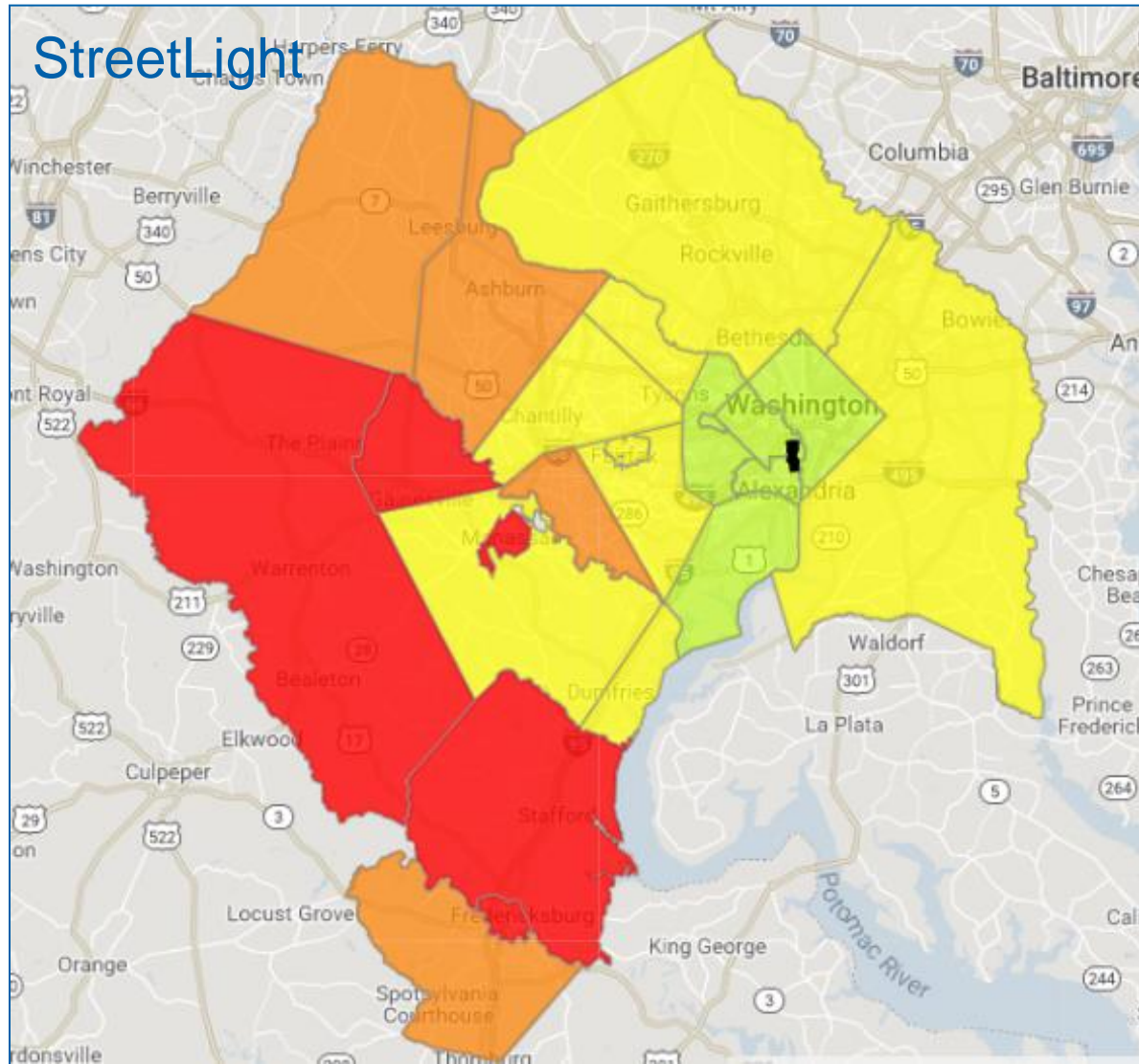
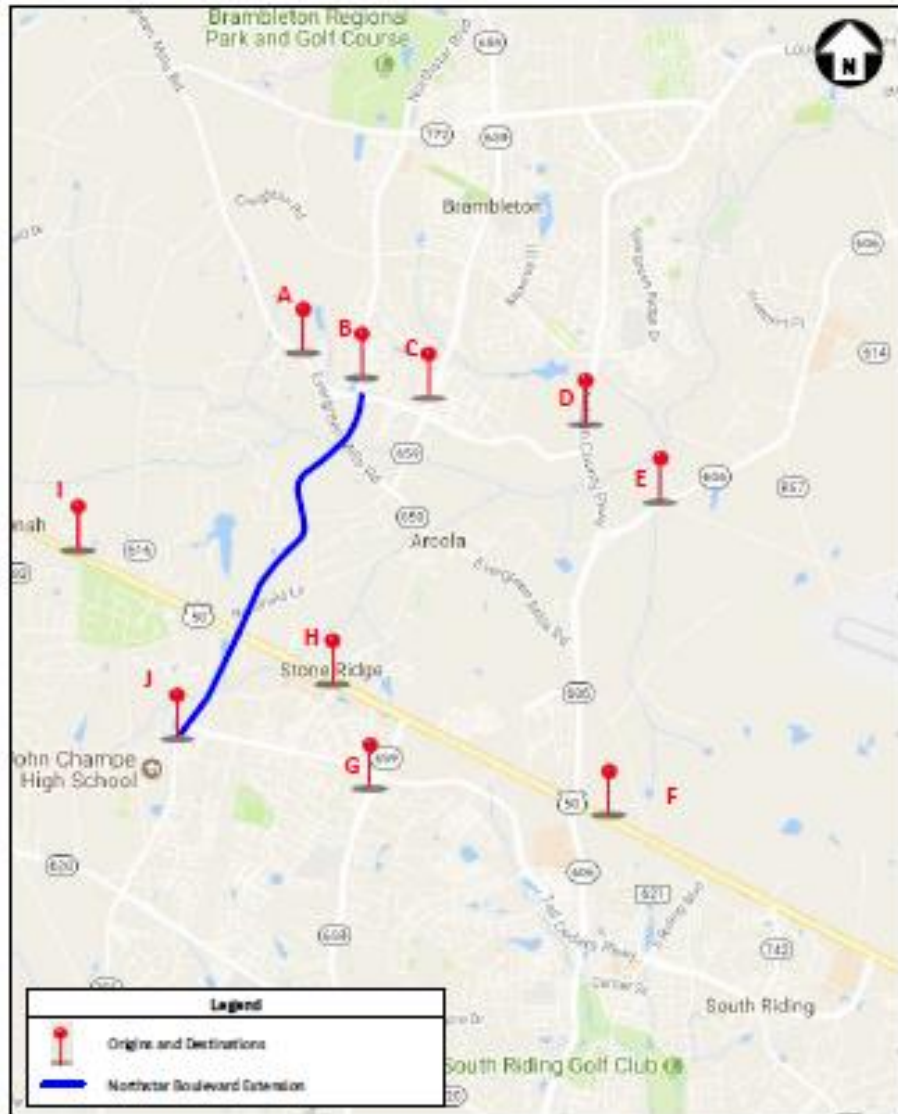# Develop Future Volume – Northstar Boulevard

GOROVE / SLADE
Transportation Planners and Engineers

Table 1: % of Origin Trips Ending At Destination (AM Peak)

AM Origin Labels	Origin Description	A — Evergreen Mills Rd, West of Shreveport Dr	B — Northstar Blvd, North of Shreveport Dr	C — Belmont Ridge Rd, North Shreveport Dr
A	Evergreen Mills Rd, West of Shreveport Dr	-	0.00%	51.30%
B	Northstar Blvd, North of Shreveport Dr	3.97%	-	0.00%
C	Belmont Ridge Rd, North Shreveport Dr	0.00%	0.00%	-
D	Loudoun County Pkwy, North of Shreveport Dr	0.00%	0.00%	0.00%
E	Old Ox Rd, East of Loudoun County Pkwy	4.21%	0.00%	2.20%
F	Route 50, East of Loudoun County Pkwy	13.12%	0.00%	1.85%
G	Gum Spring Rd, South of Tall Cedars Pkwy	0.39%	0.00%	5.61%
H	Stone Springs Blvd, South of Rt 50	0.71%	0.71%	19.17%
I	Route 50, West of Fleetwood Rd	0.00%	0.00%	3.45%
J	Northstar Blvd, South of Tall Cedars Pkwy	0.62%	0.00%	12.58%

Notes: Green highlighting indicates O-D paths that are susceptible to shifting to the proposed Northstar Boulevard Extension study

Table 2: % of O-D Trips Assumed to Shift to New Northstar Boulevard Link (AM Peak)

AM Origin Labels	Origin Description	A — Evergreen Mills Rd, West of Shreveport Dr Remain	A — Shift	B — Northstar Blvd, North of Shreveport Dr Remain	B — Shift	C — Belmont Ridge Rd, North Shreveport Dr Remain	C — Shift
A	Evergreen Mills Rd, West of Shreveport Dr	-	-	100.00%	0.00%	100.00%	0.00%
B	Northstar Blvd, North of Shreveport Dr	100.00%	0.00%	-	-	100.00%	0.00%
C	Belmont Ridge Rd, North Shreveport Dr	100.00%	0.00%	100.00%	0.00%	-	-
D	Loudoun County Pkwy, North of Shreveport Dr	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
E	Old Ox Rd, East of Loudoun County Pkwy	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
F	Route 50, East of Loudoun County Pkwy	20.00%	80.00%	100.00%	0.00%	100.00%	0.00%
G	Gum Spring Rd, South of Tall Cedars Pkwy	100.00%	0.00%	100.00%	0.00%	20.00%	80.00%
H	Stone Springs Blvd, South of Rt 50	100.00%	0.00%	100.00%	0.00%	50.00%	50.00%
I	Route 50, West of Fleetwood Rd	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
J	Northstar Blvd, South of Tall Cedars Pkwy	100.00%	0.00%	100.00%	0.00%	0.00%	100.00%

Notes: Green highlighting indicates O-D paths that are susceptible to shifting to the proposed Northstar Boulevard Extension study

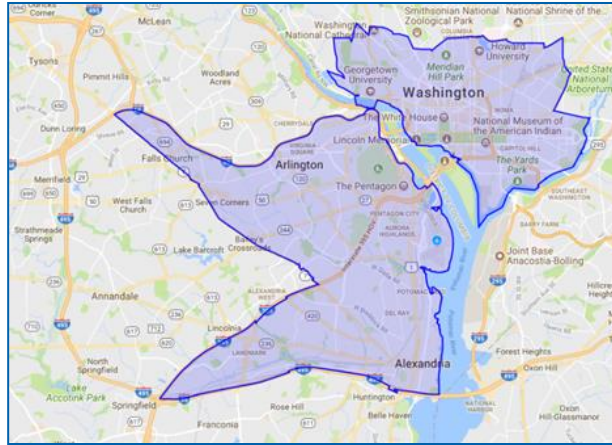# Origin-Destination Analysis - Horner Rd Park-n-Ride

Summit School Rd Extension

Horner Road Park and Ride Lot

Origin Heat Map

Origin set
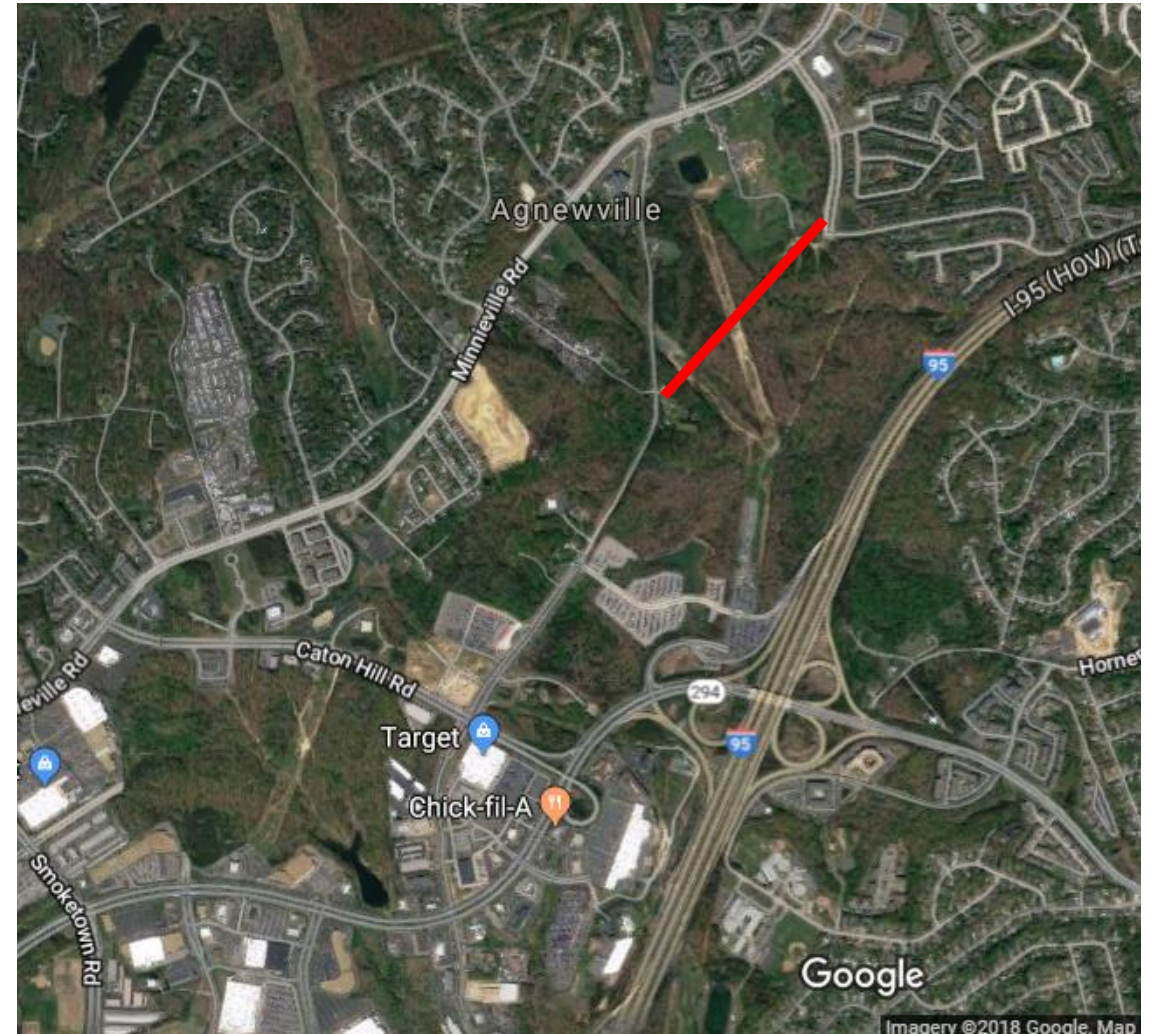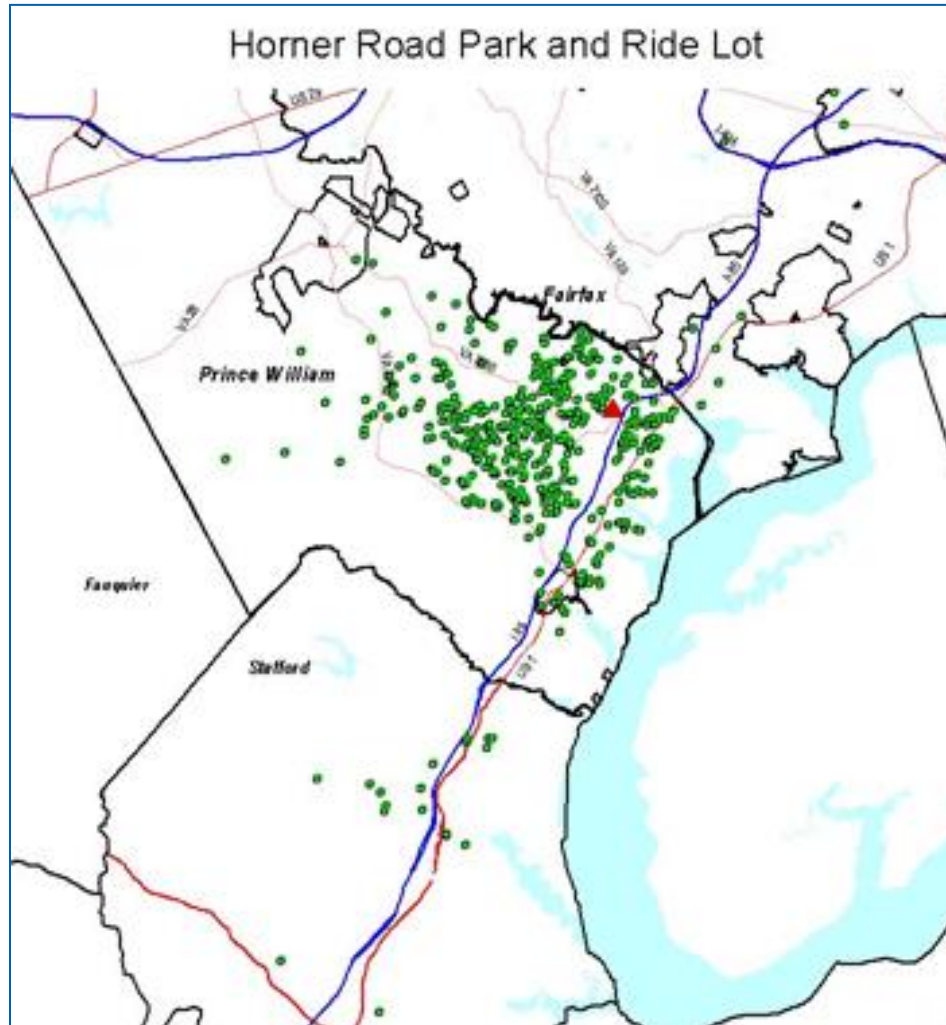
Destination set

Colors indicate the Traffic Volume (StreetLight Trip Index) from each origin Zone during the selected time period.
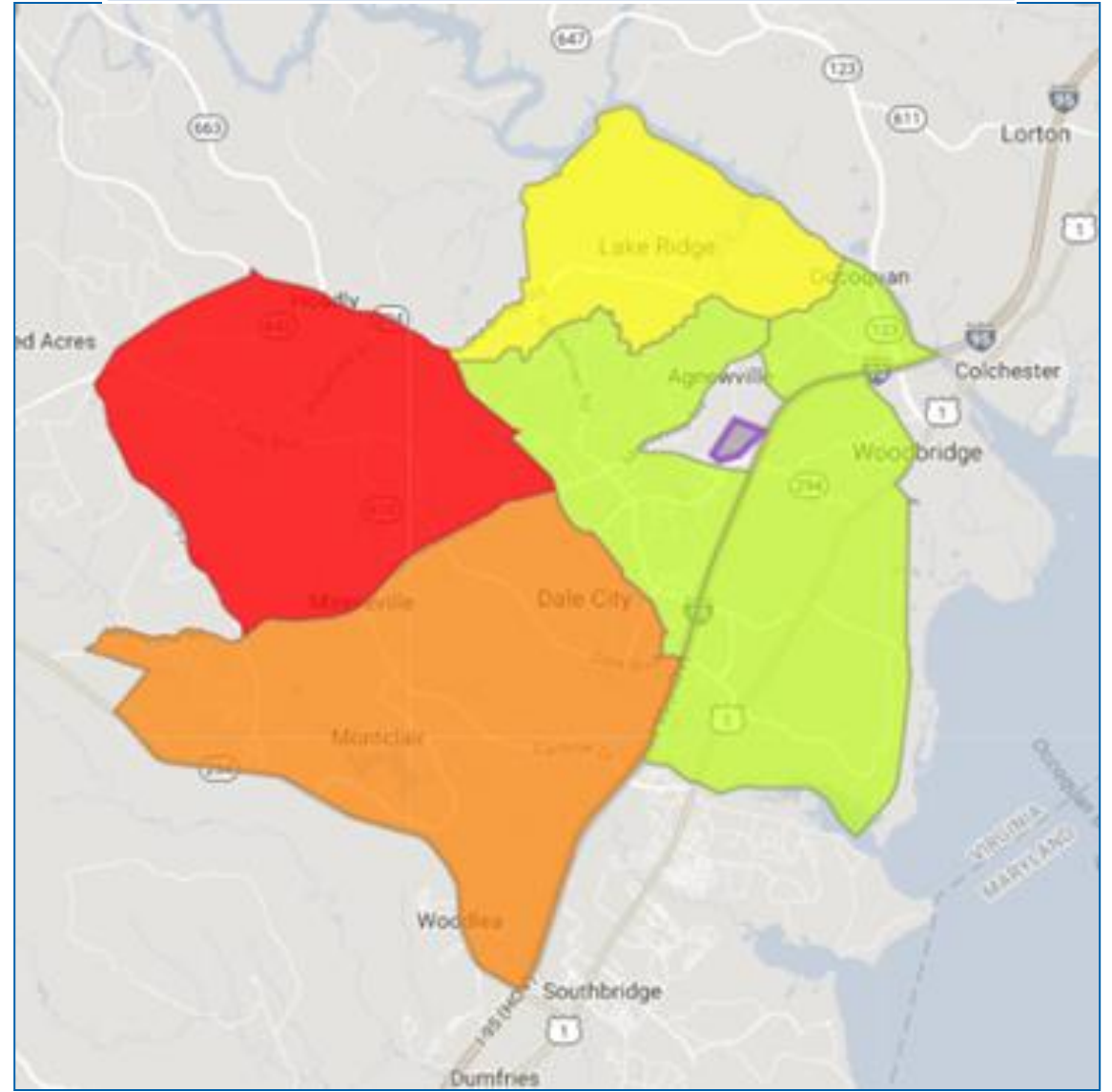
Insufficient Trips | 29 - 63 (0 - 10%) | 64 - 110 (10 - 17.5%) | 111 - 159 (17.5 - 25.2%) | 160 - 212 (25.2 - 33.7%)

Destination Zone | Middle Filter Zone
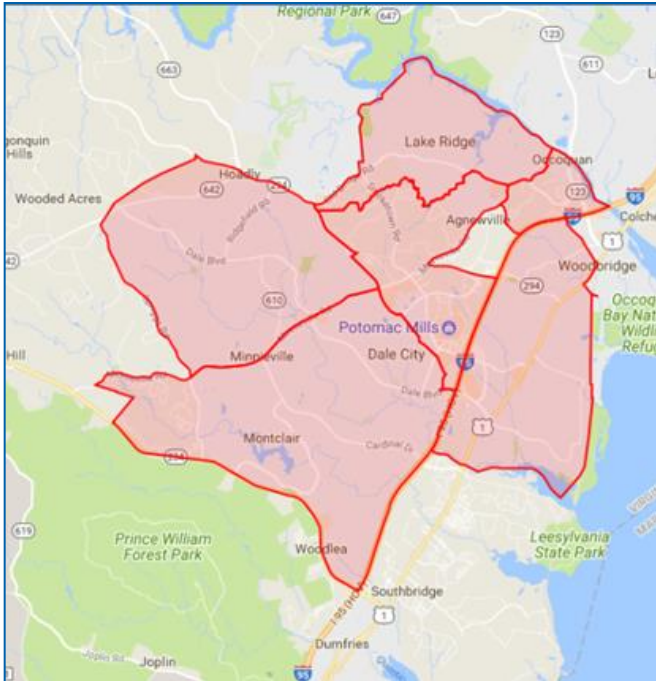
Other Modeling Capabilities

New Publication - 2018

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