StreetLight Volume: AADT

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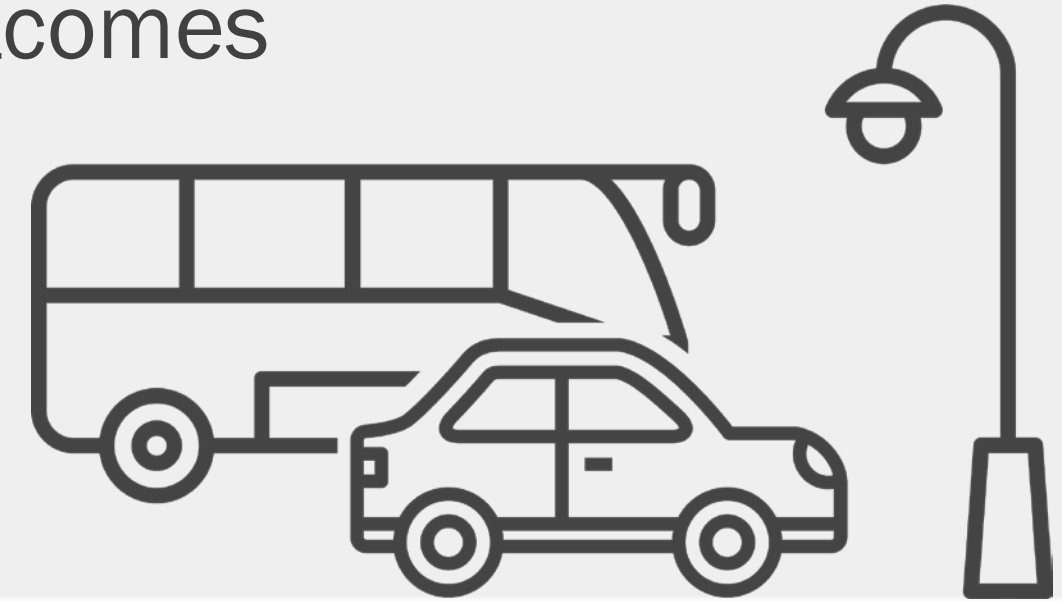
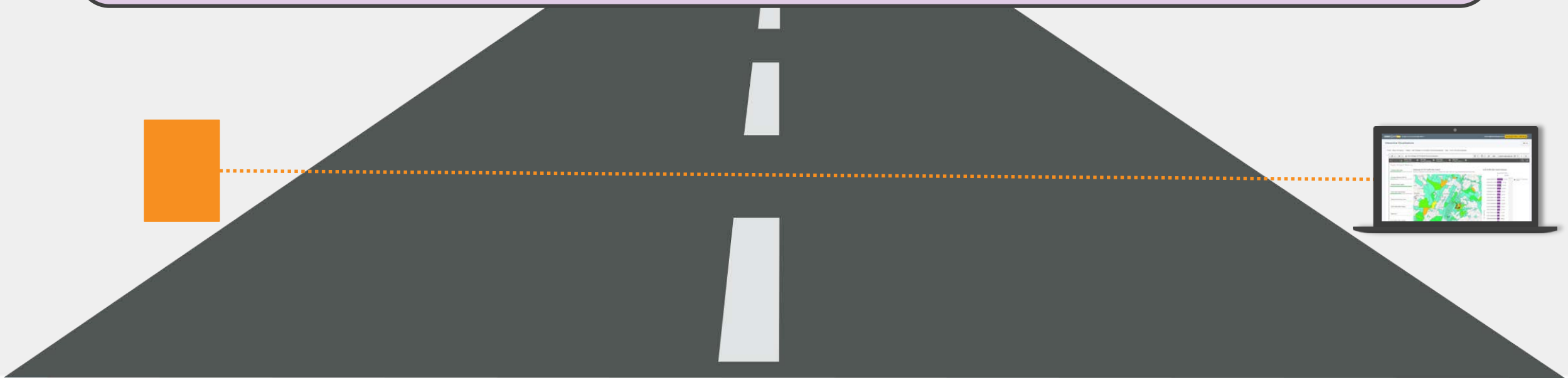
Who We are + Agenda

I. Intro to StreetLight Volume
II. Motivation
III. How We Set Our Target Outcomes
IV. Data Sources
V. Testing and Validation
VI. Questions?



StreetLight Volume: 2017 AADT – What Is It?

Average Annual Daily Traffic *Counts*



Motivation

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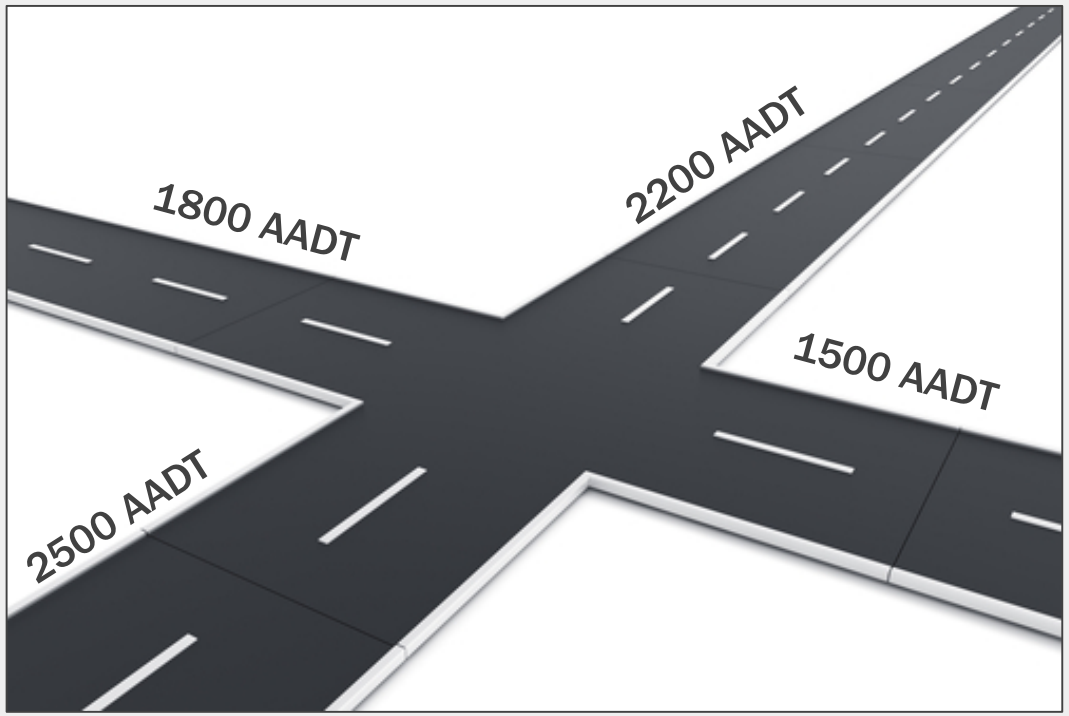
Four Key Reasons for Us to Start Estimating Traffic Counts from Our Big Data Resources

1. The Status Quo is Deficient
2. They're Industry Standard
3. Whole Industry would Benefit
4. It's Never Been Done Well

In addition, they're a precursor to VMT



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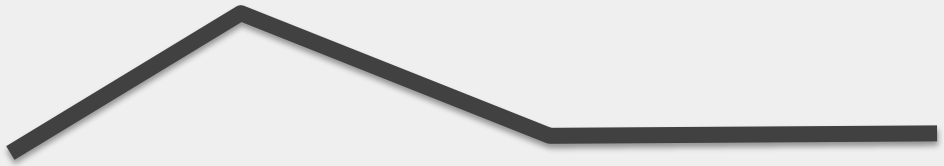
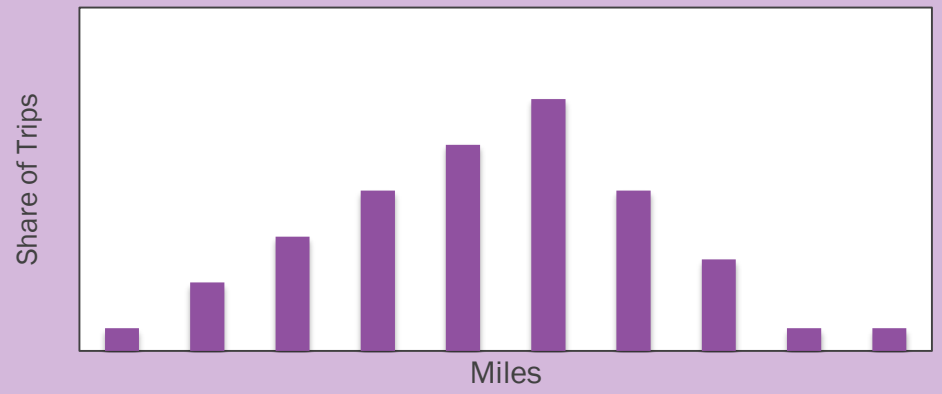
Segment Length



Average Trip VMT



Average Trip Distance + Distribution are Longtime *StreetLight InSight* Metrics

How We Set Our Target Outcomes

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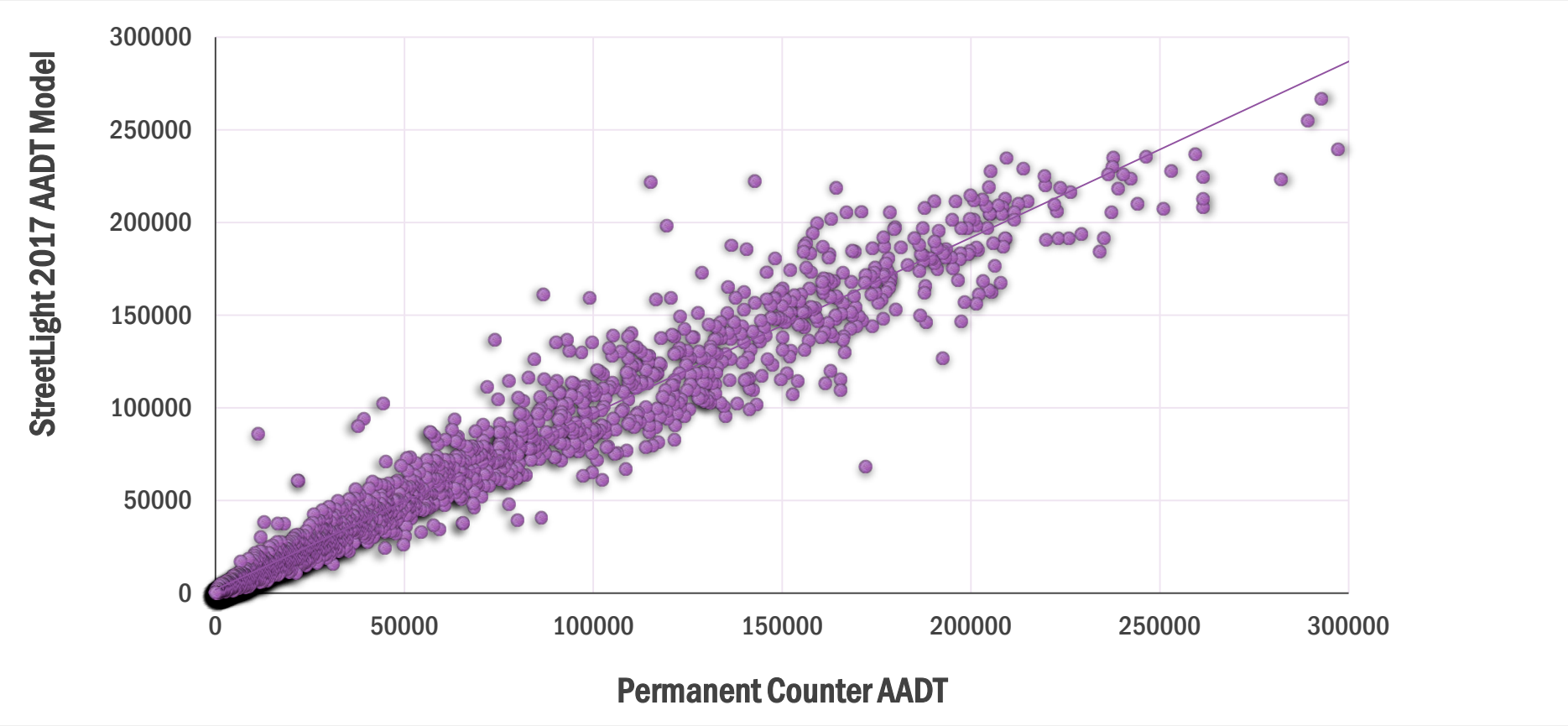
Our methods reflect our goals

1. Works better than 48-hour expansion
2. Productized for rural, arterial roads to maximize benefits.
3. Build an algorithm that is extensible:
    - To hourly, seasonal, truck v. car volume estimates
    - To be part of full, balanced origin, destination, routing Metrics

(NB – Real Time volume is not currently a goal)

These Are the Results of Our Validation Work

StreetLight 2017 AADT for Test Data compared to Permanent Counter AADT. R2 is 0.96. No outliers were removed.



Data Sources

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We Use Six Unique Data Sources for Our StreetLight Volume: 2017 AADT Estimates

1

Big Data Input #1

Full Year of 2017 Location-Based Services Data

2

Big Data Input #2

Full Year of 2017 Navigation-GPS Data

3

Contextual Input #1

US Census Data for Normalization

United States Census Bureau

4

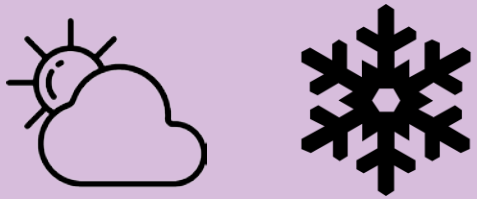
Contextual Input #2

Open Street Maps Data

5

Contextual Input #3

Weather Data



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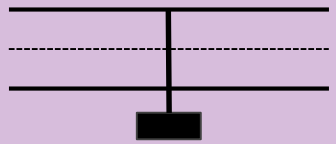
Permanent Counters

Data from 2,000+ Permanent Counters



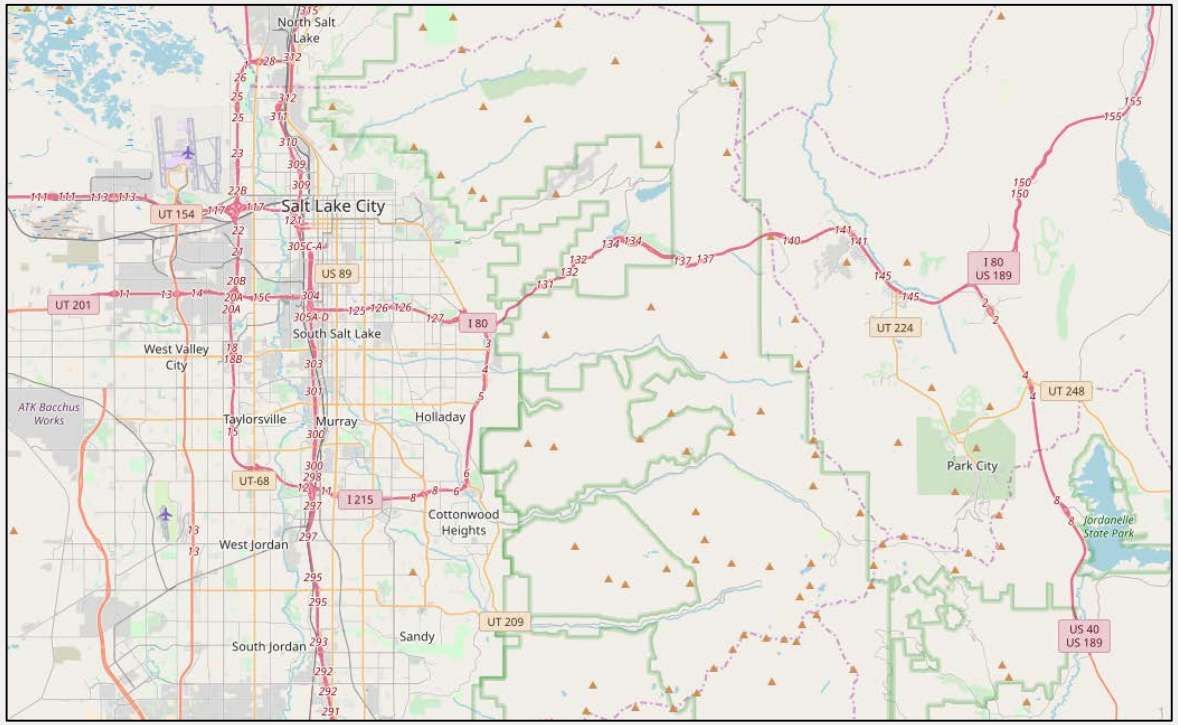
Our Big Data Resources: Location-Based Services and Navigation-GPS Data

Navigation-GPS Data: Created by Connected Trucks & Cars	
Spatial Precision	~5 meters
Frequency of Data Pings	Regularly; every 1 sec – 1 min
Type of Trip	Differentiates personal and commercial trips – ideal for truck studies
Sample Size	Penetration rate varies by region – but much smaller than LBS. ~1% - 4% for personal, 12% trucks.

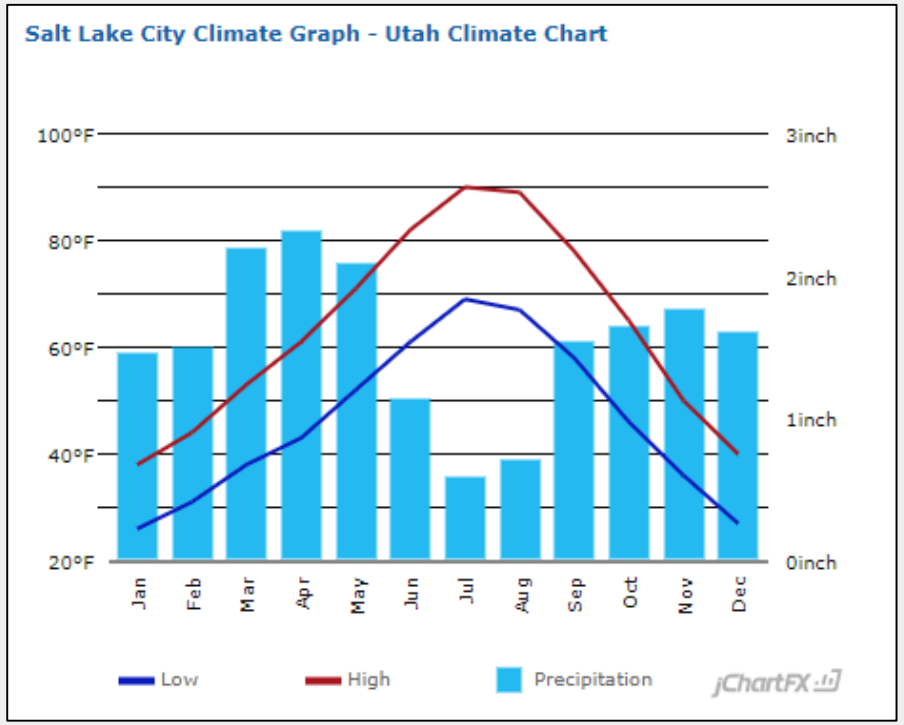
Location-Based Services (LBS) Data: Created by Smart Phone Apps	
Spatial Precision	~5 meters – 25 meters
Frequency of Data Pings	Variable; usually triggered by location change
Type of Trip	Personal
Sample Size	~23% of US and CA adult population (~65M devices in our database)

We Used Two Different Contextual Data Sources to Account for Roadway and Environmental Factors

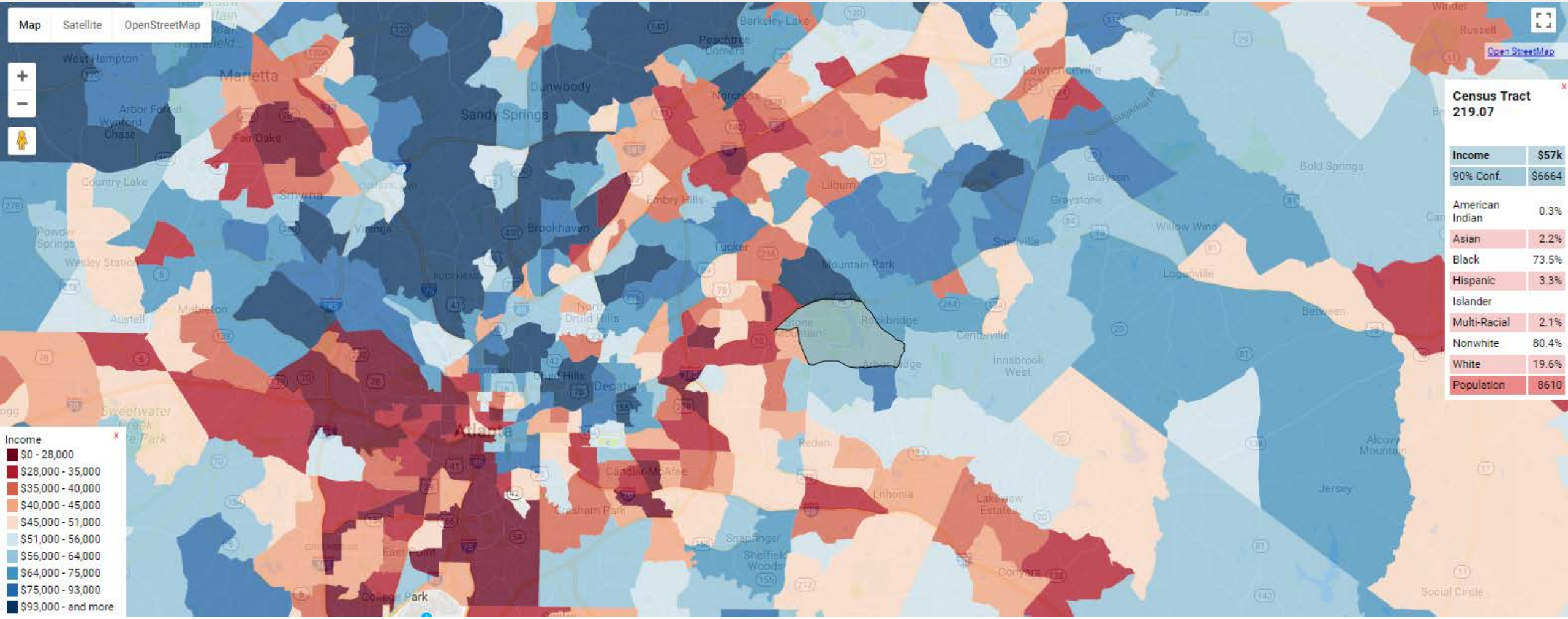
A Look into Open Street Maps: Salt Lake City, UT & Surroundings



A Look into Weather Data: Precipitation & Temperature in Salt Lake City, UT



US Census Data – Our Third Contextual Resource – Was Used for Normalization of LBS Trips

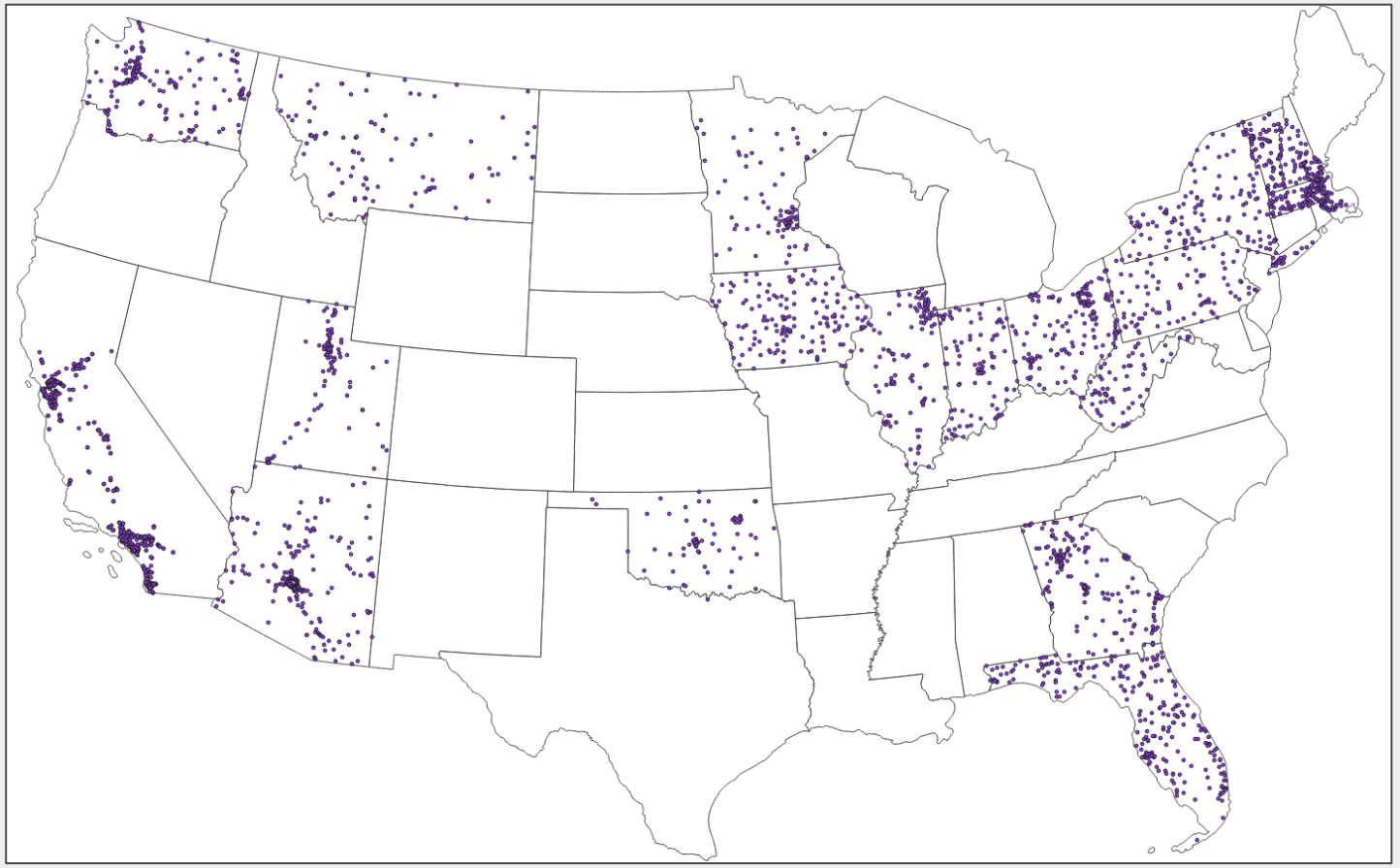


Our Data Resources from 2,000+ Permanent Count Locations Were Critical to Algorithm Development

Locations and AADT Distribution of the 2,605 Permanent Counters

State	# of Counters	State	# of Counters
AZ	232	NY	144
FL	243	NH	65
GA	181	OH	146
ID	116	OK	68
IN	90	CA	272
IA	147	PA	90
MA	193	UT	108
MN	84	VT	82
MT	97	WA	175

AADT Range	# of Counters
50,000+	795
25,000- 49,999	386
10,000 – 24,999	509
5,000 - 9,999	350
2500 – 4,999	270
0 – 2,499	294



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Testing and Validation

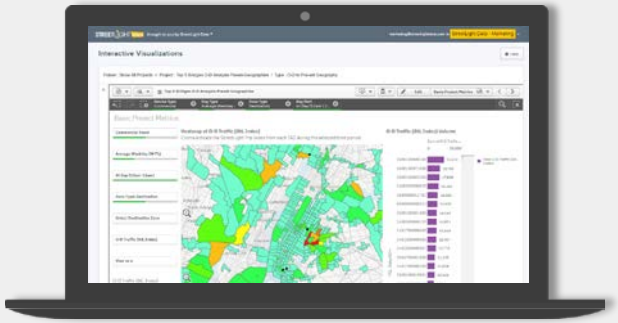
Our First Phase of Test Runs: Random Assignment of Training and Test Set Data

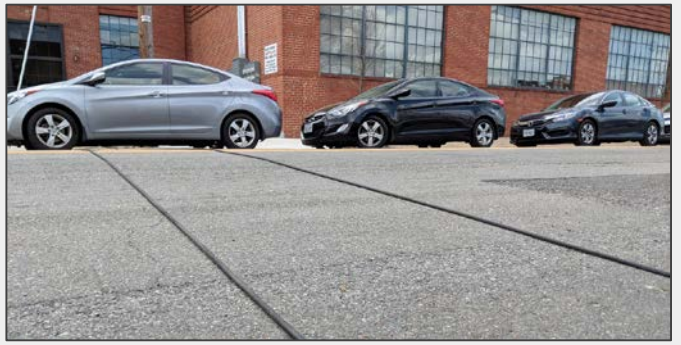
AADT Range	# of Segments	Target RMSE as % of Average AADT	StreetLight Algorithm's RMSE as % Average AADT	Delta to Target (positive means "better than target")
50,000+	795	20%	13.7%	6%
25,000- 49,999	386	25%	19.9%	5%
10,000 – 24,999	509	28%	31%	-3%
5,000- 9,999	350	39%	26.9%	12%
2500 – 4,999	270	44%	35.4%	8%
0 – 2,499	294	68%	58.30%	10%

Our Second Phase of Test Runs: State-Specific Data

AADT Range	# of Segments	Target RMSE as % of Average AADT	StreetLight Algorithm's RMSE as % Average AADT	Delta to Target (positive means "better than target")
50,000+	795	20%	15.80%	4%
25,000- 49,999	386	25%	20.80%	4%
10,000 – 24,999	509	28%	31.40%	-3%
5,000- 9,999	350	39%	31.50%	7%
2500 – 4,999	270	44%	36.10%	8%
0 – 2,499	294	68%	58.80%	9%

Data-Derived AADT Estimates Are Better than Temporary and Modeled AADT Counts





- No staff in harm's way
- Cost-effective
- Available in minutes
- 365 days of real-world data
- **As accurate to more accurate than temporary/modeled counts**

- Staff in field in harms way
- Expensive
- Time-intensive data collection and processing
- 2 to 7 days of real-world data

Questions?

Thank You!

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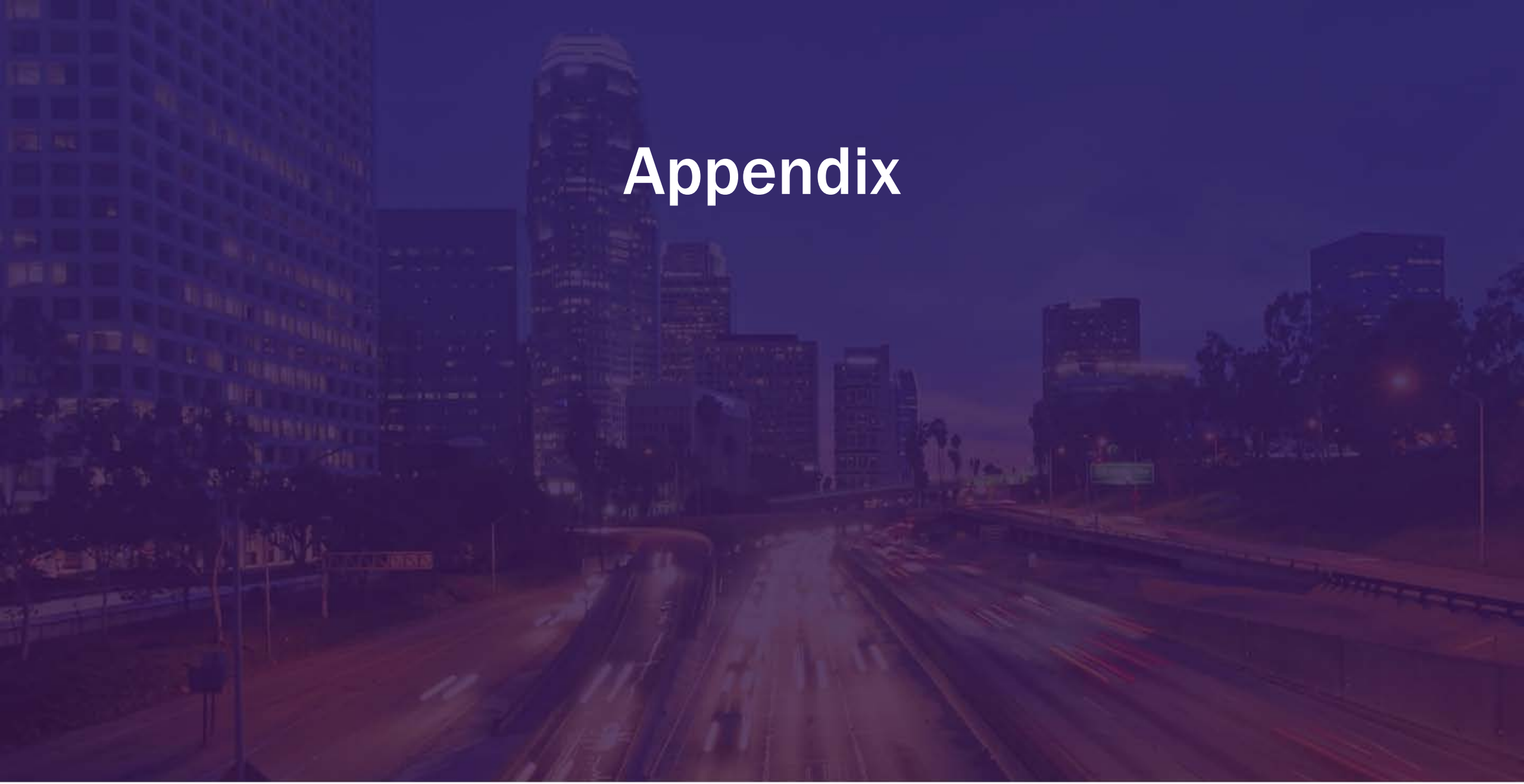
Appendix



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Spread of Counters by Estimated Road Type

(Open Streets Maps and Census)

Urban	# of Counters	Rural	# of Counters
Motorway	385	Motorway	865
Trunk	207	Trunk	103
Primary	433	Primary	221
Secondary	174	Secondary	84
Tertiary	47	Tertiary	34
Residential	23	Residential	25

Spread of Counters by Estimated Road Type

(Open Streets Maps and Census)

Urban	# of Counters	Rural	# of Counters
Motorway (1) Interstate, (2) Freeway and Expressway	385	**Motorway** (1) Interstate, (2) Freeway and Expressway	865
Trunk (3) Other Principal Arterial	207	**Trunk** (3) Other Principal Arterial	103
Primary (3), (4) Minor Arterial, (5) Major Collector	433	**Primary** (3), (4) Minor Arterial, (5) Major Collector	221
Secondary (4), (5)	174	**Secondary** (4), (5)	84
Tertiary (4), (5)	47	Tertiary (4), (5)	34
Residential (4), (5), (6)	23	Residential (4), (5), (6)	25

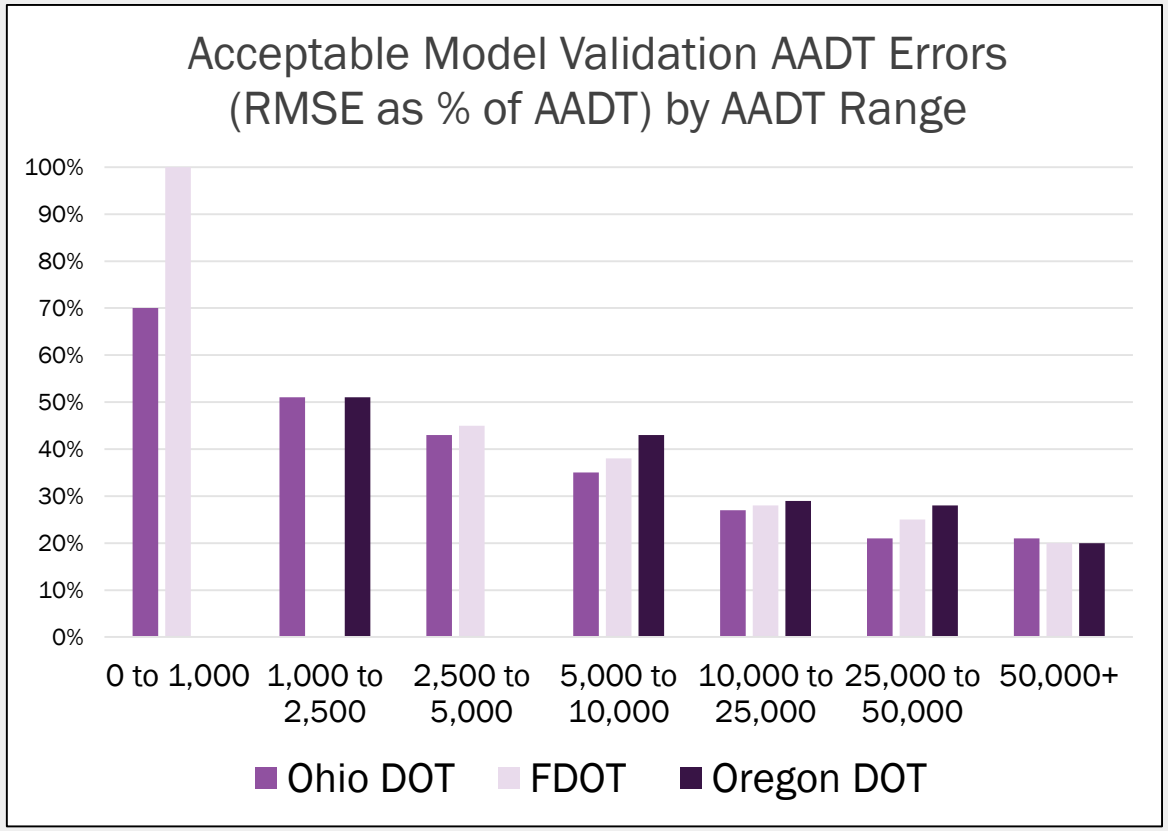
Spread of Counters by Road Type: Arizona

Urban	# of Counters	Rural	# of Counters
(1) Interstate	38	(1) Interstate	26
(2) Freeway and Expressway	69	(2) Freeway and Expressway	1
(3) Other Principal Arterial	21	(3) Other Principal Arterial	29
(4) Minor Arterial	5	(4) Minor Arterial	18
(5) Major Collector	3	(5) Major Collector	21
(6) Minor Collector	0	(6) Minor Collector	1

Spread of Counters by Road Type: Minnesota

Urban	# of Counters	Rural	# of Counters
Principal Arterial - Interstate	**4**	Principal Arterial - Interstate	**4**
Principal Arterial - Other	**16**	Principal Arterial - Other	**25**
Minor Arterial	**6**	**Minor Arterial**	**10**
Collector	**2**	Major Collector	**8**
Urban Local	**1**	Collector	**0**

Goal #2: Develop Estimates that Are Better Than Counts Derived from Expansion Models



Equation for Root Mean Square Error (RMSE) as a Percent of AADT

$$RMSE\ as\ \% = 100 * \frac{\sqrt{\left(\frac{1}{n}\right) * (Traditional\ AADT - Big\ Data\ AADT)^2}}{\left(\frac{1}{n} * \sum_{i=1}^{n}(Traditional\ AADT)\right.}$$

Source – Figure 9.8 in Travel Model Improvement Program, "Travel Model Validation and Reasonableness Checking Manual Second Edition." September 24, 2010.