Introduction to **StreetLight Data**

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The Wheel of Putting Big Data to Work

1. Who we are

2. Our data sources

3. How StreetLight InSight® changes transportation planning

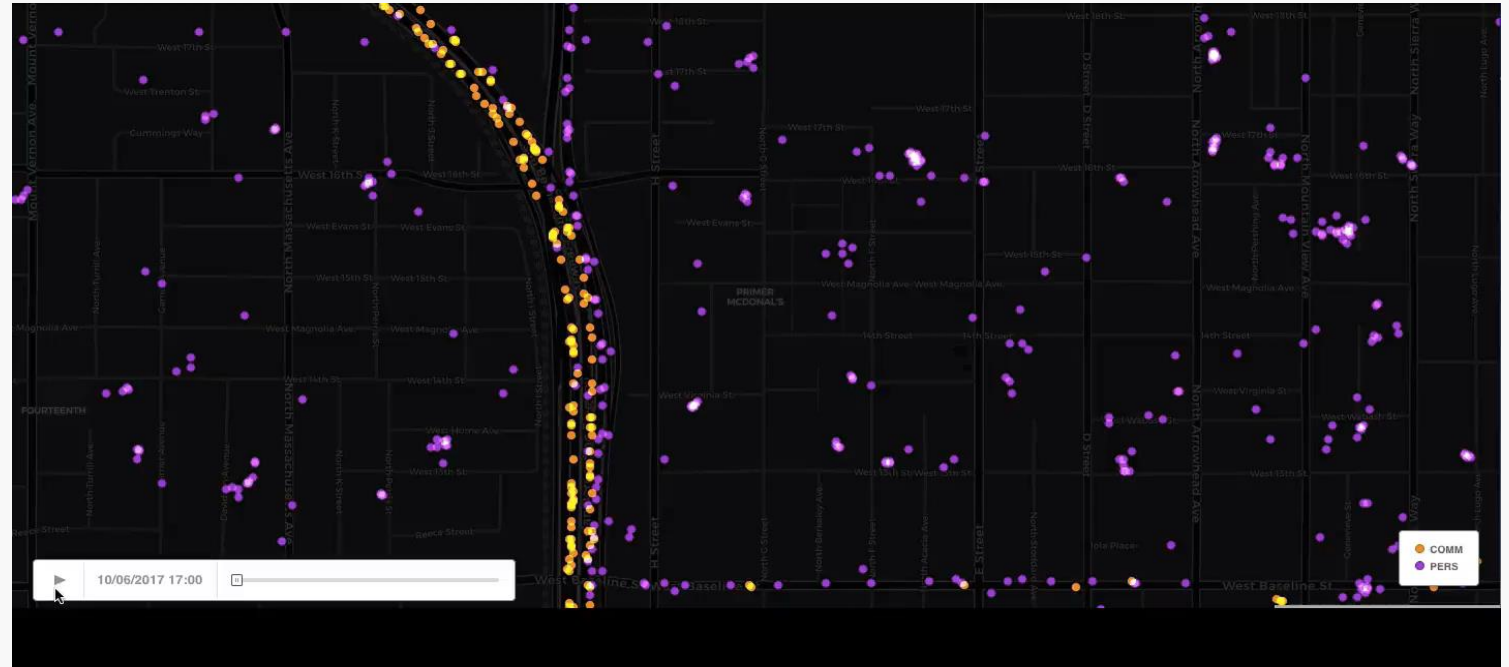4. StreetLight Data metrics

5. Q&A

Put Big Data to Work with StreetLight Data

We simplify data-driven infrastructure and policy planning by providing the best **Big Data resources and software together.**
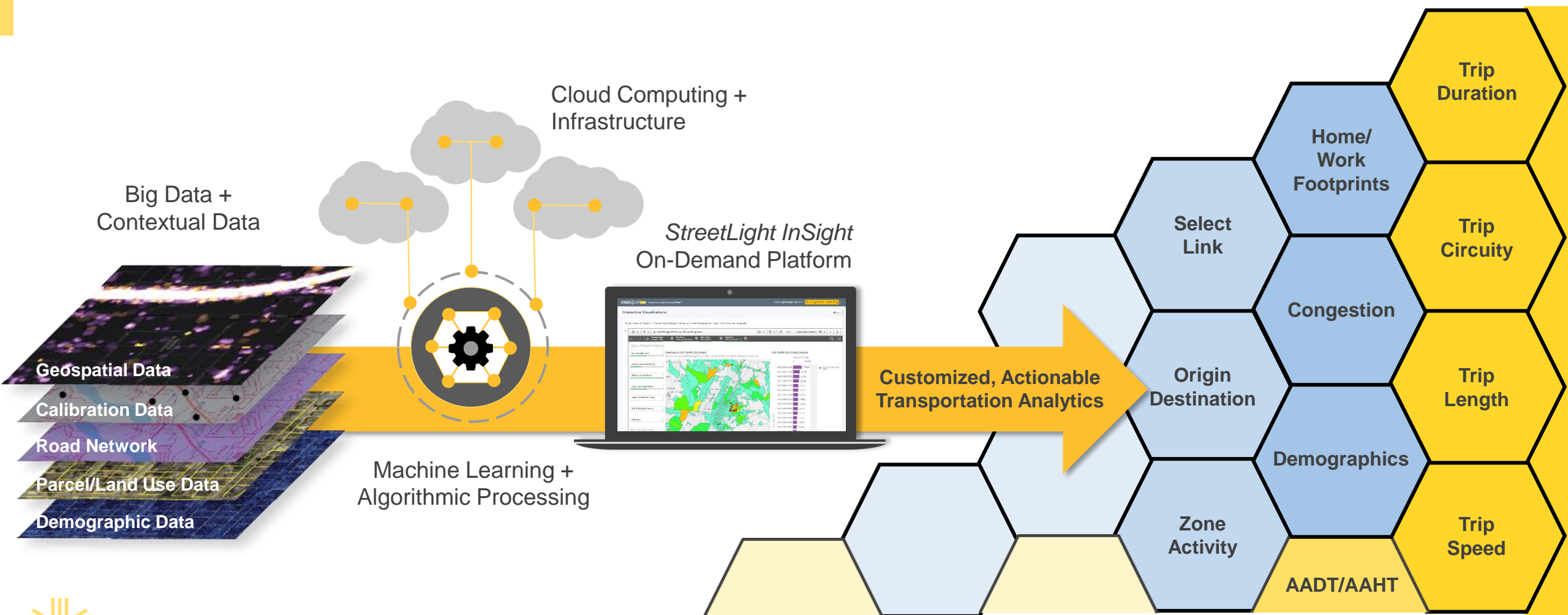
What Big Data are we working with?

Mobile device data from ~23% of US and Canadian adults and ~12% of commercial truck trips.

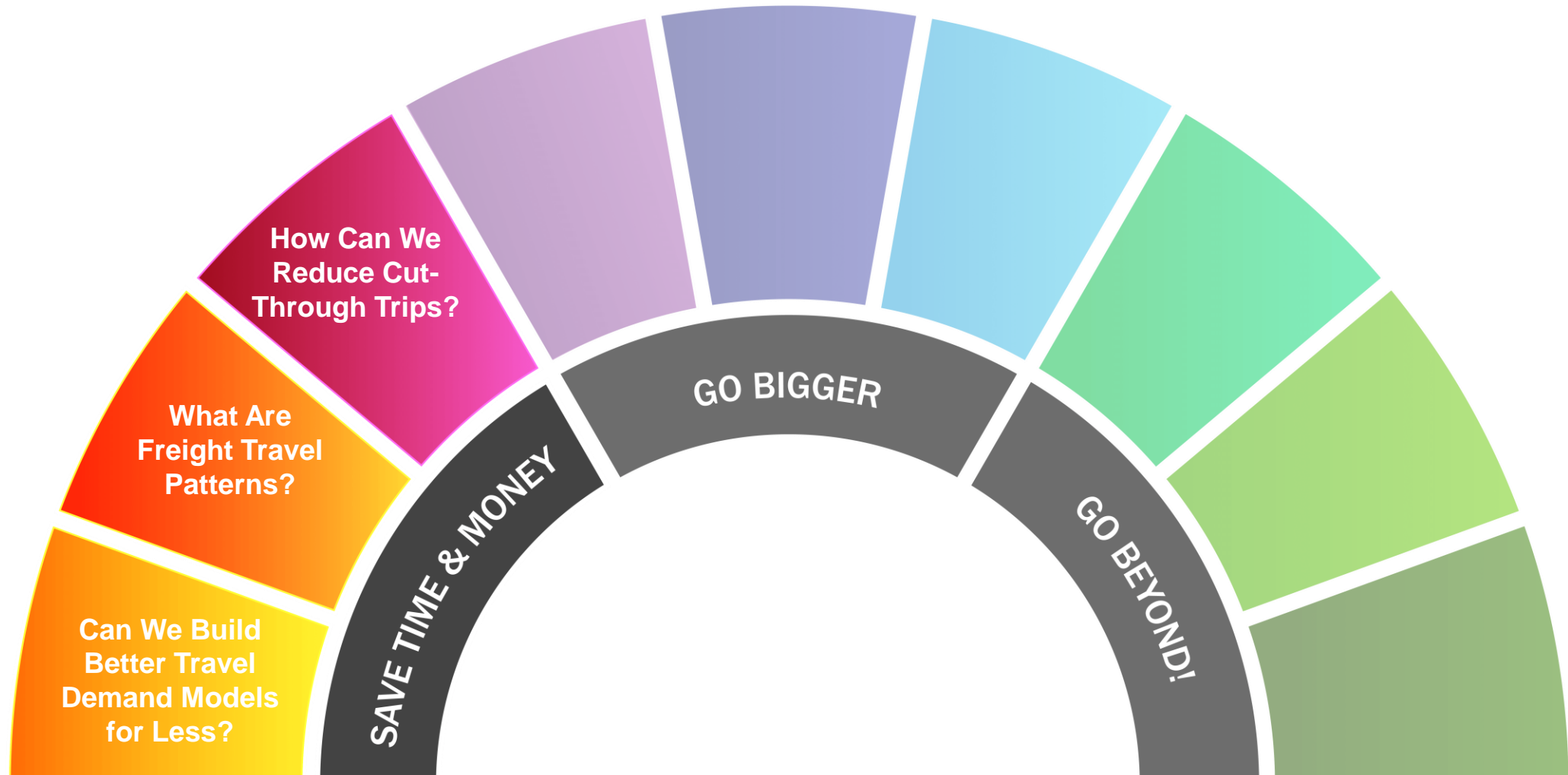Video shows a subset from Oct 8th, 2017 in San Bernardino, California.

StreetLight InSight® **turns Big Data into actionable transportation analytics on demand**

Cloud Computing + Infrastructure

Big Data + Contextual Data

StreetLight InSight On-Demand Platform

Geospatial Data
Calibration Data
Road Network
Parcel/Land Use Data
Demographic Data

Machine Learning + Algorithmic Processing

Customized, Actionable Transportation Analytics

Select Link

Home/ Work Footprints

Trip Duration

Congestion

Trip Circuity

Origin Destination

Trip Length

Demographics

Zone Activity

Trip Speed

AADT/AAHT

STEP 1: Save Time and Money
by replacing and enhancing current data collection with Big Data

How Can We Reduce Cut-Through Trips?

What Are Freight Travel Patterns?

Can We Build Better Travel Demand Models for Less?

GO BIGGER

GO BEYOND!

SAVE TIME & MONEY

Port Authority analyzed top routes to/from JFK Airport

Challenge

- JFK International Airport serves over 60M passengers annually. 75M+ passengers are projected by 2030.

- Transportation system accessing the airport is already strained with recurring congestion and severe bottlenecks on facilities and ramps leading to/from the airport terminals.

StreetLight InSight **Solution**

- WSP conducted route choice analysis (Origin-Middle Filter-Destination) for Port Authority using StreetLight to identify trip paths to/from airport.

- Results inform the Port Authority about where to Invest in transportation improvements to support and accommodate future growth of the airport.
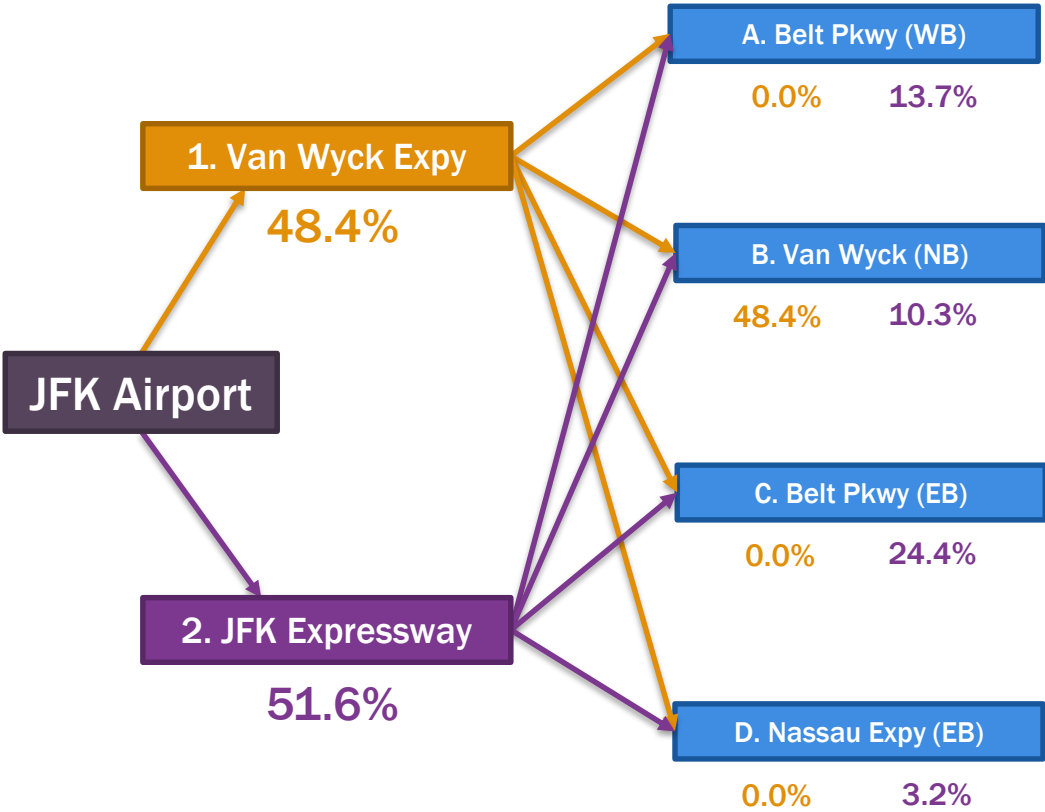

Facilities accessing JFK Airport

1. Van Wyck Expy	**A. Belt Pkwy (WB)**
	B. Van Wyck (NB)
2. JFK Expressway	**C. Belt Pkwy (EB)**
	D. Nassau Expy (EB)

Route choice for personal trips exiting airport on typical AM weekday morning

JFK Airport

1. Van Wyck Expy — 48.4%

2. JFK Expressway — 51.6%

A. Belt Pkwy (WB) — 0.0%   13.7%

B. Van Wyck (NB) — 48.4%   10.3%

C. Belt Pkwy (EB) — 0.0%   24.4%

D. Nassau Expy (EB) — 0.0%   3.2%

Route choice for personal trips exiting airport on typical AM weekday morning
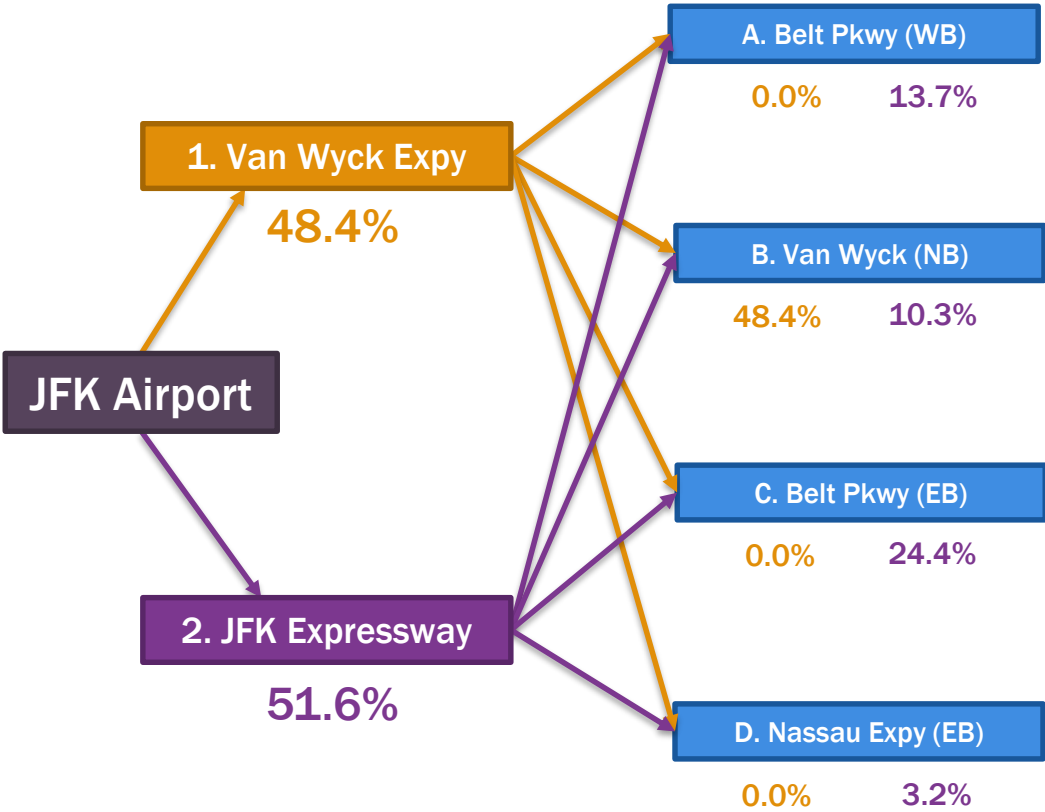
StL analyzed trip paths on the I-95 / I-295 corridor between Gardiner, Falmouth, and Scarborough areas for Maine DOT

Challenge

- Increasing growth within Portland metro area, resulting in worsening congestion and reduced travel time reliability.

- Additional congestion resulting from tourism…Maine had **36.7M** visitors in 2017 compared to a statewide population of 1.3M.
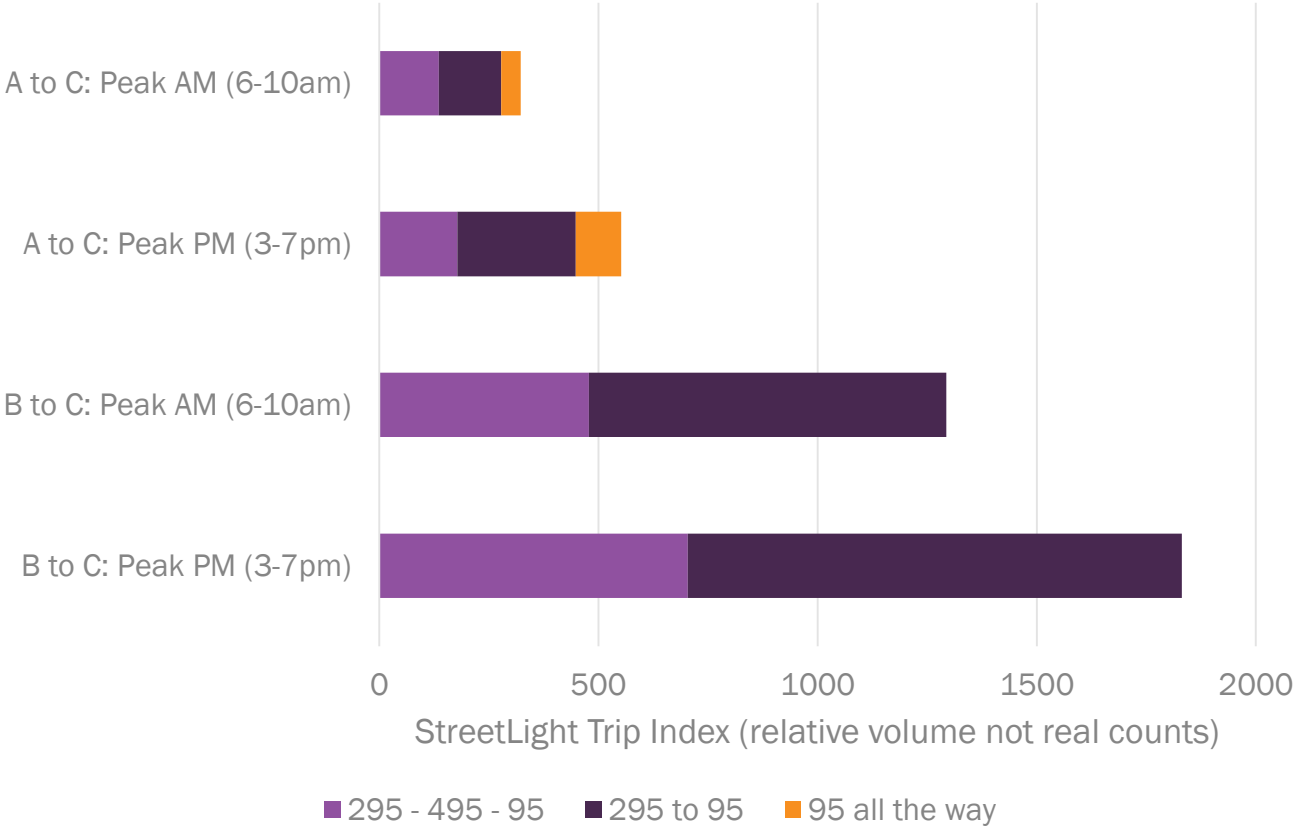
StreetLight InSight **Solution**

- Route choice analysis (Origin-Middle-Filter Destination) to understand travel patterns of longer journeys along I-95/I-295 corridor.

- Who is utilizing the tolled (I-95 / I-495) vs. un-tolled facilities?

- Where to focus transportation investments (new ramps, variable message boards)?
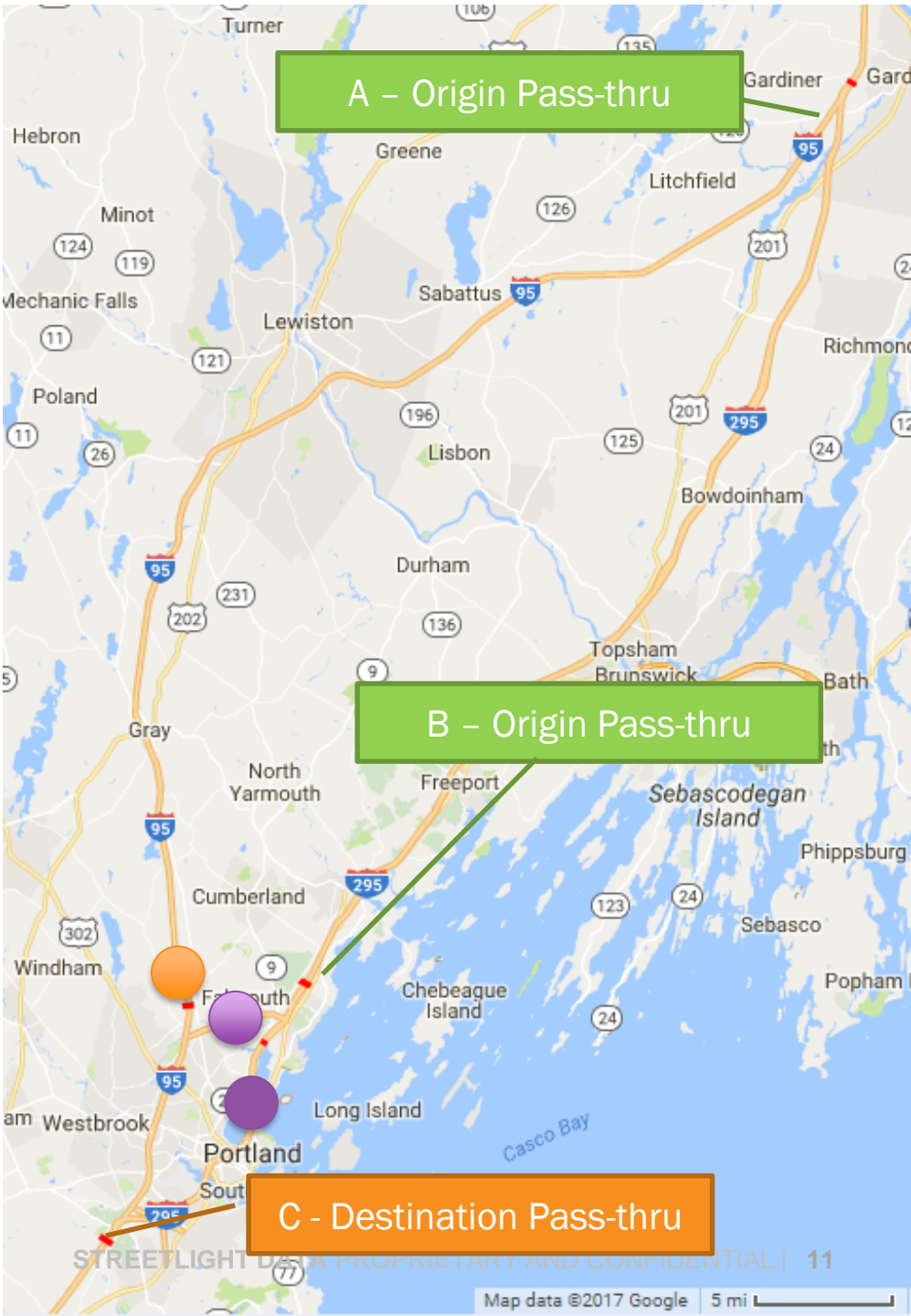

1) I-95 Maine Turnpike entire trip

2) I-295 >> I-495 Falmouth Spur >> I-95

3) I-295 entire trip

Gardiner

Falmouth
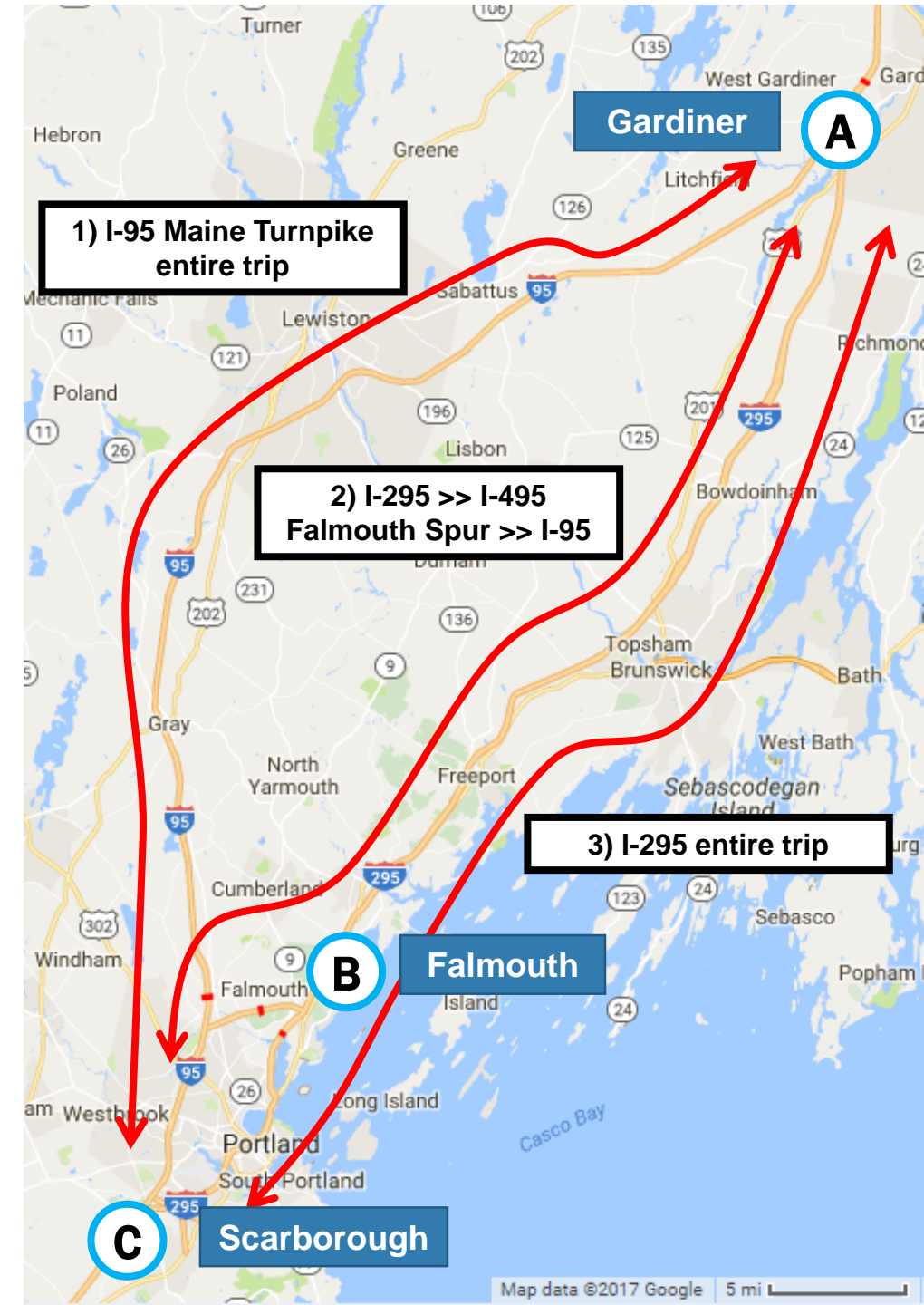
Scarborough

Most travelers utilize I-295 for some portion of their trip. Southbound travel to Scarborough is more prevalent in the PM peak.

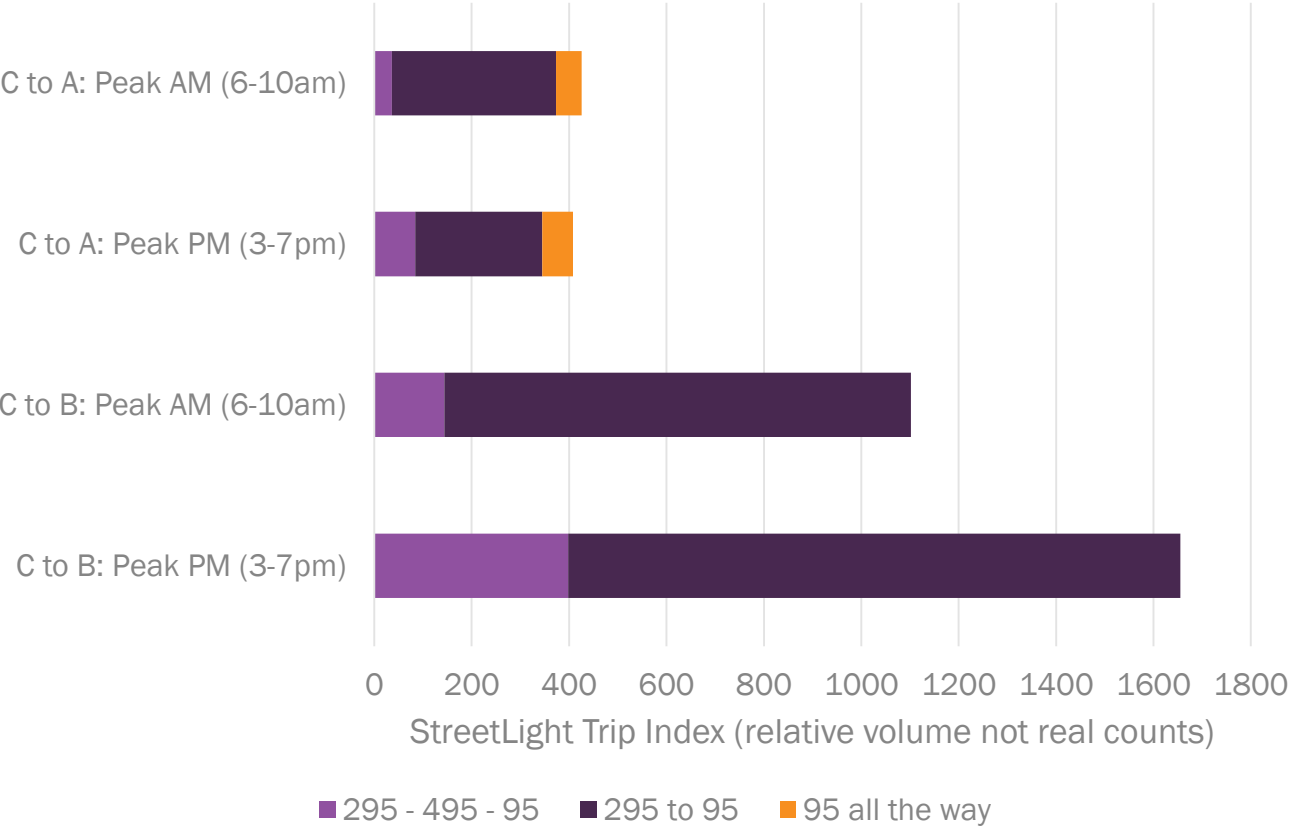## Route Choice for Personal Trips during a Typical Weekday

A bar chart with the following categories (vertical axis):
- A to C: Peak AM (6-10am)
- A to C: Peak PM (3-7pm)
- B to C: Peak AM (6-10am)
- B to C: Peak PM (3-7pm)

Horizontal axis: StreetLight Trip Index (relative volume not real counts), scale 0 to 2000.

Legend: ■ 295 - 495 - 95   ■ 295 to 95   ■ 95 all the way

Trip Index for Personal and Commercial are using different scaler and not comparable

A – Origin Pass-thru

B – Origin Pass-thru

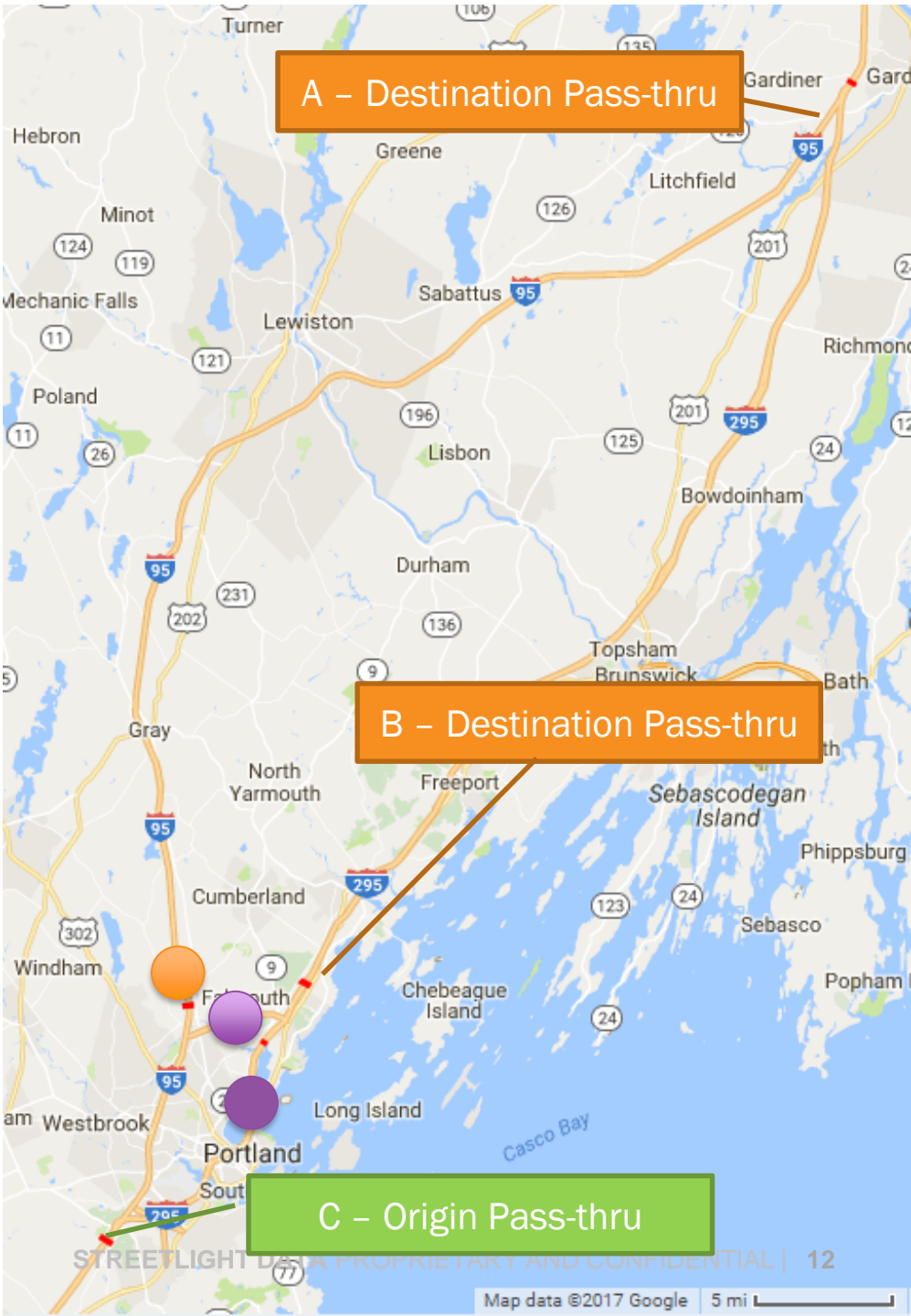C - Destination Pass-thru

Map data ©2017 Google   5 mi

Even stronger preference of taking I-295 all the way to go northbound to Gardiner

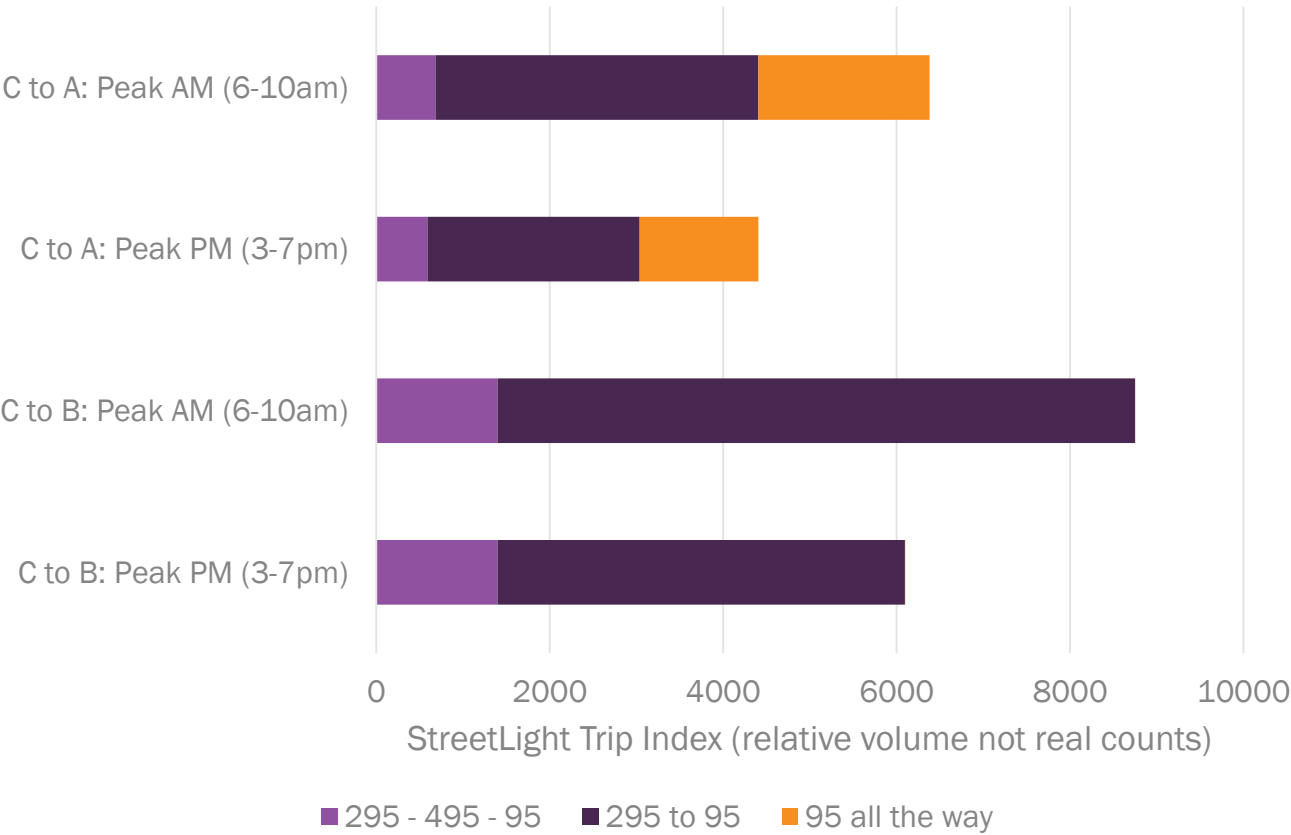### Route Choice for Personal Trips during a Typical Weekday

StreetLight Trip Index (relative volume not real counts)

Legend:
- 295 - 495 - 95
- 295 to 95
- 95 all the way

Categories:
- C to A: Peak AM (6-10am)
- C to A: Peak PM (3-7pm)
- C to B: Peak AM (6-10am)
- C to B: Peak PM (3-7pm)

Trip Index for Personal and Commercial are using different scaler and not comparable

A – Destination Pass-thru

B – Destination Pass-thru
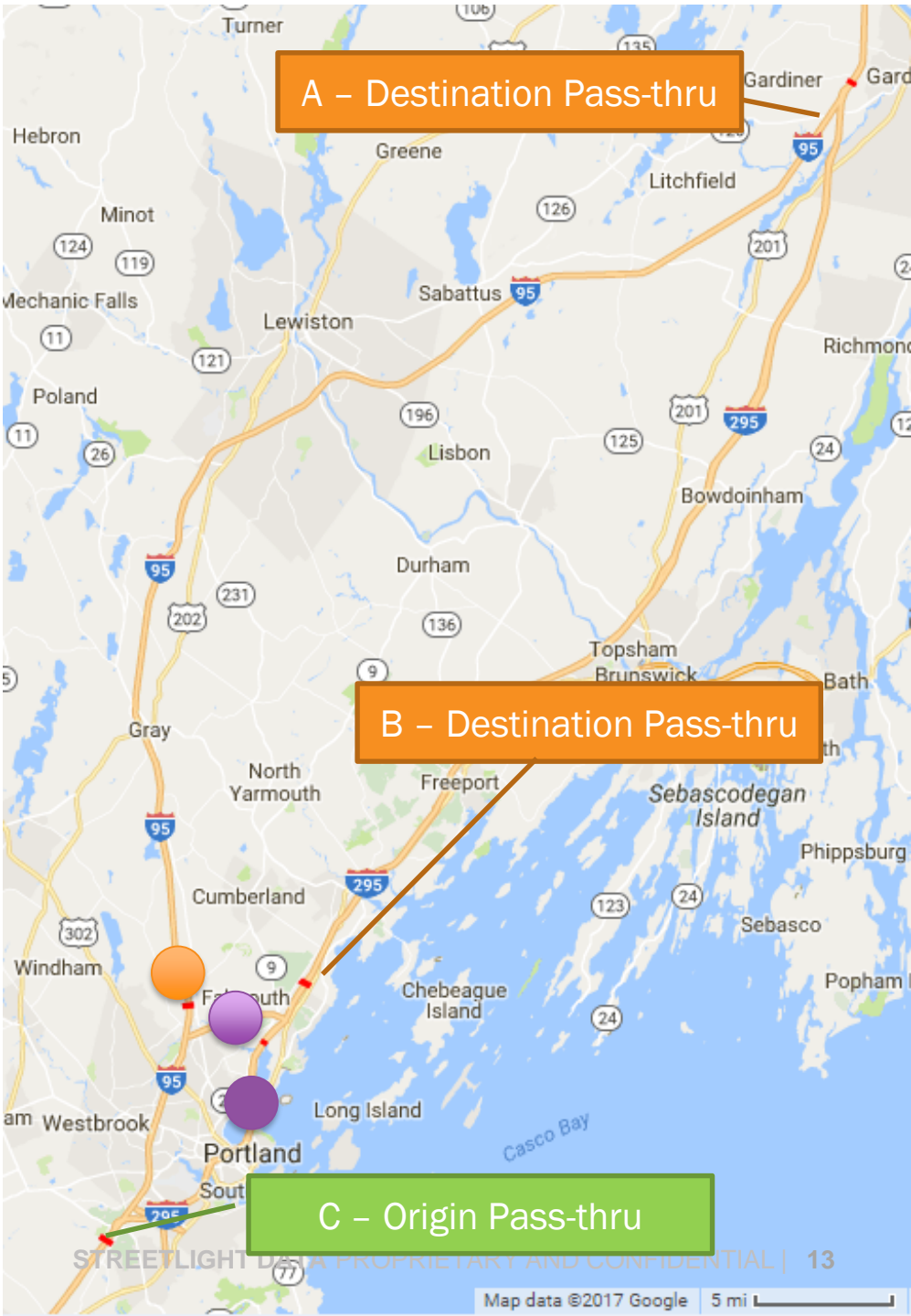
C – Origin Pass-thru

Map data ©2017 Google   5 mi

Commercial trips are more likely to use I-95 and occur during AM peak than PM

Route Choice for Commercial Trips during a Typical Weekday

C to A: Peak AM (6-10am)

C to A: Peak PM (3-7pm)

C to B: Peak AM (6-10am)

C to B: Peak PM (3-7pm)

0   2000   4000   6000   8000   10000

StreetLight Trip Index (relative volume not real counts)

■ 295 - 495 - 95   ■ 295 to 95   ■ 95 all the way

Trip Index for Personal and Commercial are using different scaler and not comparable

A – Destination Pass-thru

B – Destination Pass-thru

C – Origin Pass-thru

Map data ©2017 Google   5 mi

A Michigan MPO Gathered Cost-Effective, Comprehensive Origin-Destination Metrics for Travel Demand Modeling
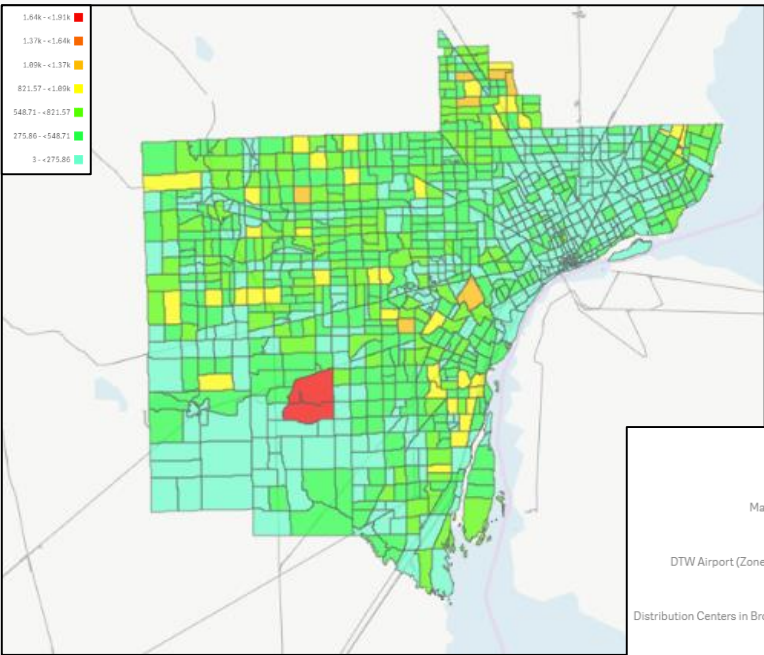
Challenge

Using surveys to collect commercial and personal O-D data to seed a regional demand model was too expensive.
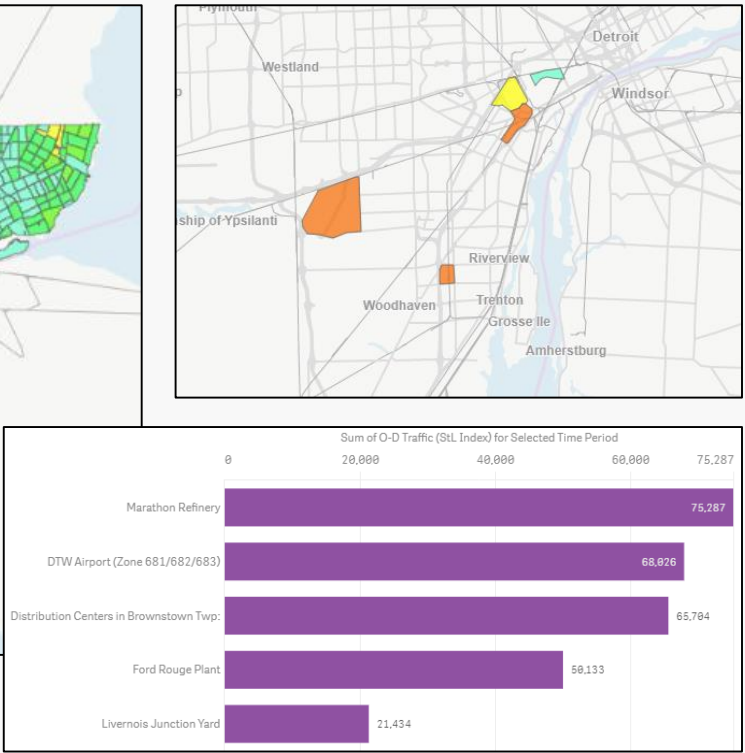
StreetLight InSight **Solution**

SEMCOG and Cambridge Systematics created a personal and commercial travel O-D from a large sample in minutes at low cost.

Peak AM TAZ to TAZ O-D – Personal Trips

Top Activity Centers for Weekday Commercial Truck Activity

Sum of O-D Traffic (StL Index) for Selected Time Period

Marathon Refinery	75,287
DTW Airport (Zone 681/682/683)	68,026
Distribution Centers in Brownstown Twp:	65,704
Ford Rouge Plant	50,133
Livernois Junction Yard	21,434

# Louisiana DOT Used Big Data to Forecast Conditions Without a Travel Demand Model

Challenge

LaDOT needs to forecast impact for upgrading a major road, but lacks a regional model to make such a forecast.

StreetLight InSight **Solution**

LaDOT and Arcadis quantified volumes on the existing routes to estimate latent demand for the I-49 Connector (30-40%) without building an expensive regional model.

Trip Volumes from Lafayette to Louisiana Scaled to Counts Using LaDOT Sensor Data
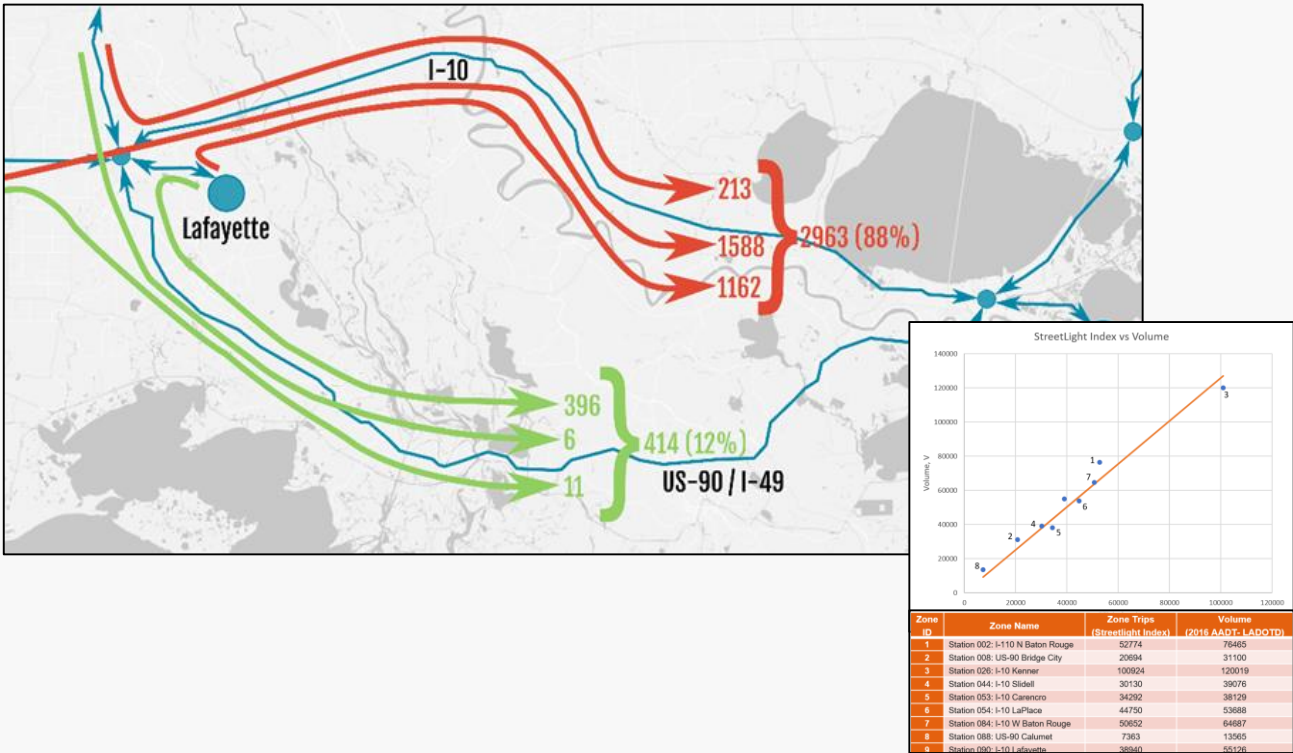
Hampton Roads (HRTPO) Need to know which highway gateways to Hampton Roads are most used by trucks going from 23 Distribution Centers to the local Port of Virginia

StreetLight InSight **Solution**

1. Analyzing the travel of port-related trucks while accounting for the 5-minute StreetLight rule—i.e. using port-related distribution centers, instead of port terminals, as trip origins—HRTPO staff was able to successfully determine routes used by port-related trucks. First, HRTPO staff programmed StreetLight to determine the destinations of trips from 23 Port-Related Distribution Centers using census block groups and one year of data.

Gateway Analysis

VA 168 (Chesapeake)
US 17 (Chesapeake)
VA 32 (Suffolk)
US 13 (Suffolk)
US 258 (Southampton County)
US 58 (Franklin)
US 460 (Isle of Wight County)
VA 10 (Isle of Wight County)
US 60 (James City County)
I-64 (James City County)
US 17 (Gloucester County)
US 13 (Virginia Beach)
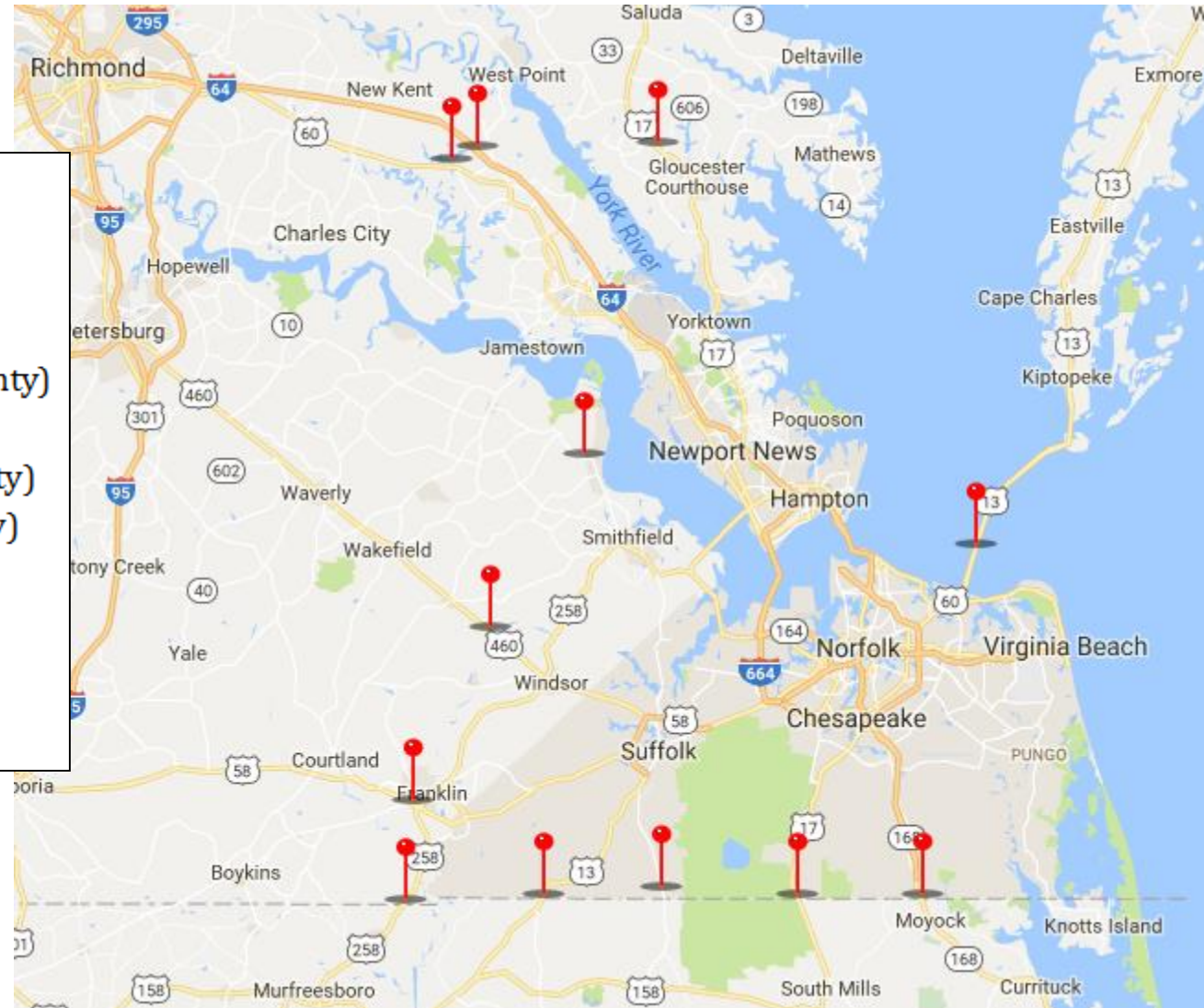
Using Distribution Centers as Origins

FIGURE 8 Port-Related Distribution Centers within Hampton Roads

Source: "Distribution Centers Utilizing the Port" slide entered by HRTPO staff into Streetlight then processed with ESRI (snipped)

Which highway gateways to Hampton Roads are most used by trucks going from 23 Distribution Centers to the local Port of Virginia

measure port truck usage of highway gateways to:

– Inform HRTPO prioritization

– Inform current studies

– Support funding applications
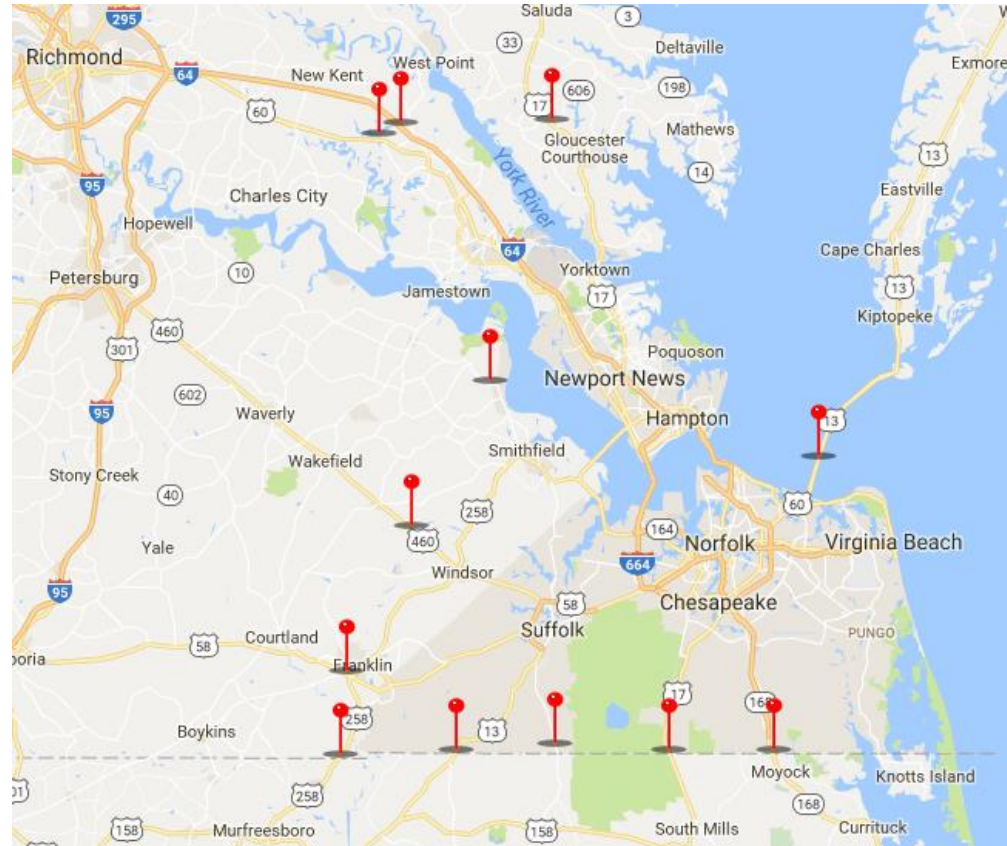
Usage of Findings

- We provided gateway usage to **highway studies**:

  – US 58 Corridor Study

  – Skiffes Creek Connector

  – US 460/58/13 Connector

  – Regional Connectors Study

- We can consider gateway usage when **scoring projects** via HRTPO Prioritization Tool

  – "increase access to port facilities" (10 points)

A Corridor Impact Study in Toronto for a New Route
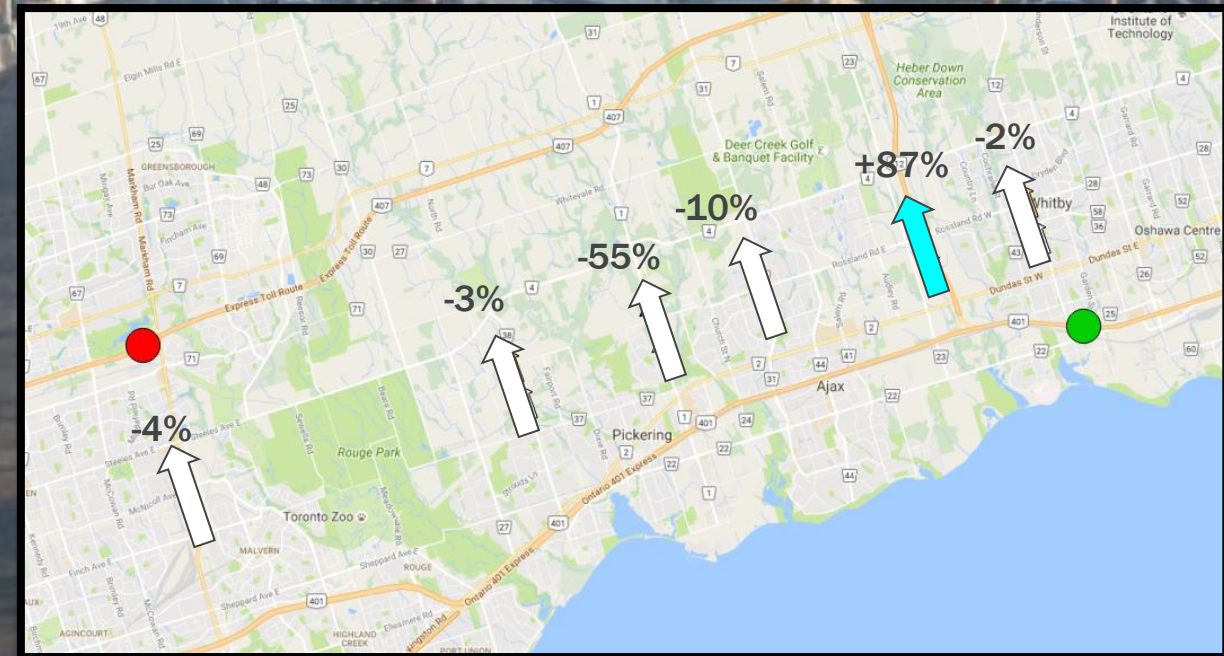## Before and After Cut Through Project

Need: Route choice between 2 highways to measure the impact of offering a new option.

Zones: 6 routes, 3 origin zones, 6 destinations zones.

Metric: O-D with Middle Filter

Months: May, June 2016

Time to Run: 2 min for each month

-4%

-3%

-55%

-10%

+87%

-2%

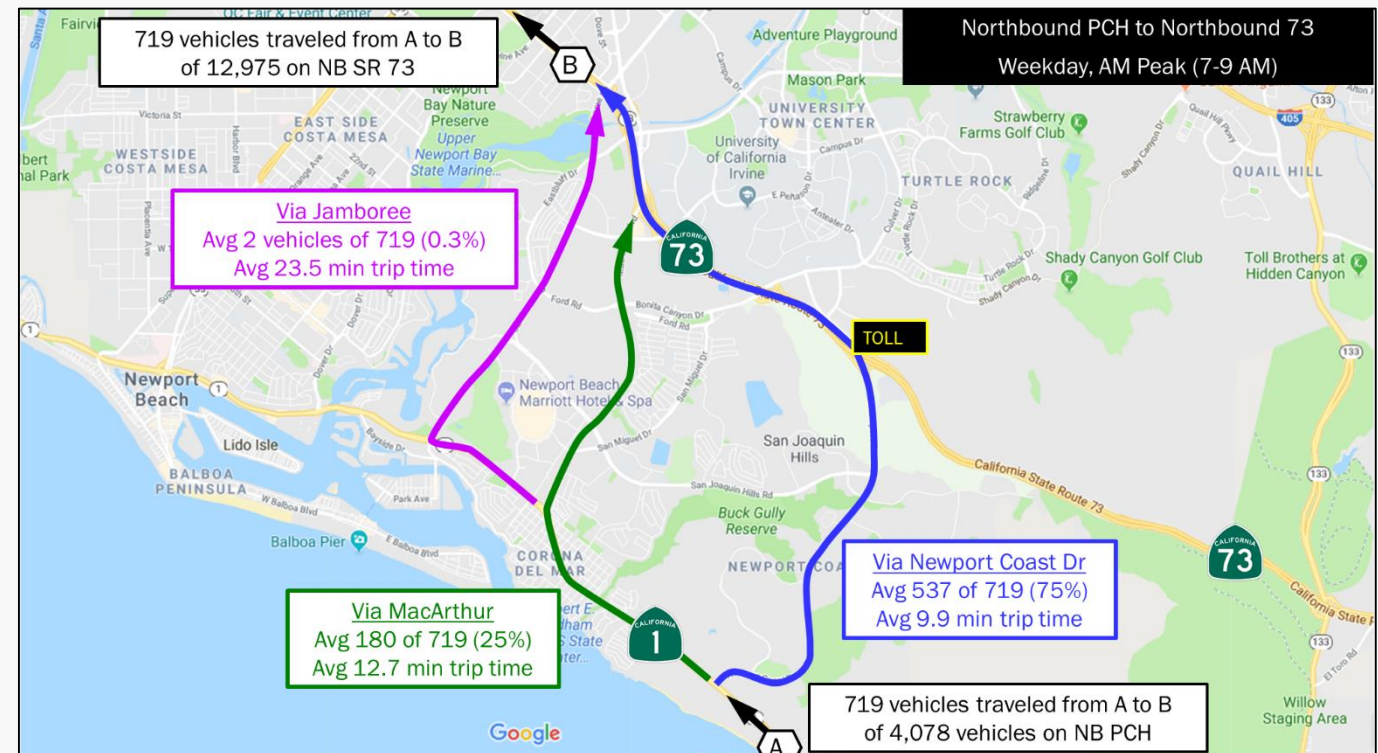# TCA Demonstrated their New Pricing Was Not Causing Cut-through Traffic

Challenge

Locals felt that TCA's new pricing caused drivers to "cut through" local neighborhoods. TCA had to find out if this belief was accurate.

StreetLight InSight **Solution**

TCA monitored the occurrence of "cut-through" trips, showing constituents that tolls weren't causing cut through traffic and building buy-in for their toll pricing.

Analysis Showing Low Cut Through Activity

Northbound PCH to Northbound 73
Weekday, AM Peak (7-9 AM)

719 vehicles traveled from A to B of 12,975 on NB SR 73

Via Jamboree
Avg 2 vehicles of 719 (0.3%)
Avg 23.5 min trip time

Via Newport Coast Dr
Avg 537 of 719 (75%)
Avg 9.9 min trip time

Via MacArthur
Avg 180 of 719 (25%)
Avg 12.7 min trip time

719 vehicles traveled from A to B of 4,078 vehicles on NB PCH

STEP 2: Go Bigger
by using real-world data to inform daily work & ongoing activities in new ways

# Using StreetLight InSight for Data-Driven Infrastructure Prioritization in Northern Virginia

Challenge

Northern Virginia's severe congestion cannot be addressed by highway expansion. VDOT needs to reduce travel in single occupancy vehicles.

StreetLight InSight **Solution**

VDOT compared every single regional corridor for mode-shift potential creating, which lead to far more effective cost/benefit process and expenditures of infrastructure dollars.

Corridors with High Shares of Bikeable Trips

Visualization by the State Smart Transportation Initiative: www.ssti.us
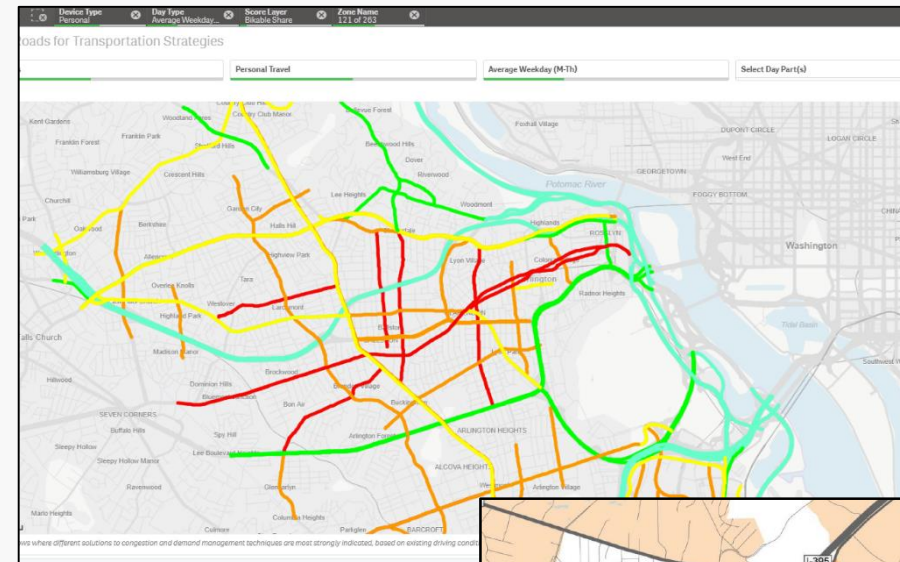
Length of Trips to Van Dorn Metro Station
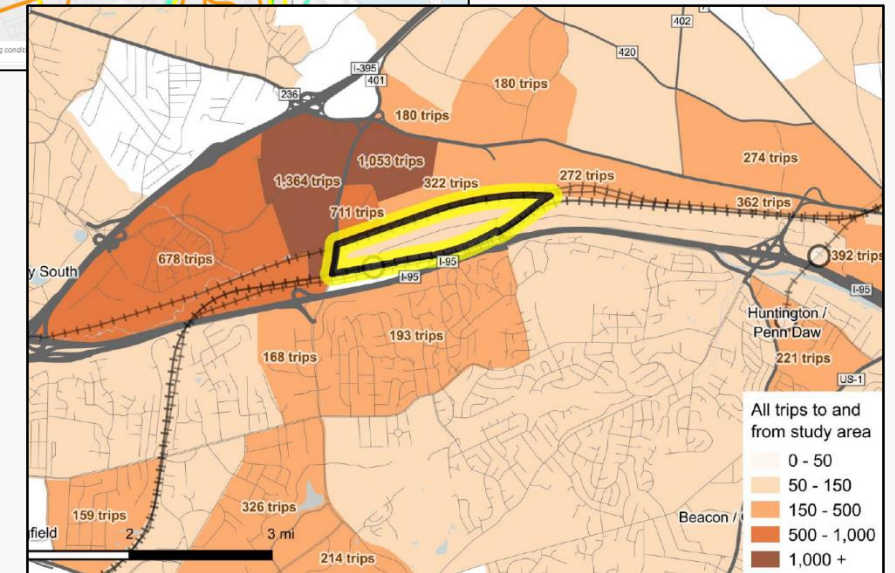
TDM: Scanning Virginia's Roadways for Opportunities

Top Locations with Greatest Impact of Reducing # of Vehicles

TDM / Congestion Mitigation

TDM Priorities in Northern Virginia

Need: ID the TAZs and road segments where traffic is most likely to contain cars going on really short trips (walkable trips) or sharing and O/D (transit-able trips). Prioritize deeper dives for demand management programs.

Zones: 1723 TAZs + road segments

Metric: Zone Activity with Detailed Trip Attributes

Months: All 2015

Time to Run: 15 min (for Metric at right)

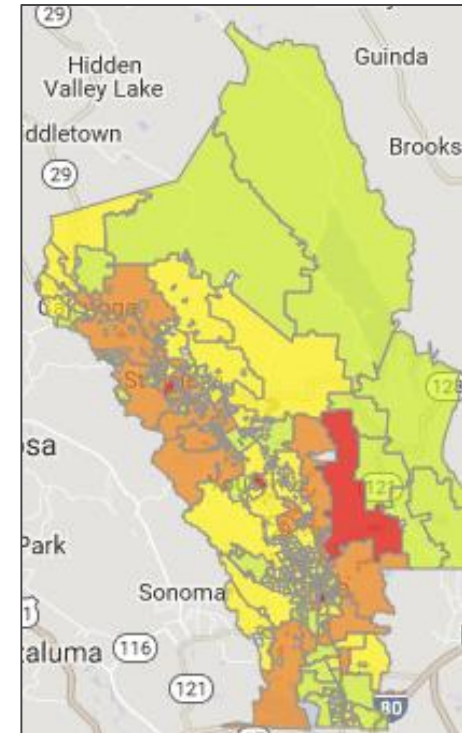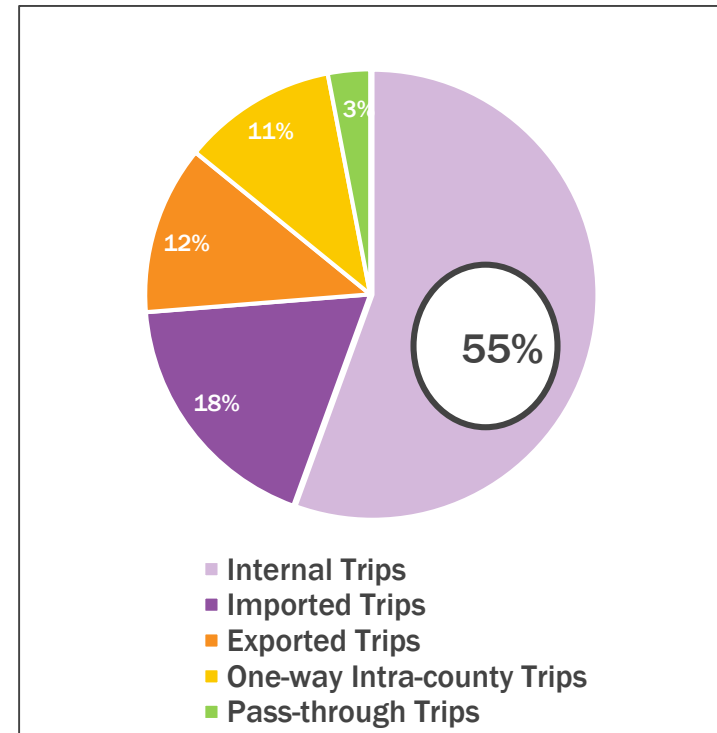| TAZ ID	Avg Trip Duration (sec)	Avg Trip Speed (mph)	Sum under 1 mile	Sum under 3 mile
851	1186	27	5%	30%
850	1433	27	6%	25%
849	1427	30	4%	21%
848	916	23	5%	47%
847	1420	27	9%	39%
846	1275	29	4%	28%
845	1180	23	6%	38%
844	1129	26	7%	37%
843	1504	27	5%	25%
842	1485	30	4%	27%
841	1460	26	7%	31%
840	1403	26	3%	24%
839	1177	25	4%	37%
838	1359	26	6%	34%
837	1272	28	3%	30%
836	1397	28	8%	45%
835	1732	33	6%	36%

Completed Project: Measuring The Types of Trips in Napa County, CA that Contribute to Congestion

Need: Eliminate congestion that hurt the tourism and agriculture sectors of Napa. Address resident concerns about the cause of traffic.

Question: Did tourists, workers, cut-through trips, or another group contribute most congestion?

Challenge: The county could not determine the origins and destinations of external-external trips with conventional methods, or the share of trips that are internal to Napa.

Solution: Clients used *StreetLight InSight* **to identify the origins and destinations all trips that touched Napa and determined that commuters and internal trips were contributing the most to congestion.**

Pie chart values:
- 55%
- 18%
- 12%
- 11%
- 3%

Legend:
- Internal Trips
- Imported Trips
- Exported Trips
- One-way Intra-county Trips
- Pass-through Trips

StreetLight InSight Output: The graph on the left, created using StreetLight's analytics, shows the percentage of each type of trip that took place in Napa County. Far more fully internal trips and "imported trips" – from commuters - took place than anticipated. The heat map on the right shows the origins of fully internal trips in Napa County.

Why Big Data

Reduce Limitations of Traditional Methods

- Vehicle Classification Counts
- License Plate Matching
- Winery Regression Analysis
- Surveys

- Expensive
- Small sample size
- Human error
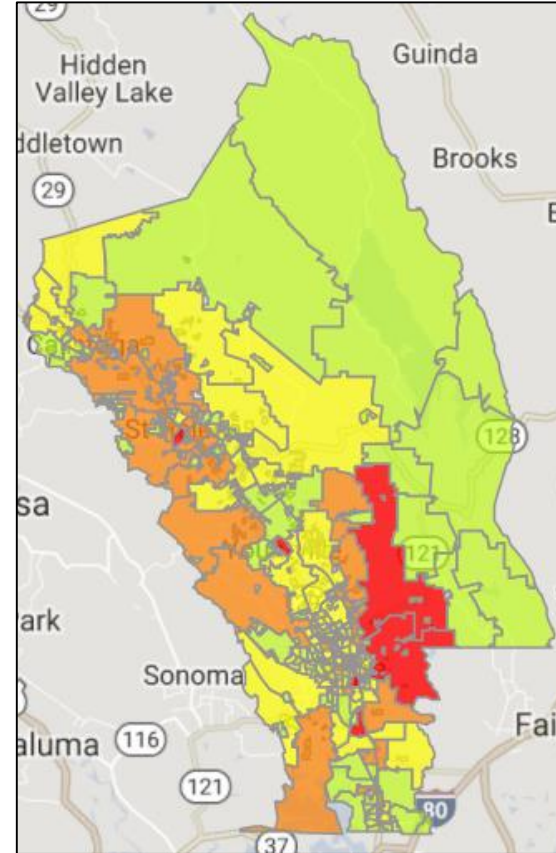- Not true origin-destination
- Not all trip types

StreetLight InSight Metrics

Relatively cheap, large sample of true origin-destination data for all trip types

Metrics Provided

- **O-D, Internal-External, and Select Link Analyses**

- **Number of Zones:** 658 TAZs in Napa, 20 surrounding counties

- **Time to Run:** ~90 minutes

- **Data Period:** 2 Months

The above heat map visualizes the relative volume of trip starts by TAZ in Napa County for an average day, all day

How the Data was Used

Planning Efforts:
Used the Data on Short- and Long-Term Planning Projects

| Transit Improvements: New Bus Routes | Transit Possibilities: Exploring Passenger Rail | Affordable Housing: A Higher Priority |
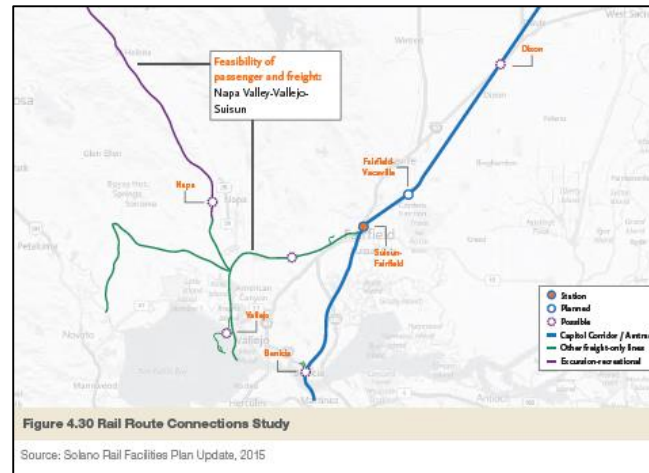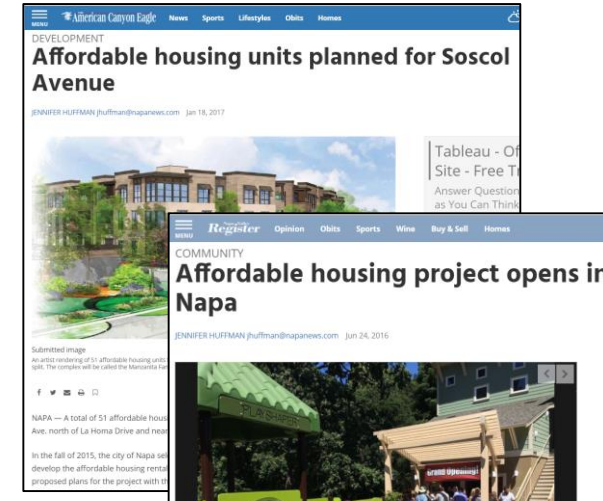
"We have a more complete Countywide Transportation Plan" – Danielle Schmitz, Planning Manager, NVTA

Napa's Congestion Management Agency Invests Strategically in Transit to Mitigate Traffic Jams
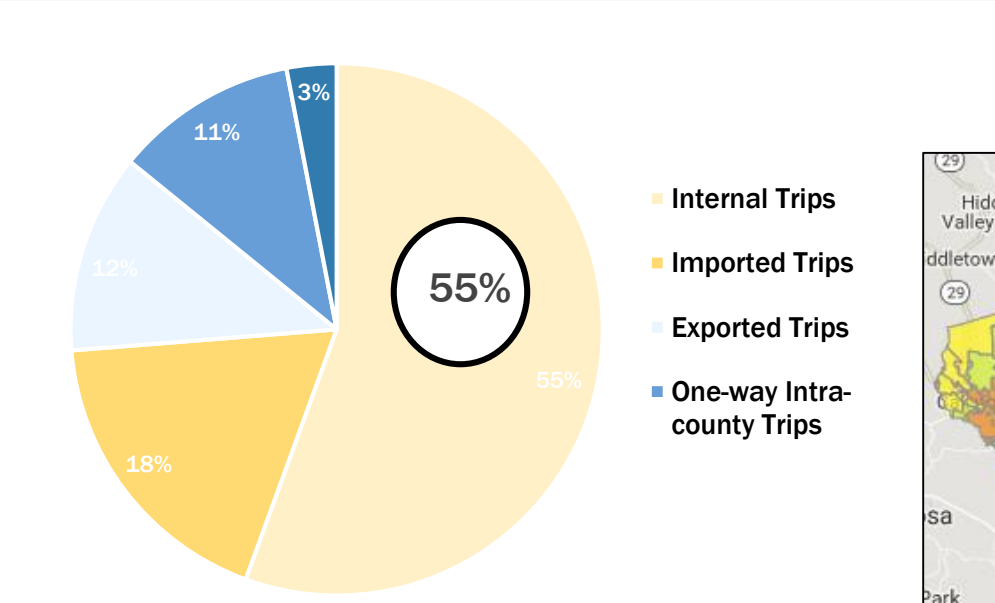
Challenge

Residents blamed traffic jams on tourists and tech industry commuters, but the local transportation authority needed evidence to invest strategically.

StreetLight InSight **Solution**

Napa determined that internal trips and Napa's own workers caused congestion. They began prioritizing transit for these groups, and justified their decisions to the public.
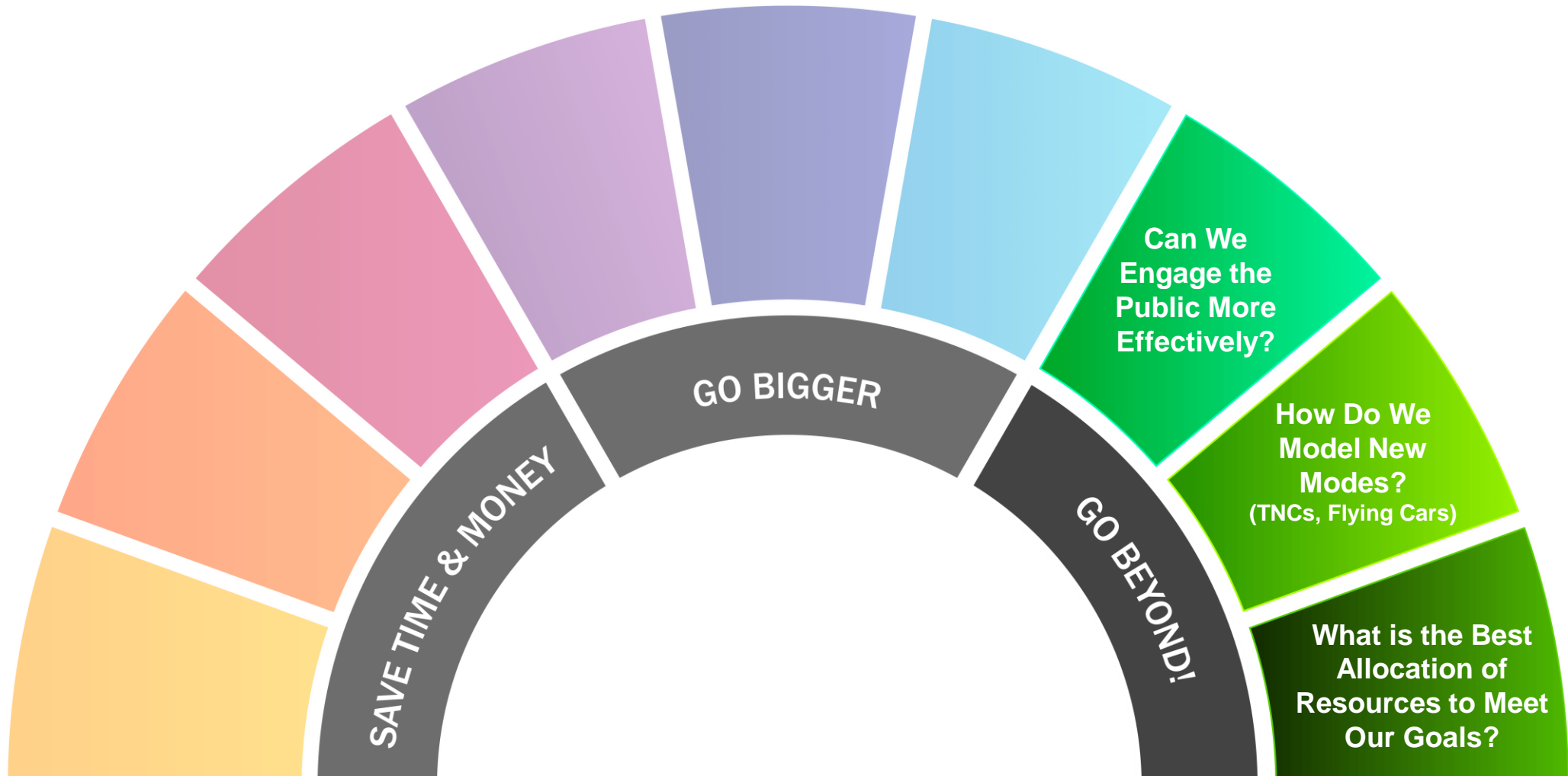
Trip Share in Napa

- Internal Trips
- Imported Trips
- Exported Trips
- One-way Intra-county Trips

55%

3%

11%

12%

18%

55%

Internal Trip Starts
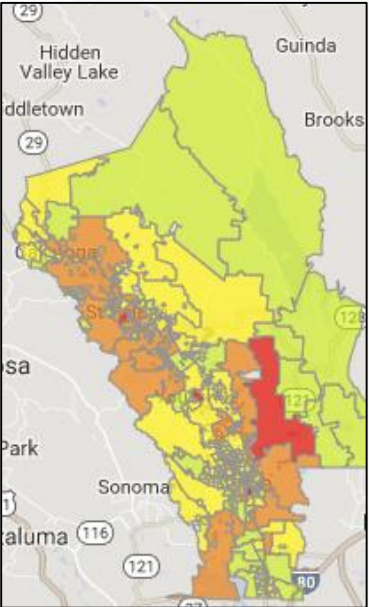
STEP 3: Go Beyond
the status quo with deep data-driven planning processes

SAVE TIME & MONEY

GO BIGGER

GO BEYOND!

Can We Engage the Public More Effectively?

How Do We Model New Modes?
(TNCs, Flying Cars)

What is the Best Allocation of Resources to Meet Our Goals?

Siemens and the City of Ann Arbor Measured the Performance of ITS Technology

Challenge

Siemens wanted to measure whether it's SCOOT adaptive signal technology was effective in Ann Arbor, but lacked "before" data and any data about cross-traffic.

StreetLight InSight **Solution**

Siemens "time traveled" to measure the impact, and proved that SCOOT made corridor travel times much more reliable.

Study Results: Weekday Travel Time Reliability

Weekdays - Increase in Likelihood to Complete Corridor in Target Time

Before (Dec 14 to Oct 15)   After (Dec 15 to May 16)
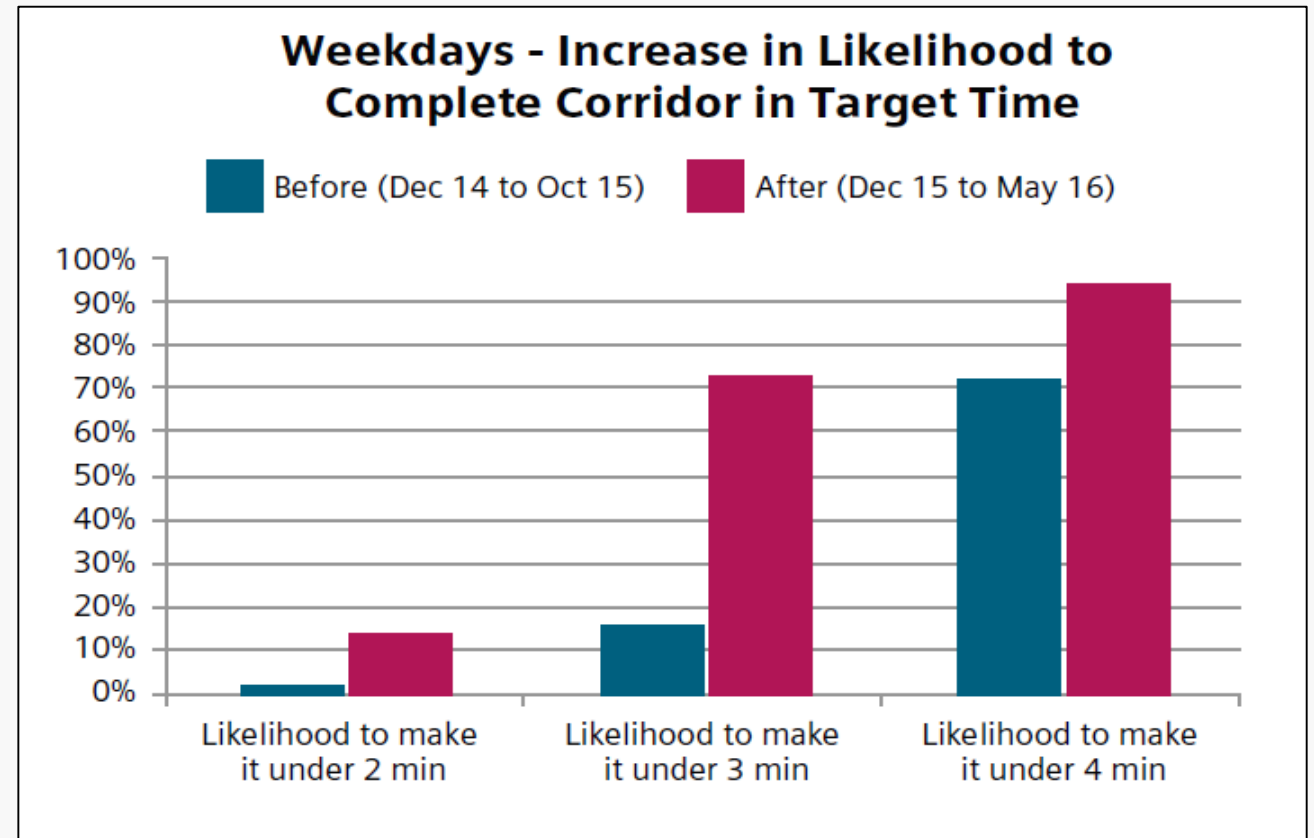
San Diego's MPO Assessed the Impact and Equity of New Toll Road Pricing

Challenge

SANDAG reduced tolls on SR 125 to shift traffic from congested I-805, but lacked a way to determine if this benefitted all income groups equally.

StreetLight InSight **Solution**

SANDAG and Fehr & Peers analyzed the incomes of SR125 and I-805 users before and after the change, and determined all income groups were equally impacted.

Share of Trips that Shifted to SR 125 in San Diego

Color	Description
	Heavy amount of trips switched to SR125
	Some trip switch to SR125
	About the same/very few trips

Planning New Modes at Uber by Using Big Data to Site Urban Aerial Transportation Hubs

Challenge

Uber lacked data on non-Uber trips, which it needed to estimate demand for UberElevate services and to identify the best hub locations.

StreetLight InSight **Solution**

Uber built a unique model, UberFlux, to quantify the potential for UberElevate and optimize their build of hub networks.

UberFlux Visualization of Travel Activity in Los Angeles

Artist Rendering of UberElevate Hub

Images created by Uber: uber.com/info/elevate

Estimating Nantucket's Population to Guide Resource Allocation for Business and Government

Challenge

Allocating resources efficiently is difficult on Nantucket because the population varies dramatically by season – and they don't have numbers on that variability.

StreetLight InSight **Solution**

The Nantucket Data Platform quantified the population's seasonal variability, which will be used by government and private businesses to reallocate resources efficiently.

Population in 2017 High Season by Day
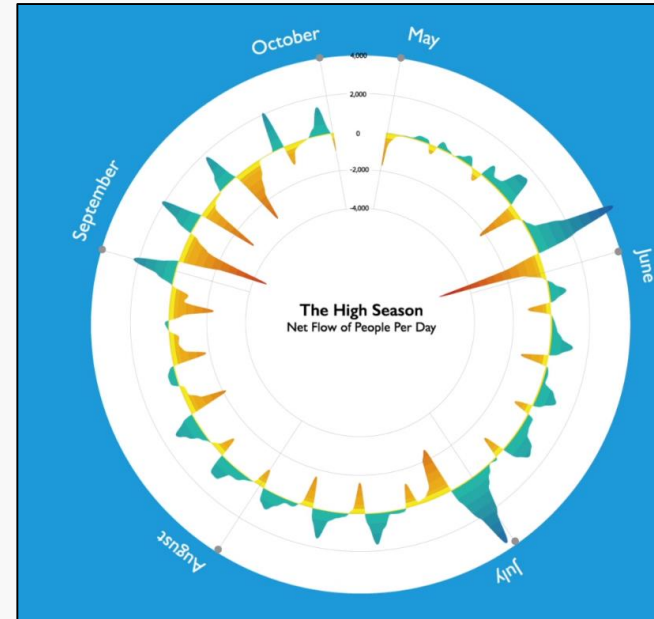
Population in all of 2017 by Month
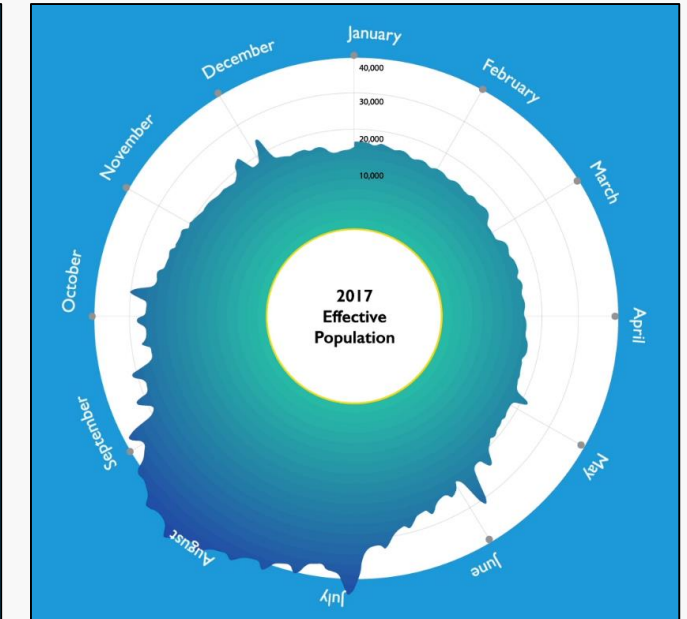
These visualizations were created by the Nantucket Data Platform: nantucketdataplatform.com

Home locations of fans attending Boston Red Sox home playoff games in 2018

MA – Fenway Park 2018 Playoffs – ZAHW

Evening period (after 7pm)
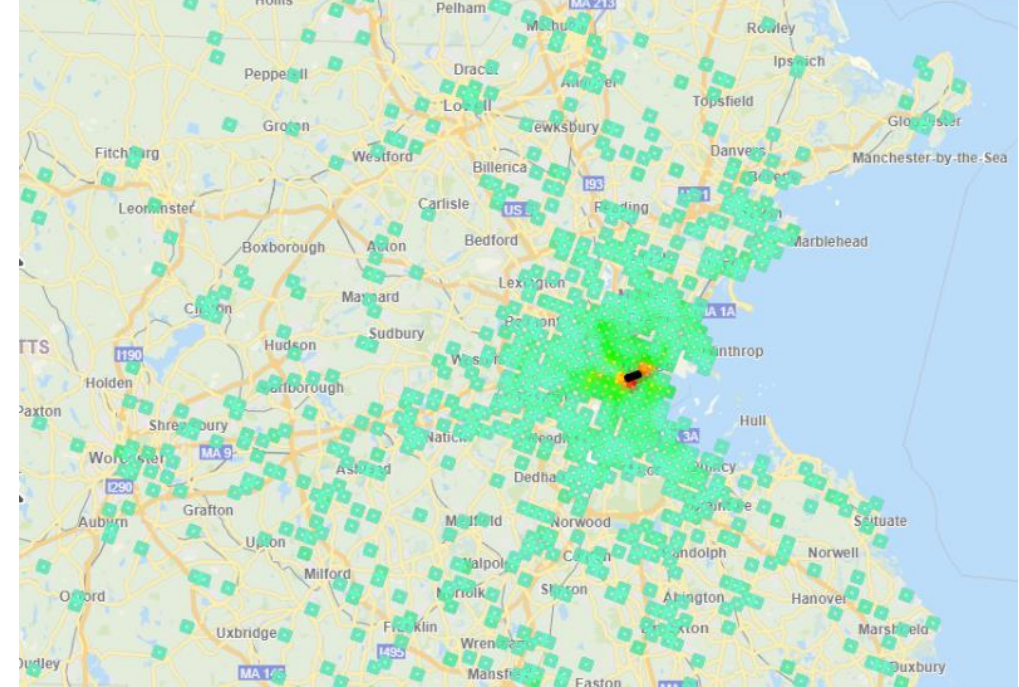
NY Yankees, 1 game

Houston Astros, 1 game

LA Dodgers, 2 games
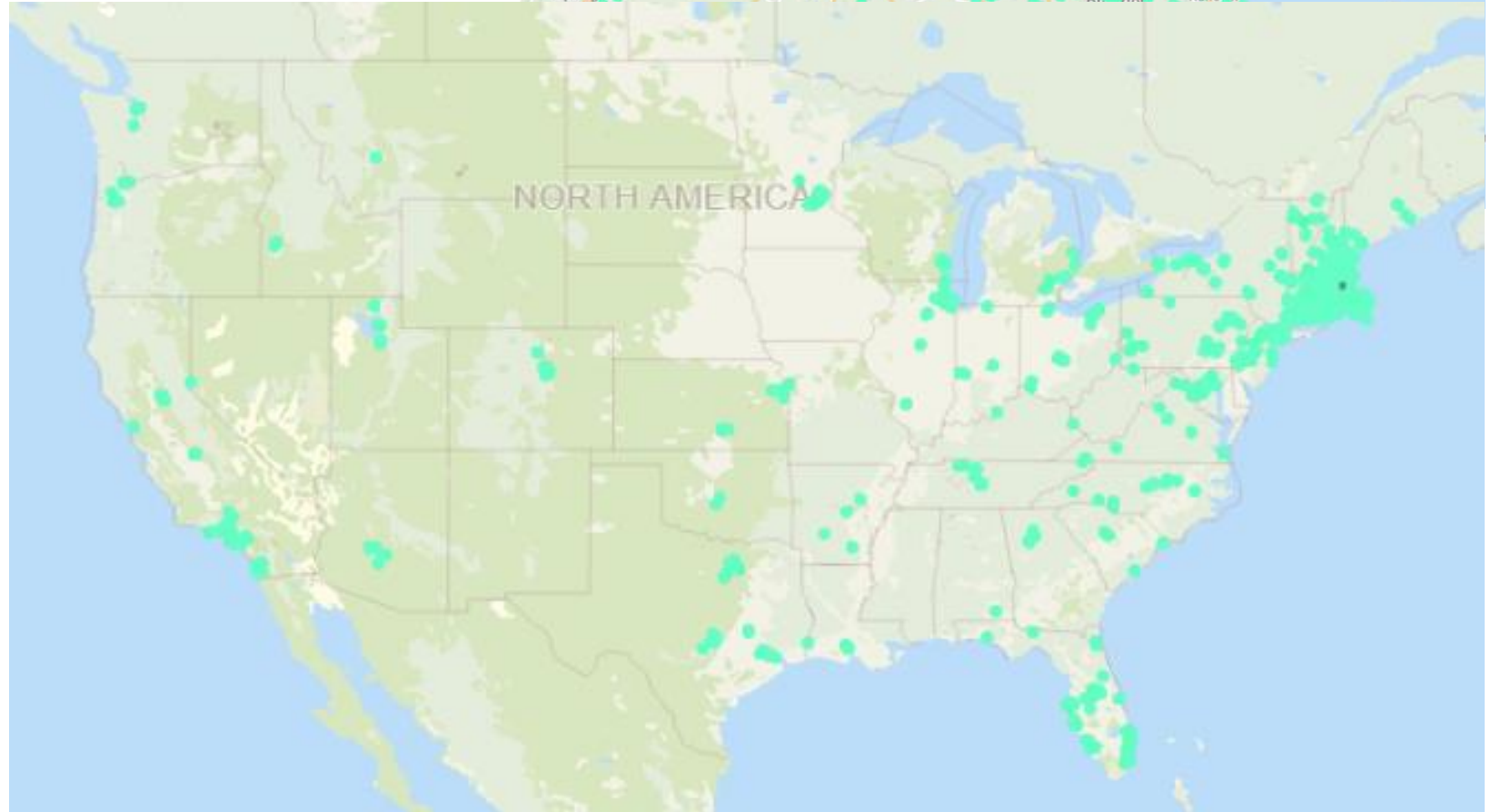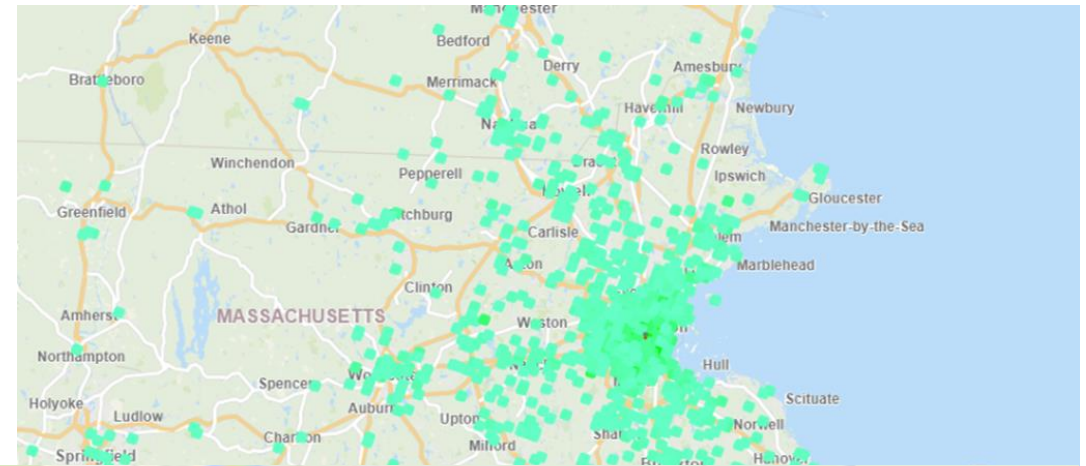
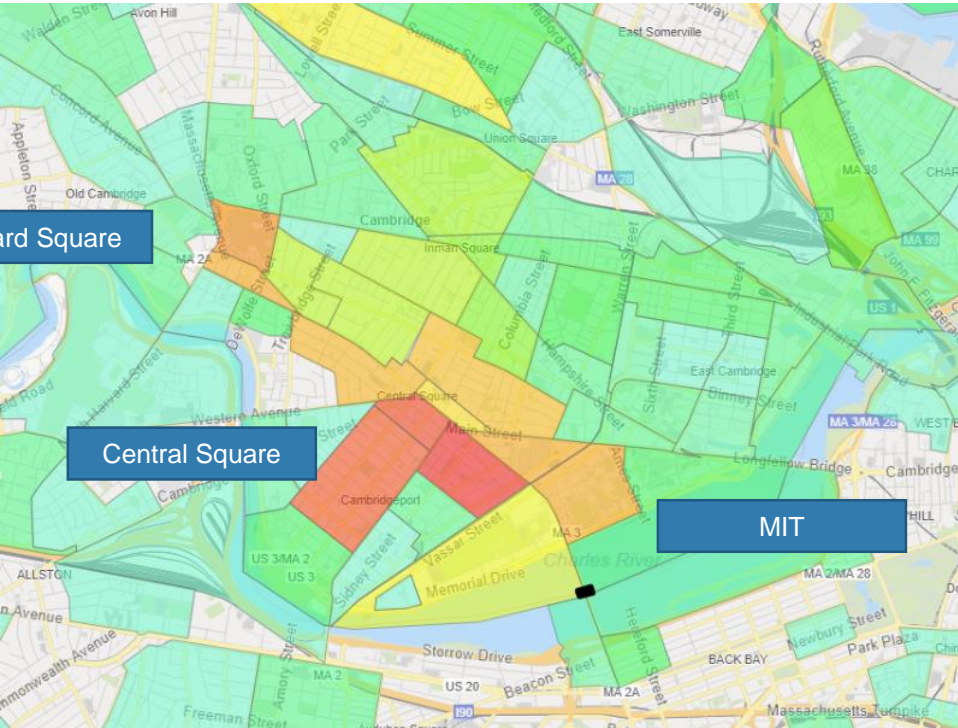# Home locations of spectators and supporters at finish line of Boston Marathon – Patriot's Day 2017
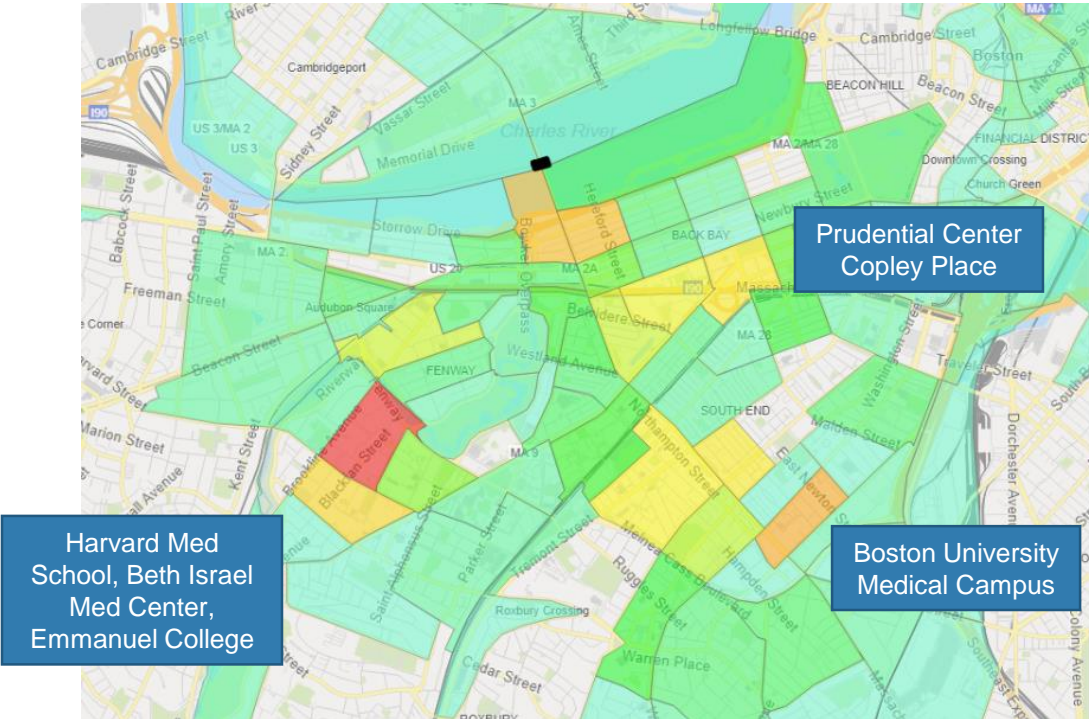
MA - Patriot's Day 2017 - VHWA v2
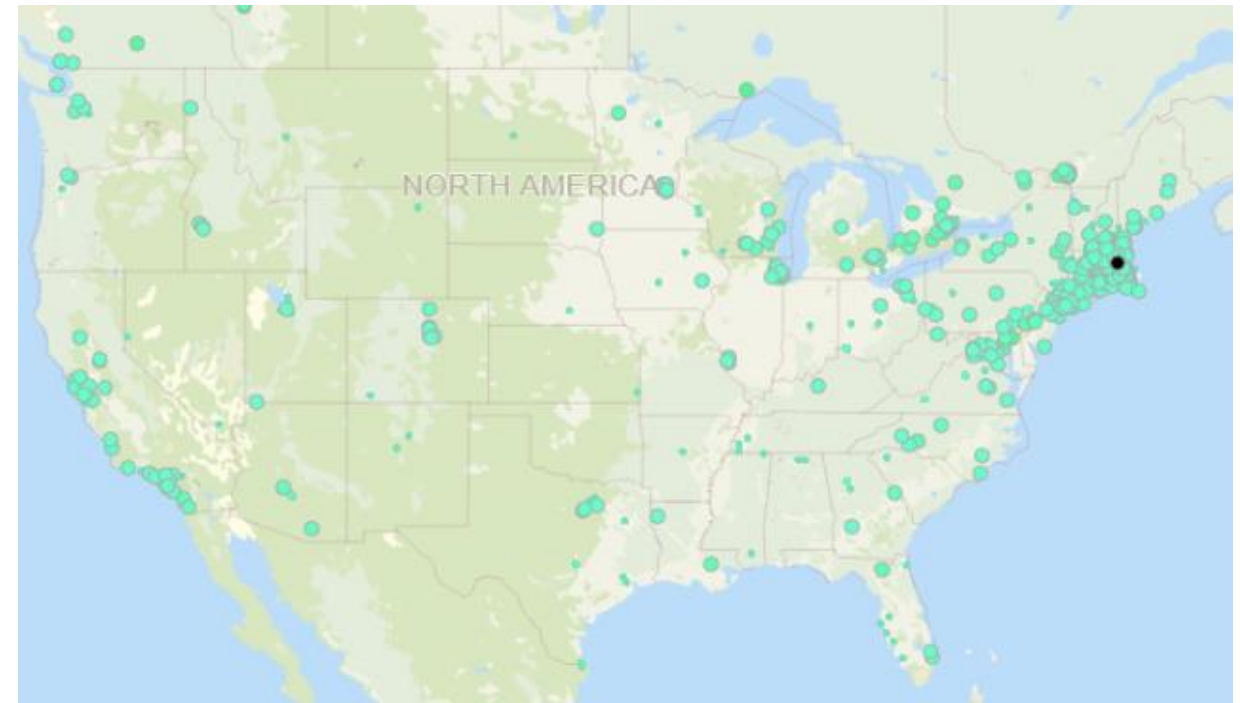
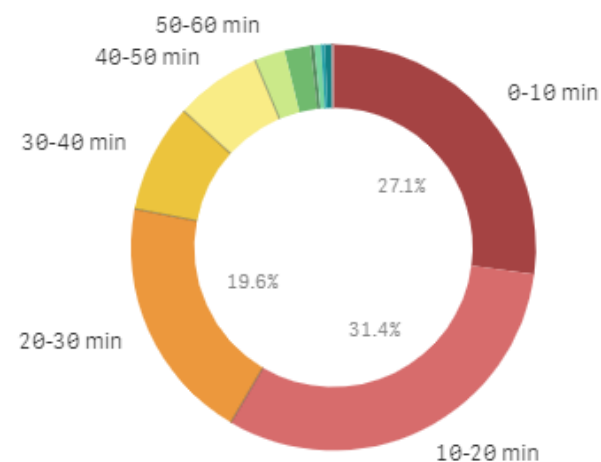# Southbound Bike Trips across Harvard Bridge over the Charles River during AM Peak

Origin Locations

Destination Locations

Attributes of bicycle trips across Harvard Bridge
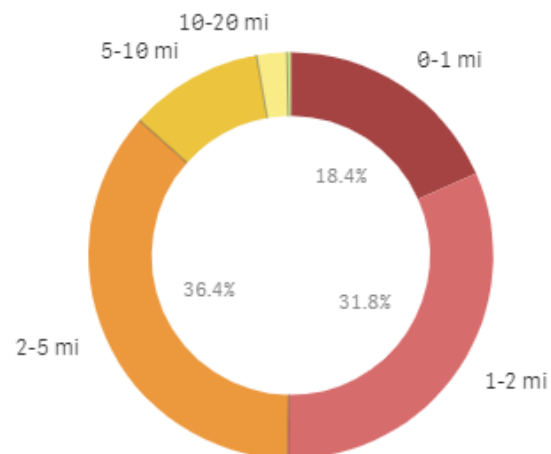

Traffic by Trip Duration
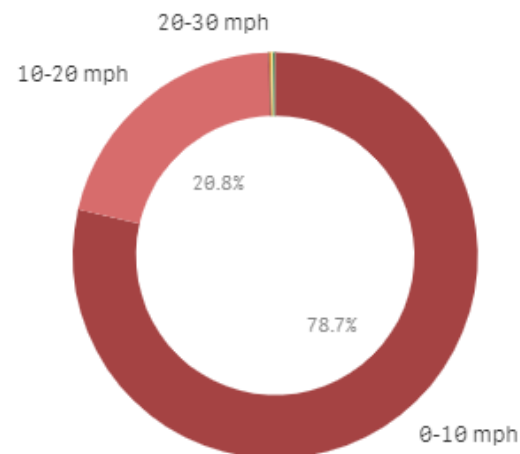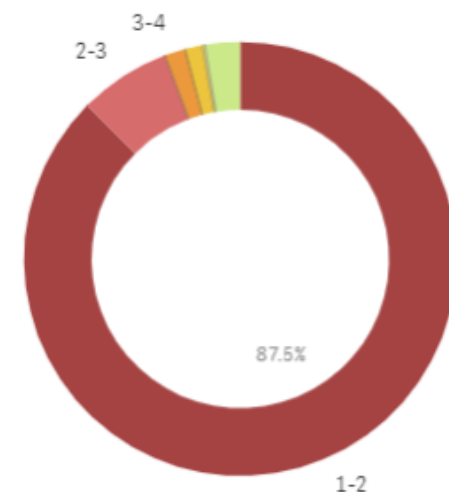- 0-10 min: 27.1%
- 10-20 min: 31.4%
- 20-30 min: 19.6%
- 30-40 min
- 40-50 min
- 50-60 min

Traffic by Trip Length
- 0-1 mi: 18.4%
- 1-2 mi: 31.8%
- 2-5 mi: 36.4%
- 5-10 mi
- 10-20 mi

Traffic by Trip Speed
- 0-10 mph: 78.7%
- 10-20 mph: 20.8%
- 20-30 mph

Traffic by Trip Circuity
- 1-2: 87.5%
- 2-3
- 3-4

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