Innovative Data Collection Using Big Data Analytics

May 19, 2021

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Meeting With You Today

Amir Rizavi, PE, ENV SP
Director of Transportation Systems

Steve Anderson, GISP
Director of Applied Technology

Our Vision

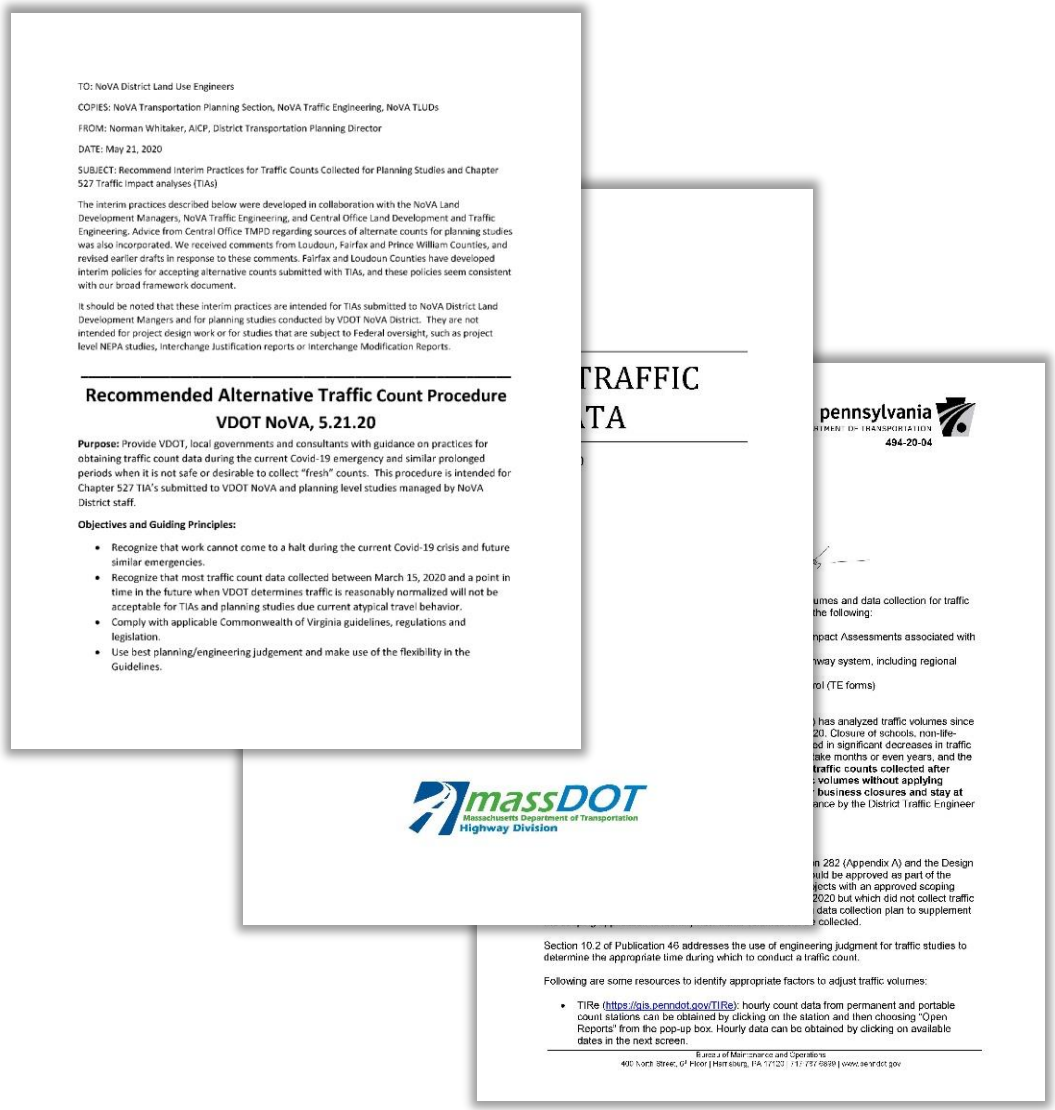
A transportation planning tool that combines big data analytics and traditional traffic analysis to identify traffic data at intersections more efficiently than ever before, without the need for traditional manual or electronic counts.

How Are We Collecting Data?

"If **"big data" products such as INRIX** or Street Light are used, this should be discussed in advance with the appropriate local government and VDOT land development manager, or **in the case of VDOT planning studies, with Traffic Engineering and Transportation Planning**. Data should have been **collected between to January 1 2017 and March 15 2020**." – VDOT NoVA, *Recommended Alternative Traffic Count Procedure*

"Where no TMCs exist, Traffic Signal Warrants **may be estimated using third-party sensor or probe data**, estimates based upon ATRs, or combinations thereof, upon authorization from the State Traffic Engineer." – MassDOT, *Guidance on Traffic Count Data*

"Third-party vendor data, with origin-destination information prior to March 12, 2020, **can be used to estimate percentages** of turning movements." – PennDOT, *COVID-19 Traffic Data Guidance*



TO: NoVA District Land Use Engineers

COPIES: NoVA Transportation Planning Section, NoVA Traffic Engineering, NoVA TLUDs

FROM: Norman Whitaker, AICP, District Transportation Planning Director

DATE: May 21, 2020

SUBJECT: Recommend Interim Practices for Traffic Counts Collected for Planning Studies and Chapter 527 Traffic Impact analyses (TIAs)

The interim practices described below were developed in collaboration with the NoVA Land Development Managers, NoVA Traffic Engineering, and Central Office Land Development and Traffic Engineering. Advice from Central Office TMPD regarding sources of alternate counts for planning studies was also incorporated. We received comments from Loudoun, Fairfax and Prince William Counties, and revised earlier drafts in response to these comments. Fairfax and Loudoun Counties have developed interim policies for accepting alternative counts submitted with TIAs, and these policies seem consistent with our broad framework document.

It should be noted that these interim practices are intended for TIAs submitted to NoVA District Land Development Mangers and for planning studies conducted by VDOT NoVA District. They are not intended for project design work or for studies that are subject to Federal oversight, such as project level NEPA studies, Interchange Justification reports or Interchange Modification Reports.

Recommended Alternative Traffic Count Procedure
VDOT NoVA, 5.21.20

Purpose: Provide VDOT, local governments and consultants with guidance on practices for obtaining traffic count data during the current Covid-19 emergency and similar prolonged periods when it is not safe or desirable to collect "fresh" counts. This procedure is intended for Chapter 527 TIA's submitted to VDOT NoVA and planning level studies managed by NoVA District staff.

Objectives and Guiding Principles:

- Recognize that work cannot come to a halt during the current Covid-19 crisis and future similar emergencies.
- Recognize that most traffic count data collected between March 15, 2020 and a point in time in the future when VDOT determines traffic is reasonably normalized will not be acceptable for TIAs and planning studies due current atypical travel behavior.
- Comply with applicable Commonwealth of Virginia guidelines, regulations and legislation.
- Use best planning/engineering judgement and make use of the flexibility in the Guidelines.

massDOT Massachusetts Department of Transportation Highway Division

pennsylvania
494-20-04

Section 10.2 of Publication 46 addresses the use of engineering judgment for traffic studies to determine the appropriate time during which to conduct a traffic count.

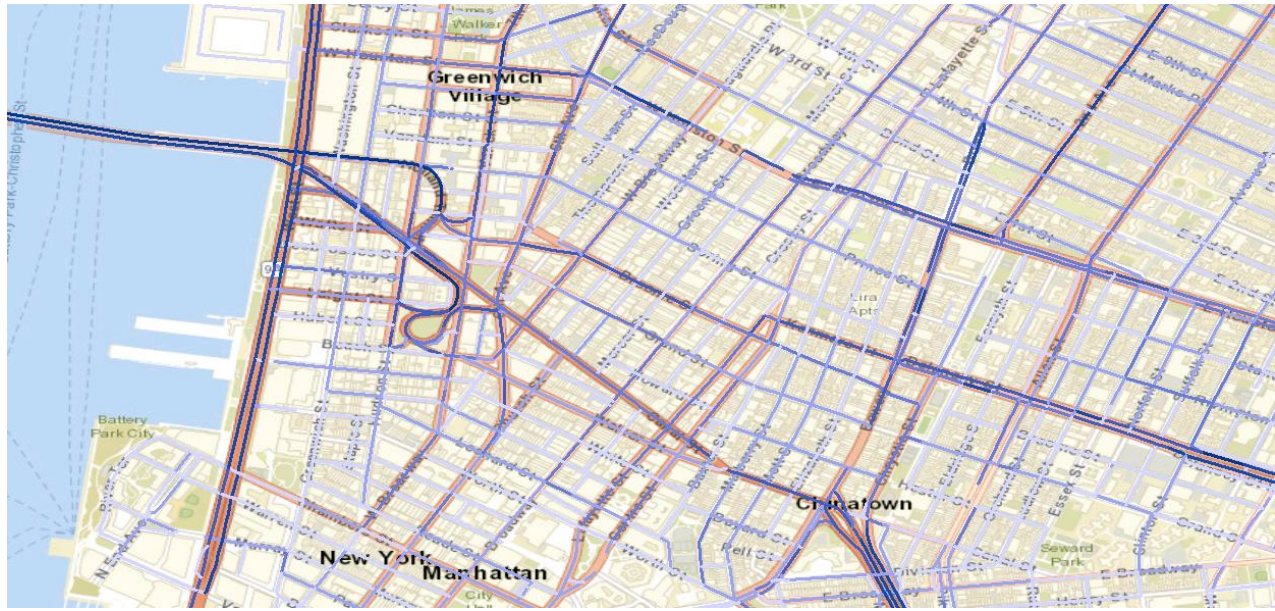
Following are some resources to identify appropriate factors to adjust traffic volumes:

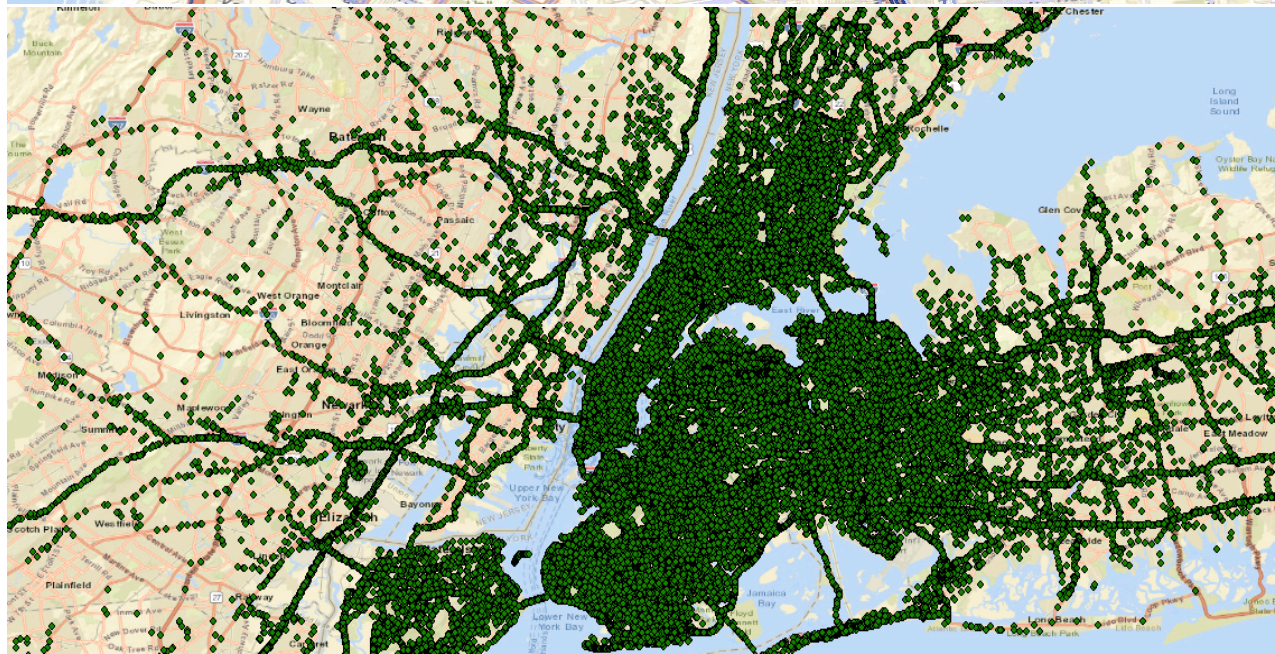
- TIRe (https://gis.penndot.gov/TIRe): hourly count data from permanent and portable count stations can be obtained by clicking on the station and then choosing "Open Reports" from the pop-up box. Hourly data can be obtained by clicking on available dates in the next screen.

VHB's latest technology-driven innovation revolutionizes the way we account for traffic volumes at urban, suburban, or rural intersections during typical and atypical circumstances. Intersect leverages big data and traffic analysis to keep critical projects moving forward.

Traditional Methods

Probe Collection





Data Sources

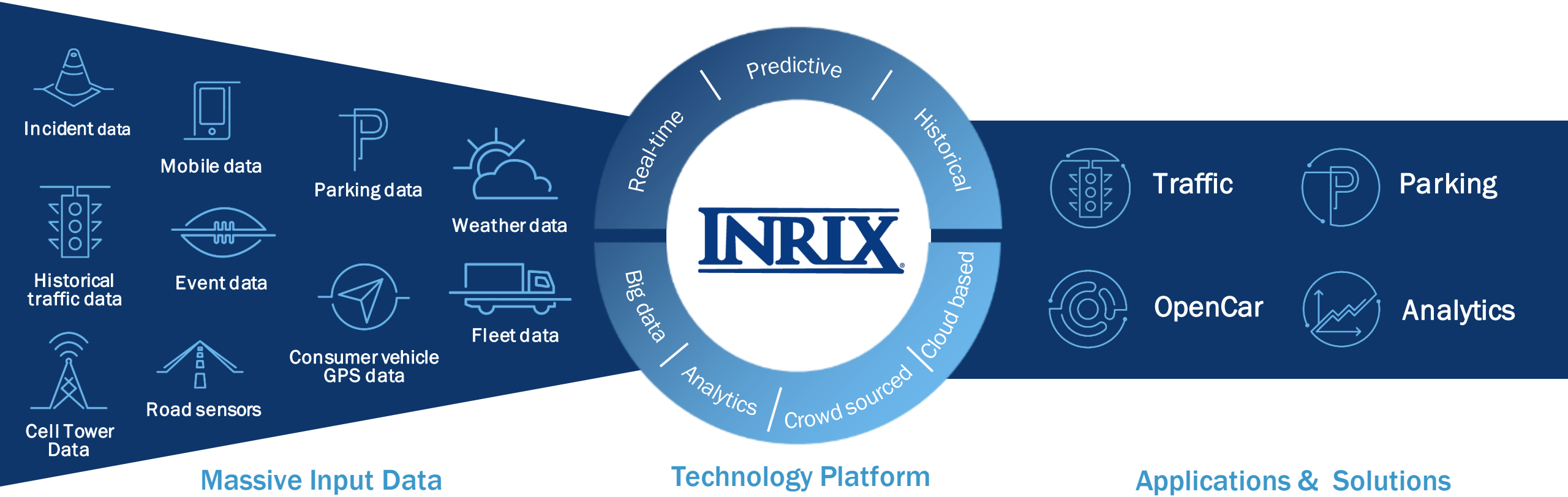
INRIX
Wejo
HERE
Verizon
Replica

Teralytics
Airsage
Moovit
CityDash
Streetlight

Source	Captured Data	Capture Rate
INRIX	• Speed • Historic average speed • Travel time • Volume data	• Near real time (30 seconds – 1 minute)
Wejo	• Speed • Historic average speed • Travel time • Volume data • Queuing	• Near real time (3 to 5 seconds)
HERE (previous NAVTEQ)	• Speed • Travel time • Jam factor (congestion)	• Near real time (30 seconds – 1 minute)
Verizon	• Origin-Destination matrices • Congestion analysis • Parking optimization • Volume data	• Near real time (1 minute)
Replica	• Origin-Destination • All mode estimates • Trip Purpose	• Highest capture rate • Overnight process

INRIX Technology Platform

Unique big data and analytics platform ingesting multiple data feeds



Massive Input Data

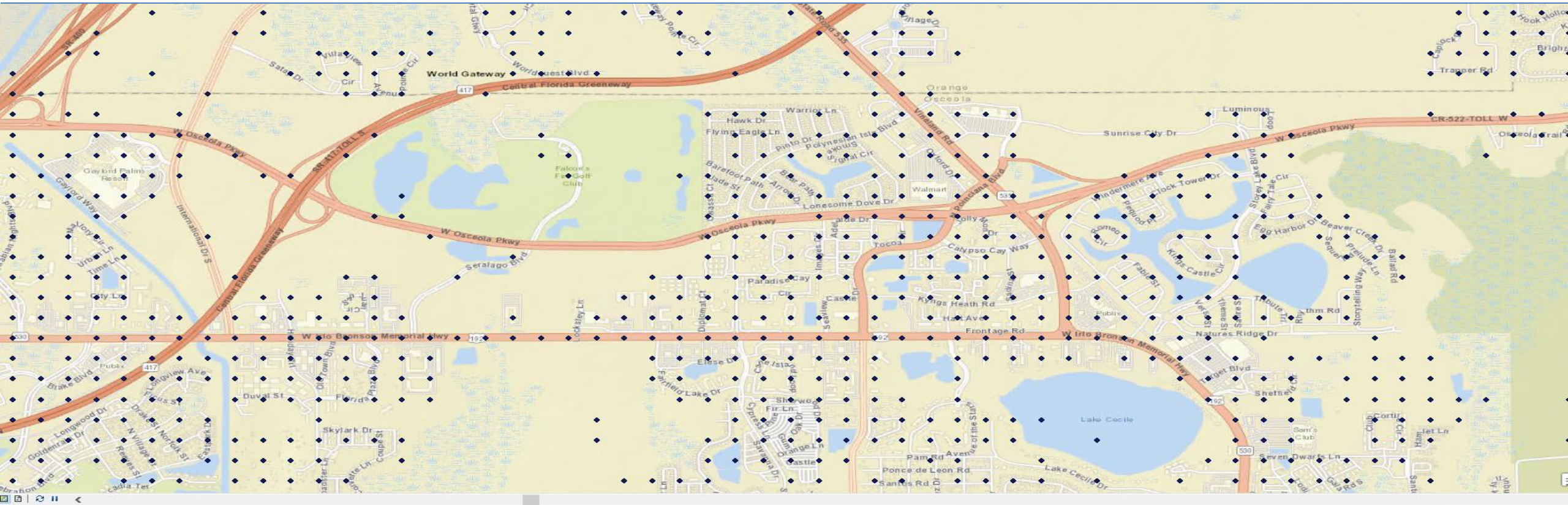
Technology Platform

Applications & Solutions

- Global geo-spatial platform for location based services
- Massive real-time data aggregation and processing
- Analytics capabilities on 10 years of historical data

Trip Analysis Using Big Data

Start trip Locations—Maintaining Anonymity



Table

trips.csv

	Field1	Field2	Field3	Field4	Field5	Field6	Field7	Field8	Field9	Field10	Field11	Field12	Field13	Field14	Field1
	ff3cba967599d6092ace1df580bd1b80	ff3cba967599d6092ace1df580bd1b80	42998cf32d552343bc8e460416382dca	1	2020-02-12T10:55:08.000Z	3	2020-02-12T11:20:03.000Z	3	28.46084	-81.42311	28.49102	-81.4643	II	1	
	ff437755b400ec6268c0e27d7cfd8476	ff437755b400ec6268c0e27d7cfd8476	42998cf32d552343bc8e460416382dca	1	2020-02-12T17:41:05.000Z	3	2020-02-12T17:55:33.000Z	3	28.35092	-81.5879	28.38113	-81.54945	II	1	
	ff481e899970f82e25d87bbbcb57697c	a7cbdac3b46286807c1f793f83f1ee5a	d07e70efcfab08731a97e7b91be644de	1	2020-02-12T19:01:28.000Z	3	2020-02-12T19:18:25.000Z	3	28.86091	-82.04246	28.87293	-81.90788	EI	1	
	ff527cde41ab325d5f8afc07be57fad5	f927ac0e48d4e1af77a7809e1c7a9c7f	d07e70efcfab08731a97e7b91be644de	1	2020-02-12T22:30:23.000Z	3	2020-02-12T22:51:13.000Z	3	28.75983	-81.35719	28.85249	-81.34208	IE	1	
	ff9636c4b1e8e10a2dc5e3232799d45b	ff9636c4b1e8e10a2dc5e3232799d45b	42998cf32d552343bc8e460416382dca	1	2020-02-12T19:58:42.000Z	3	2020-02-12T20:05:51.000Z	3	28.27717	-81.34757	28.2941	-81.36268	II	1	
	ff9ea8cea50107013c5345c46447d7bc	737b8475674271bfab142abdf7720abe	54229abfcfa5649e7003b83dd4755294	1	2020-02-12T16:03:57.000Z	3	2020-02-12T16:18:41.000Z	3	28.51998	-81.31187	28.57668	-81.31599	II	2	
	ffe156be7150c534fcfd3872673b0b1d	ffe156be7150c534fcfd3872673b0b1d	42998cf32d552343bc8e460416382dca	1	2020-02-12T21:01:18.000Z	3	2020-02-12T21:22:15.000Z	3	28.55014	-81.5316	28.60441	-81.55082	II	1	
▶	ffe210e51aab2f3f79e91bc9d0af19d5	ffe210e51aab2f3f79e91bc9d0af19d5	42998cf32d552343bc8e460416382dca	1	2020-02-12T23:26:25.000Z	3	2020-02-13T00:17:53.000Z	3	28.69359	-81.47666	28.56462	-81.36405	II	1	

979147 (0 out of 979147 Selected)

trips.csv

Looking At a Trip For Turning Movement | Trip Start

Table

Trips_firstXY

OBJECTID *	Field1	Field2	Field3	Field4	Field5	Field6	Field7	Field8	Field9	Field10	Field11	Field12	Field13	Field
146732	12dbae3be630e277475fa4cb4741cbe6	12dbae3be630e277475fa4cb4741cbe6	42998cf32d552343bc8e460416382dca	1	2020-02-12T00:01:19.000Z	2	2020-02-12T00:21:58.000Z	2	28.33279	-81.48902	28.25661	-81.48216	I	
218101	a78d259a796ea59a34fddc01148c8a44	a78d259a796ea59a34fddc01148c8a44	42998cf32d552343bc8e460416382dca	1	2020-02-12T00:14:41.000Z	2	2020-02-12T01:04:34.000Z	2	28.33279	-81.48902	28.18037	-81.49864	I	
406697	2d0aac53dd7d4cbcee5cc070953ca1f0	a9c0c5c02ccad2c96574d93756b8aa7b	c3e878e27f52e2a57ace4d9a76fd9acf	1	2020-02-12T00:17:07.023Z	2	2020-02-12T00:22:59.053Z	2	28.33279	-81.48902	28.33279	-81.47941	I	
925490	0caf3e4352738a0d28da969ec8660688	0caf3e4352738a0d28da969ec8660688	42998cf32d552343bc8e460416382dca	1	2020-02-12T00:29:16.000Z	2	2020-02-12T00:40:25.000Z	2	28.33279	-81.48902	28.33037	-81.5316	I	
375794	d3d7f4dc9a3cc7e7406aeed78df4aeb3	9f237f3c1b3c66ec2108bed5cb5b857d	84d9ee44e457ddef7f2c4f25dc8fa865	1	2020-02-12T00:33:14.000Z	2	2020-02-12T00:54:40.000Z	2	28.33279	-81.48902	28.27354	-81.59339	I	
505379	46a56cb867fe4f18520afbbe7392bec5	46a56cb867fe4f18520afbbe7392bec5	42998cf32d552343bc8e460416382dca	1	2020-02-12T00:54:36.000Z	2	2020-02-12T00:59:50.000Z	2	28.33279	-81.48902	28.33399	-81.52748	I	
302514	d99876bdb4081a11881541b5719fb67f	d99876bdb4081a11881541b5719fb67f	42998cf32d552343bc8e460416382dca	1	2020-02-12T01:06:42.000Z	2	2020-02-12T01:23:20.000Z	2	28.33279	-81.48902	28.37388	-81.50276	I	
440639	015b9bf8c3daf8f6f6db08fb000b00f5	0e0f01f6220d3b4888462d279b7193f4	e2c0be24560d78c5e599c2a9c9d0bbd2	1	2020-02-12T01:17:59.000Z	2	2020-02-12T01:35:23.000Z	2	28.33279	-81.48902	28.19369	-81.71699	E	
187526	6fd15ab153659dcc9f74ae663cc2e0b1	6fd15ab153659dcc9f74ae663cc2e0b1	42998cf32d552343bc8e460416382dca	0	2020-02-12T01:24:41.000Z	2	2020-02-12T01:46:34.000Z	2	28.33279	-81.48902	28.3352	-81.47941	I	
469020	c6ee338cee376eaa59e6c1657c757a25	c6ee338cee376eaa59e6c1657c757a25	42998cf32d552343bc8e460416382dca	1	2020-02-12T01:27:36.000Z	2	2020-02-12T01:30:57.000Z	2	28.33279	-81.48902	28.33037	-81.4904	I	
111460	dc6f77a2cc653bb4a8ec83d65c57a27a	ac12f1037e04a472ea5e1b1a961c7ee5	d07e70efcfab08731a97e7b91be644de	1	2020-02-12T01:29:50.000Z	2	2020-02-12T01:46:13.000Z	2	28.33279	-81.48902	28.2941	-81.47117	I	
539352	4062179511232910459e57e7ded84009	4062179511232910459e57e7ded84009	42998cf32d552343bc8e460416382dca	1	2020-02-12T01:42:31.000Z	2	2020-02-12T02:57:20.000Z	2	28.33279	-81.48902	27.60141	-80.82298	E	
51610	959617d0613a030ee9f8abdcd33be5d0	959617d0613a030ee9f8abdcd33be5d0	42998cf32d552343bc8e460416382dca	1	2020-02-12T01:42:42.000Z	2	2020-02-12T01:52:44.000Z	2	28.33279	-81.48902	28.37146	-81.40525	I	
713401	bf4eadebf054d0dedd2ae54df540e4c7	3a1fef85ad90ffa1d9fb76cfb73ab388	d07e70efcfab08731a97e7b91be644de	1	2020-02-12T01:51:15.000Z	2	2020-02-12T01:55:16.000Z	2	28.33279	-81.48902	28.33279	-81.49452	I	
398927	93dd13529cc7719e2601129e324277db	fa6e7c7164e1e4c8ee04a999dcce44f6	d07e70efcfab08731a97e7b91be644de	1	2020-02-12T02:02:13.000Z	2	2020-02-12T02:08:58.000Z	2	28.33279	-81.48902	28.34125	-81.47392	I	
724213	fb722f372ac35912fb6cc934fcc6e707	fb722f372ac35912fb6cc934fcc6e707	42998cf32d552343bc8e460416382dca	1	2020-02-12T02:03:06.000Z	2	2020-02-12T02:28:28.000Z	2	28.33279	-81.48902	28.34971	-81.61262	I	
770165	5a9dd2cf24ed8fb515ad58939f204516	5a9dd2cf24ed8fb515ad58939f204516	42998cf32d552343bc8e460416382dca	1	2020-02-12T02:16:50.000Z	2	2020-02-12T02:50:12.000Z	2	28.33279	-81.48902	28.27112	-81.3668	I	
905181	e4b77730014aa502c37f7b832e122b5c	e4b77730014aa502c37f7b832e122b5c	42998cf32d552343bc8e460416382dca	1	2020-02-12T02:50:17.000Z	2	2020-02-12T02:57:57.000Z	2	28.33279	-81.48902	28.33641	-81.53297	I	
692622	7972221d314a05973ffe59993cae672c	7972221d314a05973ffe59993cae672c	42998cf32d552343bc8e460416382dca	1	2020-02-12T02:51:59.000Z	2	2020-02-12T02:58:00.000Z	2	28.33279	-81.48902	28.33641	-81.53297	I	
647216	39d740762136951f51ae5d9fcf0f87cc6	39d740762136951f51ae5d9fcf0f87cc6	42998cf32d552343bc8e460416382dca	1	2020-02-12T03:58:24.000Z	2	2020-02-12T04:00:36.000Z	2	28.33279	-81.48902	28.33279	-81.49177	I	
372053	1125ed42630d2cc0abc3781da728a1f9	1125ed42630d2cc0abc3781da728a1f9	42998cf32d552343bc8e460416382dca	1	2020-02-12T04:10:50.000Z	2	2020-02-12T04:28:05.000Z	2	28.33279	-81.48902	28.24088	-81.43684	I	
299388	39c61cb36edccb28cb3747d5a5ee0e1c	39c61cb36edccb28cb3747d5a5ee0e1c	42998cf32d552343bc8e460416382dca	1	2020-02-12T04:47:23.000Z	2	2020-02-12T04:53:17.000Z	2	28.33279	-81.48902	28.32916	-81.51649	I	
483270	b416f6536a9ee9c81024f56968cb896f	b416f6536a9ee9c81024f56968cb896f	42998cf32d552343bc8e460416382dca	1	2020-02-12T11:14:15.000Z	3	2020-02-12T11:23:08.000Z	3	28.33279	-81.48902	28.30498	-81.45744	I	

Intersection Probe Data | Speed Data

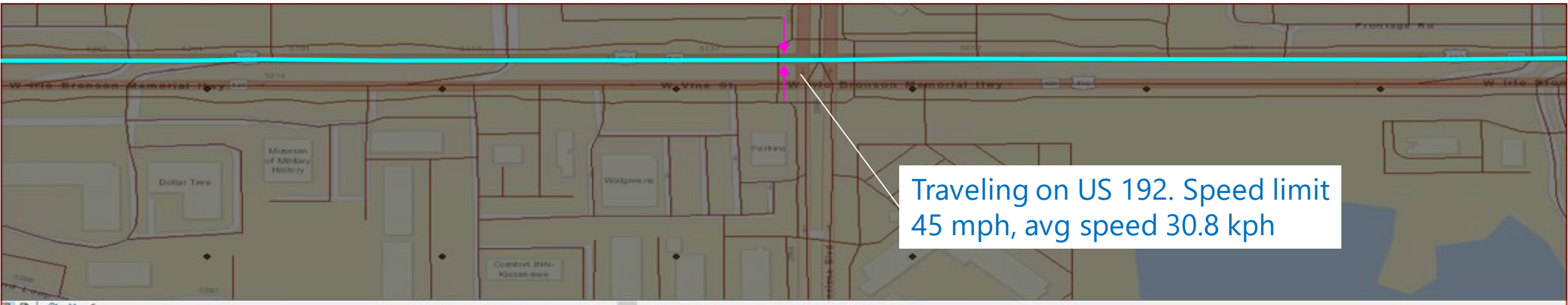


Table - roads

oads

FID	Shape	osm_id *	name	ref	type	oneway	bridge	maxspeed
85517	Polyline	136135049	West Irlo Bronson Memorial Highwa	US 192	primary	1	0	45

0 (1 out of 279562 Selected)

roads

NRIX_TrajectorySample

TrajRawDistanceM	TrajRawDurationMillis	SegmentId	SegmentIdx	LengthM	CrossingStartOffsetM	CrossingEndOffsetM	CrossingStartDateUtc	CrossingEndDateUtc	CrossingSpeedKph	OnRoad
11638.06378	1402000	554574785_0	12	148.989	0	148.989	2020-02-12T21:25:44.073Z	2020-02-12T21:26:01.469Z	30.831494	
11638.06378	1402000	554574785_1	13	59.091	0	59.091	2020-02-12T21:26:01.469Z	2020-02-12T21:26:08.369Z	30.831494	
11638.06378	1402000	159568848_0	14	53.492	0	53.492	2020-02-12T21:26:08.369Z	2020-02-12T21:26:14.615Z	30.831494	
11638.06378	1402000	159568848_1	15	73.362	0	73.362	2020-02-12T21:26:14.615Z	2020-02-12T21:26:23.181Z	30.831494	
11638.06378	1402000	159568828_0	16	21.156	0	21.156	2020-02-12T21:26:23.181Z	2020-02-12T21:26:25.651Z	30.831493	
11638.06378	1402000	136135049_36	17	178.313	0	178.313	2020-02-12T21:26:25.651Z	2020-02-12T21:26:46.472Z	30.831494	
11638.06378	1402000	136135049_37	18	135.106	0	135.106	2020-02-12T21:26:46.472Z	2020-02-12T21:27:02.247Z	30.831494	
11638.06378	1402000	136135049_38	19	10.119	0	10.119	2020-02-12T21:27:02.247Z	2020-02-12T21:27:03.429Z	30.831491	
11638.06378	1402000	136135049_39	20	71.54	0	71.54	2020-02-12T21:27:03.429Z	2020-02-12T21:27:11.782Z	30.831493	
11638.06378	1402000	136135049_40	21	161.34	0	161.34	2020-02-12T21:27:11.782Z	2020-02-12T21:28:00.000Z	12.045774	
11638.06378	1402000	136135049_41	22	50.152	0	50.152	2020-02-12T21:28:00.000Z	2020-02-12T21:28:03.061Z	58.987288	
11638.06378	1402000	136135049_42	23	108.818	0	108.818	2020-02-12T21:28:03.061Z	2020-02-12T21:28:09.702Z	58.987287	
11638.06378	1402000	136135049_43	24	65.306	0	65.306	2020-02-12T21:28:09.702Z	2020-02-12T21:28:13.688Z	58.987288	

1 (1 out of 251 Selected)

Intersection Probe Data | Bridge Crossings

roads

Shape	osm_id *	name	ref	type	oneway	bridge	maxspeed
Polyline	45505925	Bronson Highway	US 192	primary	1	1	45

1 (1 out of 279562 Selected)

TrajectorySample

TrajRawDistanceM	TrajRawDurationMillis	SegmentId	SegmentIdx	LengthM	CrossingStartOffsetM	CrossingEndOffsetM	CrossingStartDateUtc	CrossingEndDateUtc	CrossingSpeedKph	OnRoadNetworkSnapCount
11638.06378	1402000	136135049_64	45	102.292	0	102.292	2020-02-12T21:30:52.115Z	2020-02-12T21:31:19.966Z	13.222292	
11638.06378	1402000	136135049_65	46	67.24	0	67.24	2020-02-12T21:31:19.966Z	2020-02-12T21:31:34.246Z	16.951273	
11638.06378	1402000	136135049_66	47	33.271	0	33.271	2020-02-12T21:31:34.246Z	2020-02-12T21:31:36.386Z	55.964199	
11638.06378	1402000	136135049_67	48	20.692	0	20.692	2020-02-12T21:31:36.386Z	2020-02-12T21:31:37.717Z	55.964206	
11638.06378	1402000	136135049_68	49	69.24	0	69.24	2020-02-12T21:31:37.717Z	2020-02-12T21:31:42.171Z	55.9642	

Intersection Probe Data | Congestion Management

roads

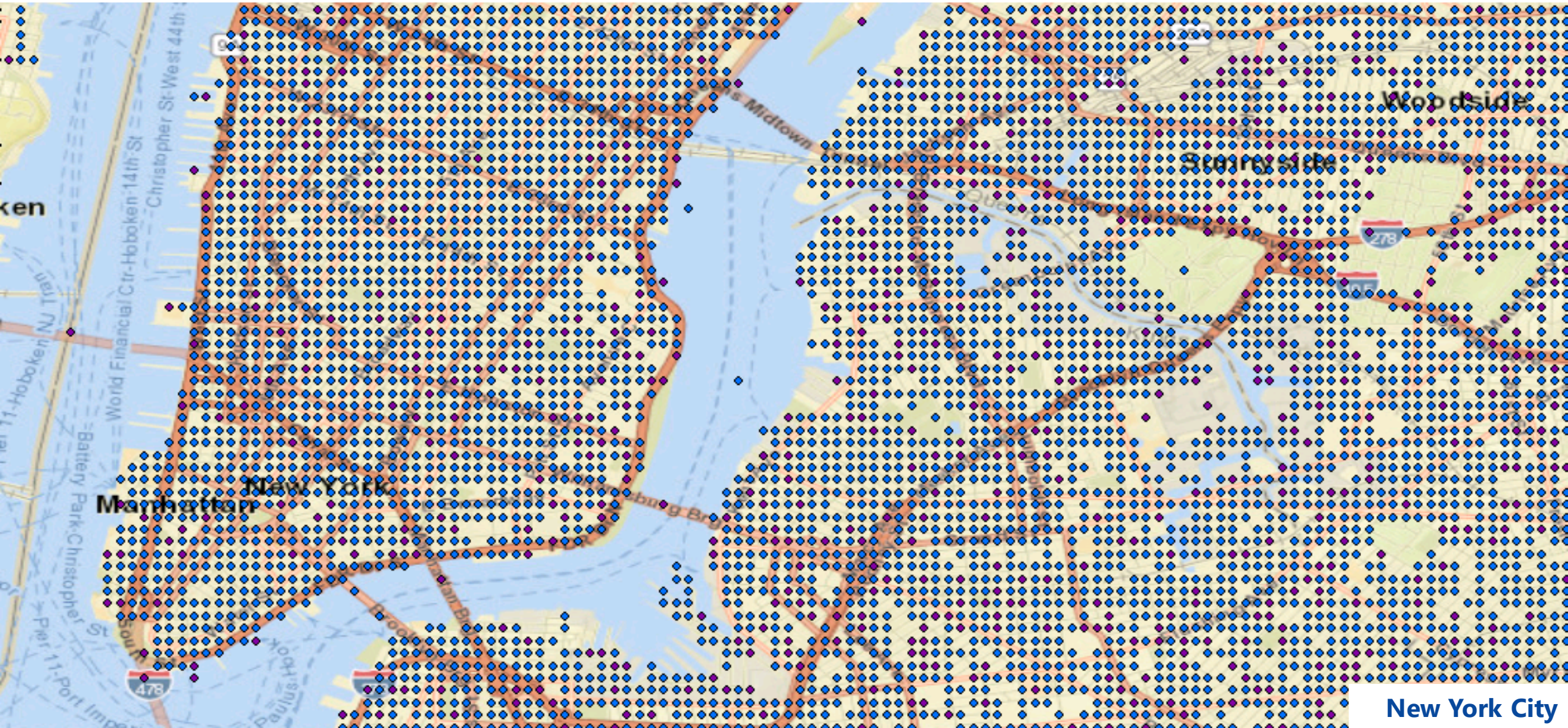
ID	Shape	osm_id *	name	ref	type	oneway	bridge	maxspeed
995	Polyline	43678374			motorway_link	1	1	0

1 (1 out of 279562 Selected)

_TrajectorySample

TrajIdx	TrajRawDistanceM	TrajRawDurationMillis	SegmentId	SegmentIdx	LengthM	CrossingStartOffsetM	CrossingEndOffsetM	CrossingStartDateUtc	CrossingEndDateUtc
4	2354.952301	466000	32084902_0	8	158.01	0	158.01	2020-02-12T22:31:06.669Z	2020-02-12T22:31:17.134Z
4	2354.952301	466000	48649289_0	9	38.919	0	38.919	2020-02-12T22:31:17.134Z	2020-02-12T22:31:19.711Z
4	2354.952301	466000	48649280_0	10	34.988	0	34.988	2020-02-12T22:31:19.711Z	2020-02-12T22:31:22.028Z
4	2354.952301	466000	32084870_0	11	351.332	0	351.332	2020-02-12T22:31:22.028Z	2020-02-12T22:31:45.295Z
4	2354.952301	466000	43678382_1	18	89.471	0	89.471	2020-02-12T22:32:53.359Z	
4	2354.952301	466000	46976043_0	19	118.182	0	118.182	2020-02-12T22:32:59.284Z	
4	2354.952301	466000	46976043_1	20	68.776	0	68.776	2020-02-12T22:33:07.111Z	
4	2354.952301	466000	556856709_0	21	90.086	0	90.086	2020-02-12T22:33:11.666Z	
4	2354.952301	466000	556856705_0	22	64.704	0	64.704	2020-02-12T22:33:17.632Z	
4	2354.952301	466000	46976043_1	20	68.776	0	68.776	2020-02-12T22:33:07.111Z	2020-02-12T22:33:11.666Z

Starting Trip Locations—All Vehicles, 1 Day



New York City

Intersect Procedures

Intersect's Innovative Process

STEP 1

LEVERAGE
Probe Data in a
Big Data Environment

STEP 2

IDENTIFY
Control Points

STEP 3

APPLY
a Balanced
Flow Approach

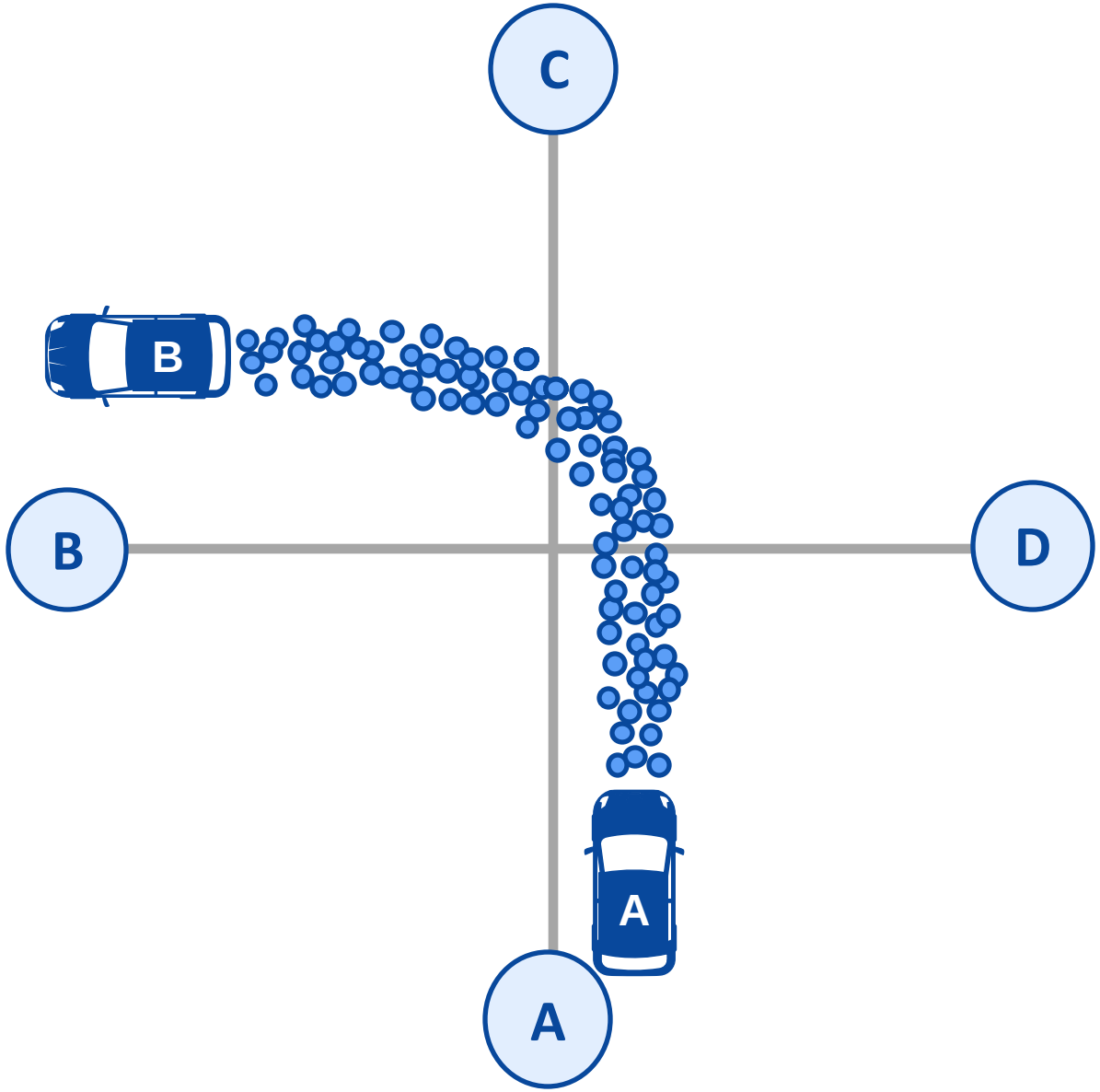
STEP 4

VALIDATE
The Process/Data

STEP 1

Intersect Leverages Probe Data in a Big Data Environment

- Identify turn % or volumes
- Continuous collection
  - Time of day
  - Day of week
- Seasonal adjustments (multiple days)



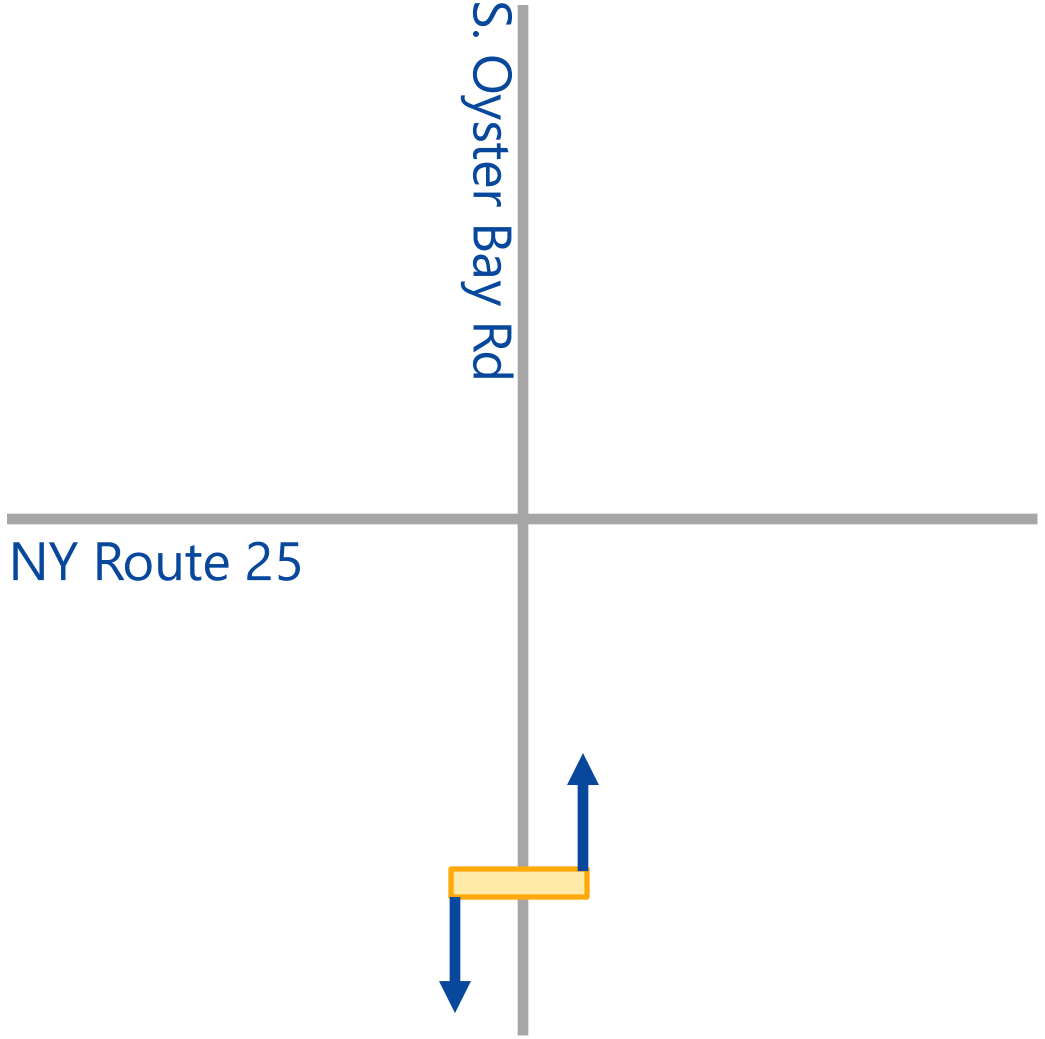
Percent Turns Using Probe Data

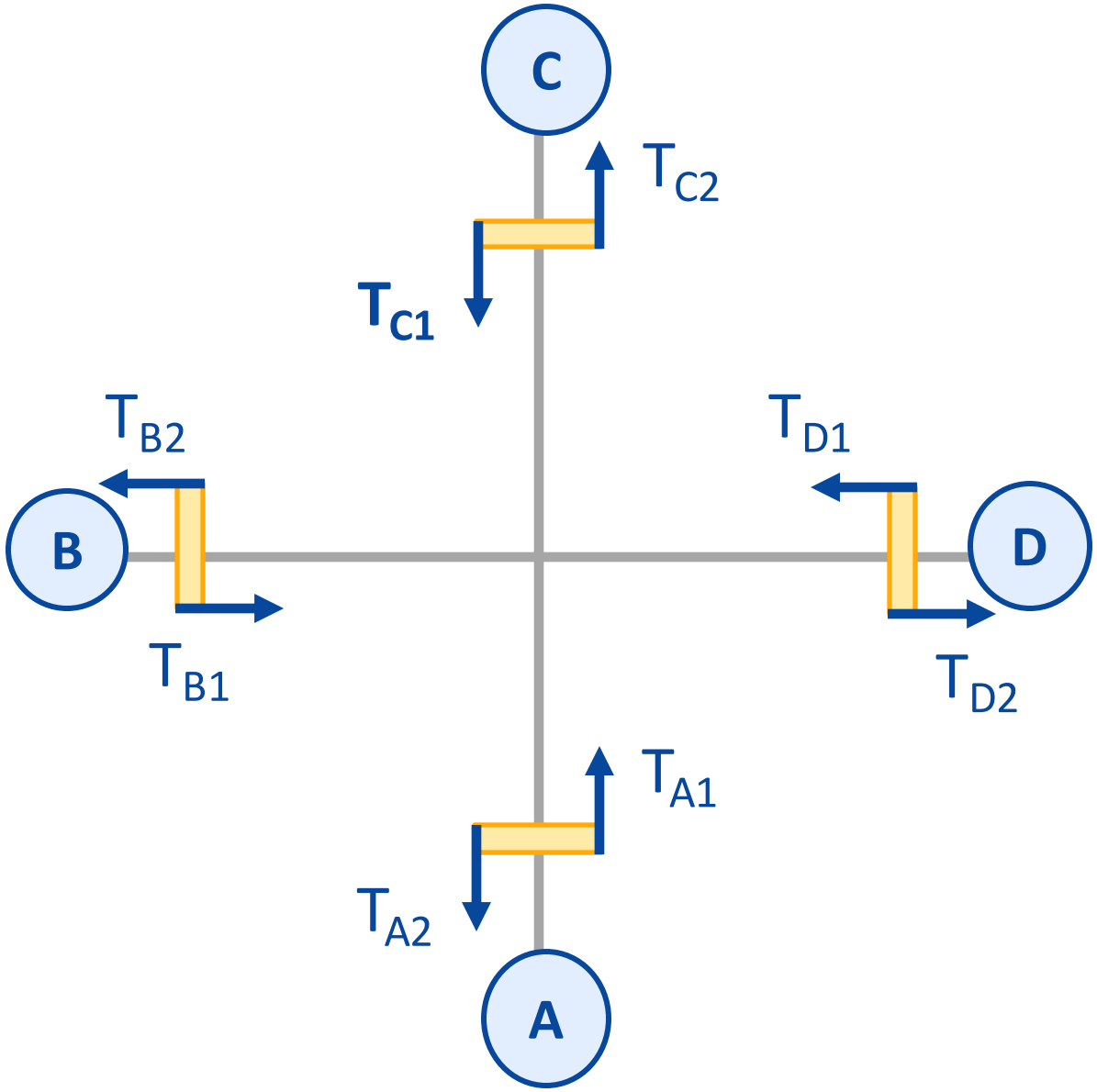
$$\%\ \text{Left Turns (4-6 pm)} = \frac{\sum_{4-6pm} Point\ A \rightarrow B}{\sum_{4-6pm} Point\ A \rightarrow B + \sum_{4-6pm} Point\ A \rightarrow C + \sum_{4-6pm} Point\ A \rightarrow D}$$

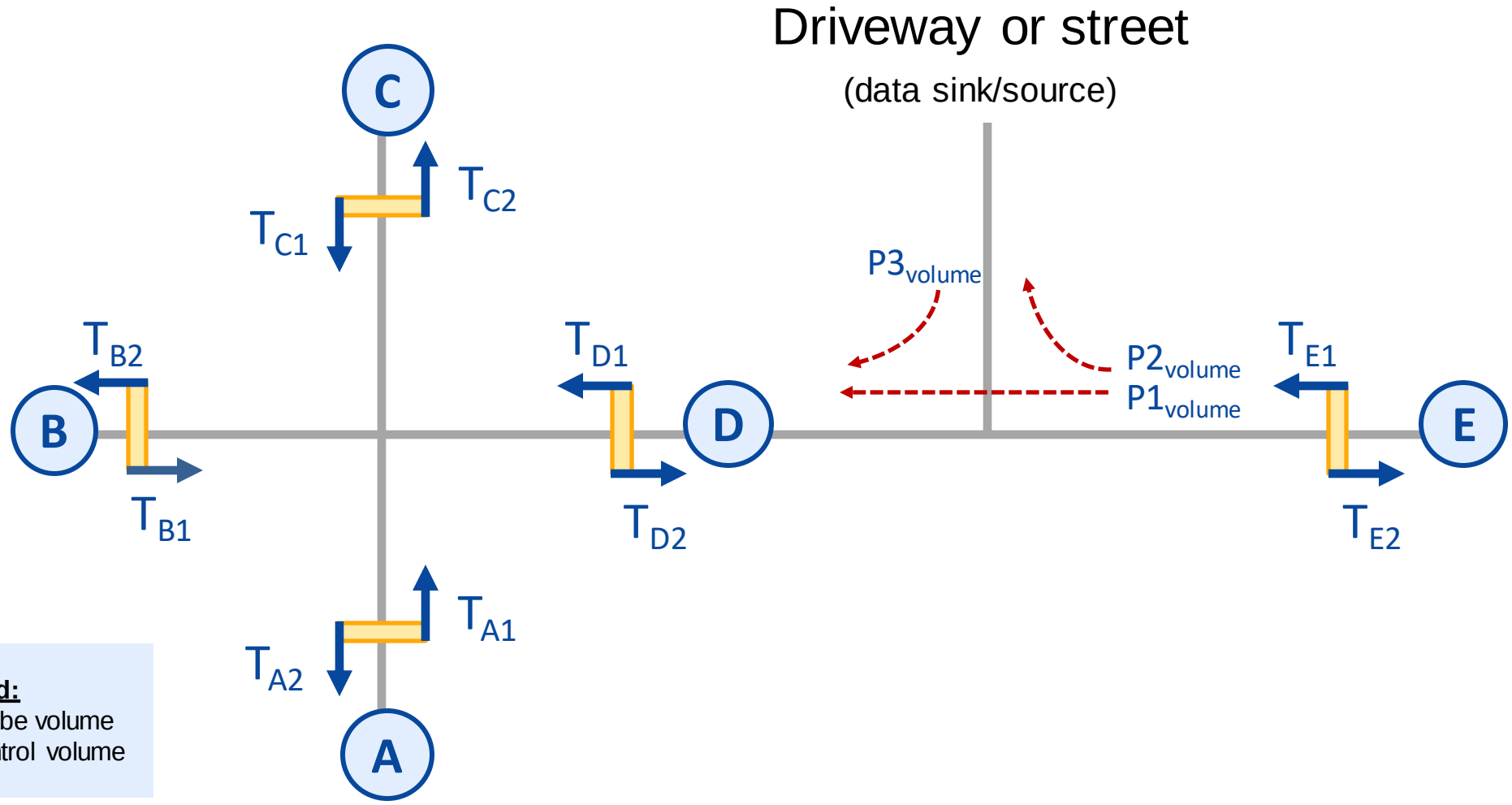
STEP 2

Intersect Identifies Control Points

- Permanent/portable count stations
- Sensors
- Local or private counts
- Capture rates




C
T_{C2}
T_{C1}
T_{B2}
B
T_{B1}
T_{D1}
D
T_{D2}
T_{A1}
T_{A2}
A



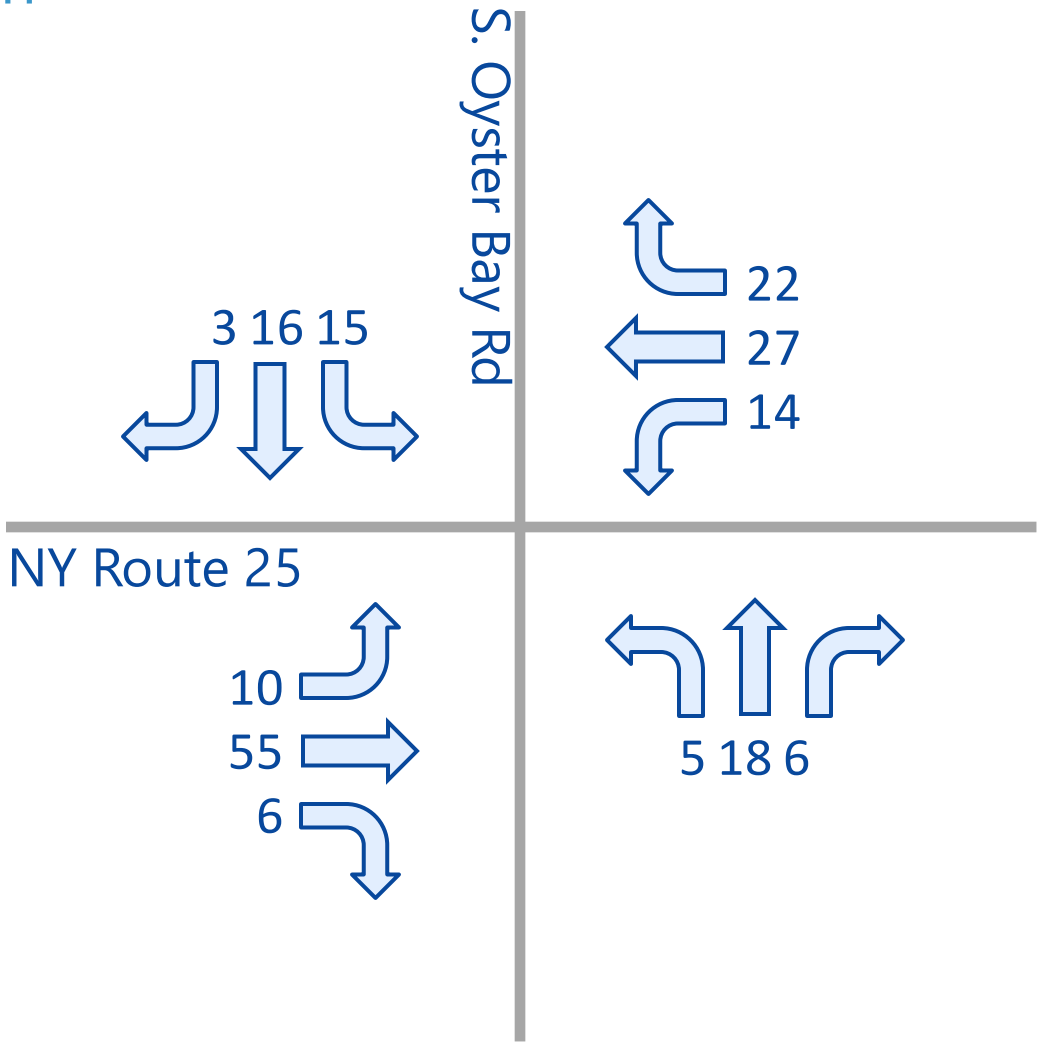
Legend:
P – probe volume
T – control volume

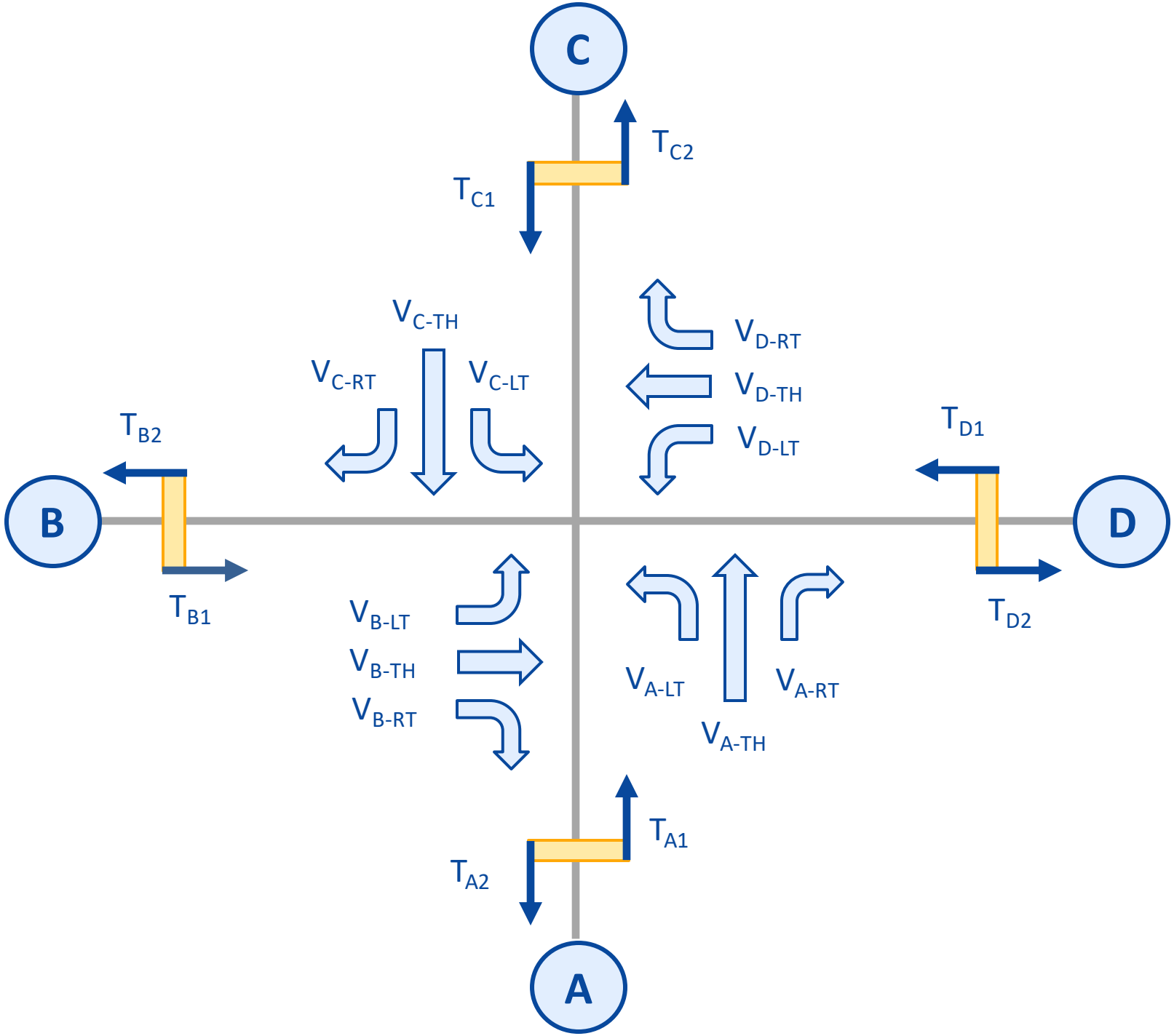
$$T_{D1} = \left[T_{E1} \times \frac{P1_{volume}}{(P1_{volume} + P2_{volume})} \right] + \left[\left[T_{E1} \times \frac{P3_{volume}}{(P1_{volume} + P2_{volume})} \right] \right]$$

STEP 3

Intersect's Balanced Flow Approach

- Ingested data counts
- Sample for multiple hours
- Derive percentages for approaches and turns
- Balanced inbound and outbound volumes




C
A
B
D
T_{C1}
T_{C2}
T_{A1}
T_{A2}
T_{B1}
T_{B2}
T_{D1}
T_{D2}
V_{C-TH}
V_{C-RT}
V_{C-LT}
V_{D-RT}
V_{D-TH}
V_{D-LT}
V_{B-LT}
V_{B-TH}
V_{B-RT}
V_{A-LT}
V_{A-TH}
V_{A-RT}

Deviation For Inbound Traffic:

$$\text{Deviation}_{A1} = \frac{T_{A1}}{(V_{A\text{-}LT} + V_{A\text{-}TH} + V_{A\text{-}RT})}$$

$$\text{Deviation}_{B1} = \frac{T_{B1}}{(V_{B\text{-}LT} + V_{B\text{-}TH} + V_{B\text{-}RT})}$$

$$\text{Deviation}_{C1} = \frac{T_{C1}}{(V_{C\text{-}LT} + V_{C\text{-}TH} + V_{C\text{-}RT})}$$

$$\text{Deviation}_{D1} = \frac{T_{D1}}{(V_{D\text{-}LT} + V_{D\text{-}TH} + V_{D\text{-}RT})}$$

Deviation For Outbound Traffic:

$$\text{Deviation}_{A2} = \frac{T_{A2}}{(V_{D\text{-}LT} + V_{C\text{-}TH} + V_{B\text{-}RT})}$$

$$\text{Deviation}_{B2} = \frac{T_{B2}}{(V_{A\text{-}LT} + V_{D\text{-}TH} + V_{C\text{-}RT})}$$

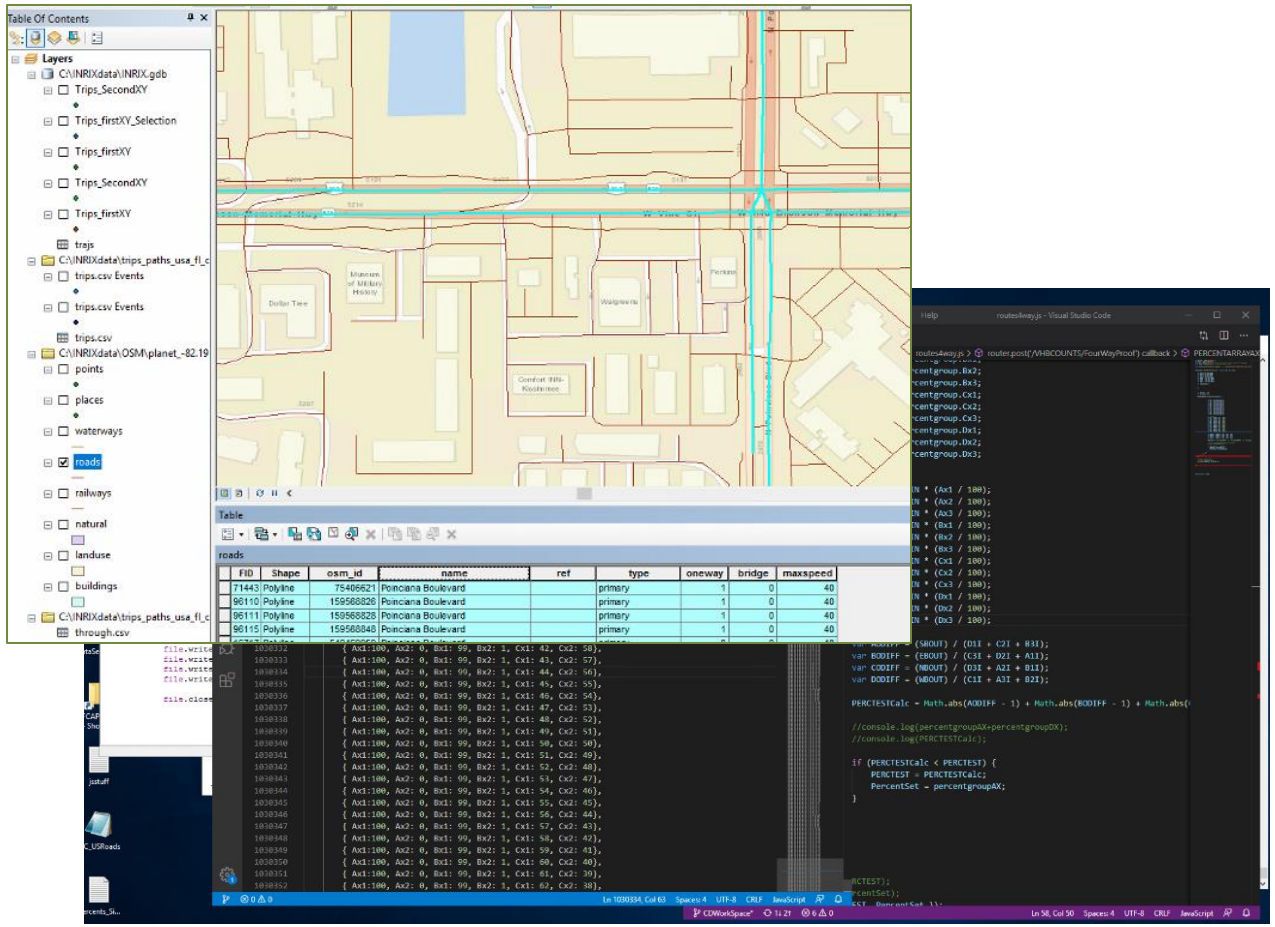
$$\text{Deviation}_{C2} = \frac{T_{C2}}{(V_{B\text{-}LT} + V_{A\text{-}TH} + V_{D\text{-}RT})}$$

$$\text{Deviation}_{D2} = \frac{T_{D2}}{(V_{C\text{-}LT} + V_{B\text{-}TH} + V_{A\text{-}RT})}$$

STEP 3

Intersect's Balanced Flow Approach

- Balance the in/out for each leg
- Converted to big data environment
- Program is 1.3 million (3-way) and 2.8 billion (4-way) permutations



STEP 4

Intersect's Process and Data Validation

2019 Summer Traffic Volumes developed via INTERSECT
WHERE DATA AND RESULTS CONVERGE

26435.03
AM Peak

Legend:

XXX	2020 Intersection Volumes
XXX	2019 Volumes (Adjusted)

AM Peak Volumes

			19	0	19			
			7	0	7			
			SBRT	SBTH	SBLT			
46	7	EBLT				WBRT	4	10
671	644	EBTH				WBTH	728	789
54	9	EBRT				WBLT		
			NBLT	NBTH	NBRT			
			5	0	3			
			41	0	11			

Intersection: Montauk Hwy & Barberry Rd/Wagstaff Ln
Start Time: 11:30

	Adjustment Factor	
A1 / C1 (NBRT / SBRT)	3.56	2.73
A2 / C2 (NBTH / SBTH)	10.00	7.00
A3 / C3 (NBLT / SBLT)	8.20	2.55
B1 / D1 (WBRT / EBRT)	2.50	6.00
B2 / D2 (WBTH / EBTH)	1.08	1.04
B3 / D3 (WBLT / EBLT)	3.44	6.50

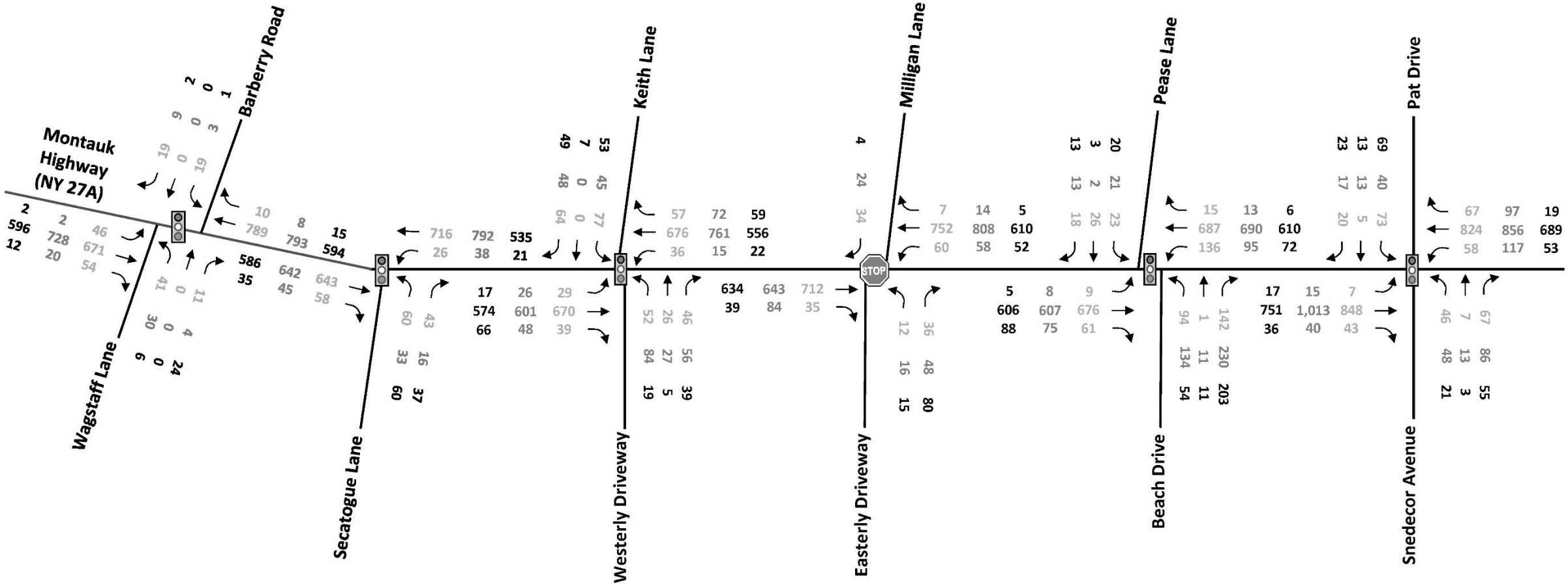
			SBRT	SBTH	SBLT			
		EBLT				WBRT		
643	607	EBTH				WBTH	675	716
58	40	EBRT				WBLT	29	26
			NBLT	NBTH	NBRT			
			47		34			
			60		43			

Intersection: Montauk Hwy & Secatogue Ln
Start Time: 11:30

	Adjustment Factor	
A1 / C1 (NBRT / SBRT)	1.27	0.00
A2 / C2 (NBTH / SBTH)	0.00	0.00
A3 / C3 (NBLT / SBLT)	1.27	0.00
B1 / D1 (WBRT / EBRT)	0.00	1.44
B2 / D2 (WBTH / EBTH)	1.06	1.06
B3 / D3 (WBLT / EBLT)	0.89	0.00

STEP 4

Intersect's Process and Data Validation

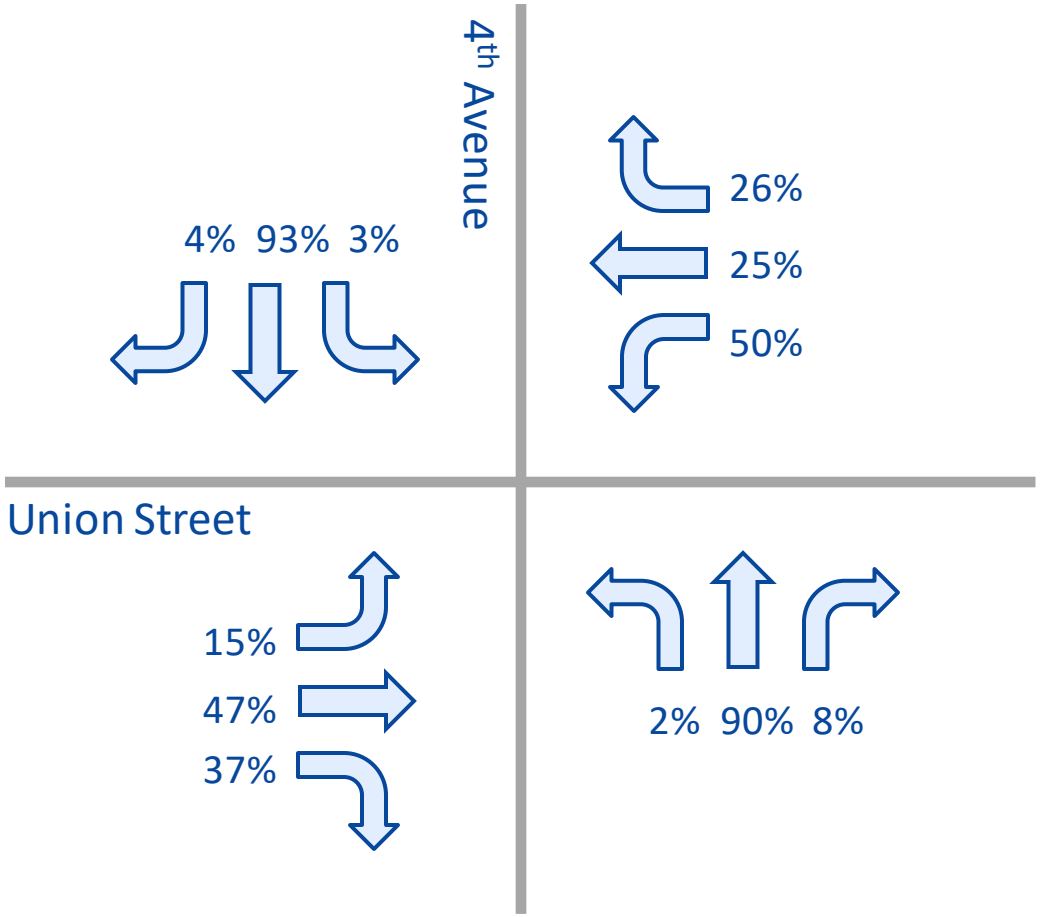


STEP 4

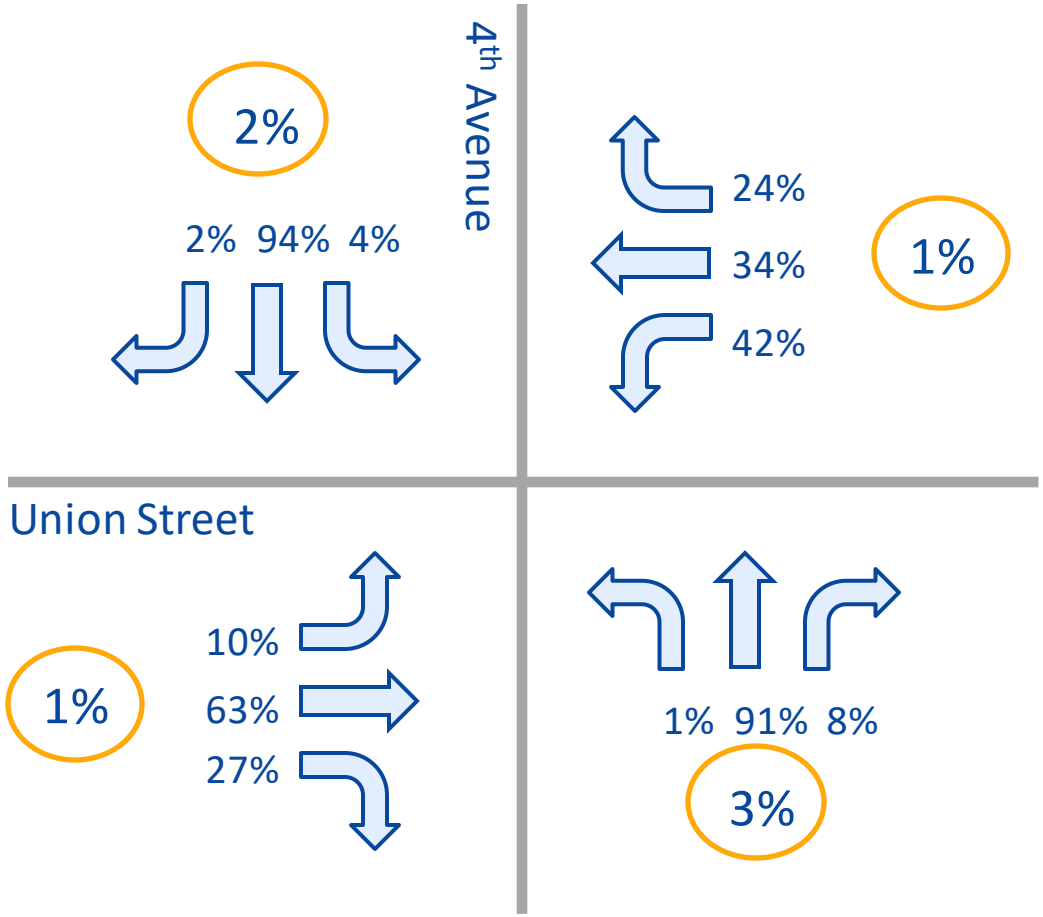
Intersect's Process and Data Validation

Urban

Probe Data (October 2019)



Historical Data (October 2019)



Intersect's Valuable Benefits

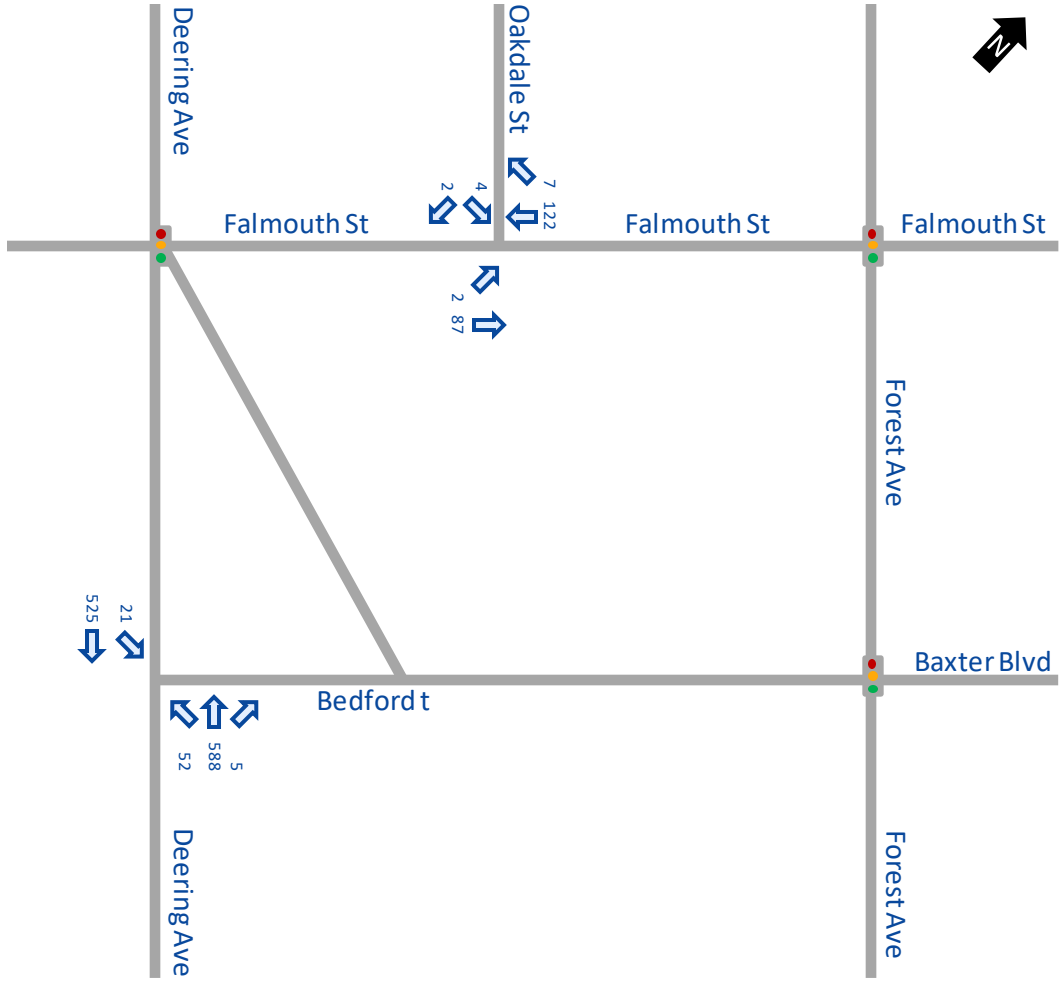
- **24/7 accessible data** for any intersection
- **Year-round availability** for data collection—easy adjustments to account for holidays, summer months, etc.
- Fewer steps yield **more efficiency and faster results—a cost and time savings**
- A larger data set offers **more reliability and accuracy**
- **Customizable output**
- Virtual collection minimizes field work and **enhances safety**
- **Viable tool** during typical and atypical traffic conditions

Case Studies

vhb®

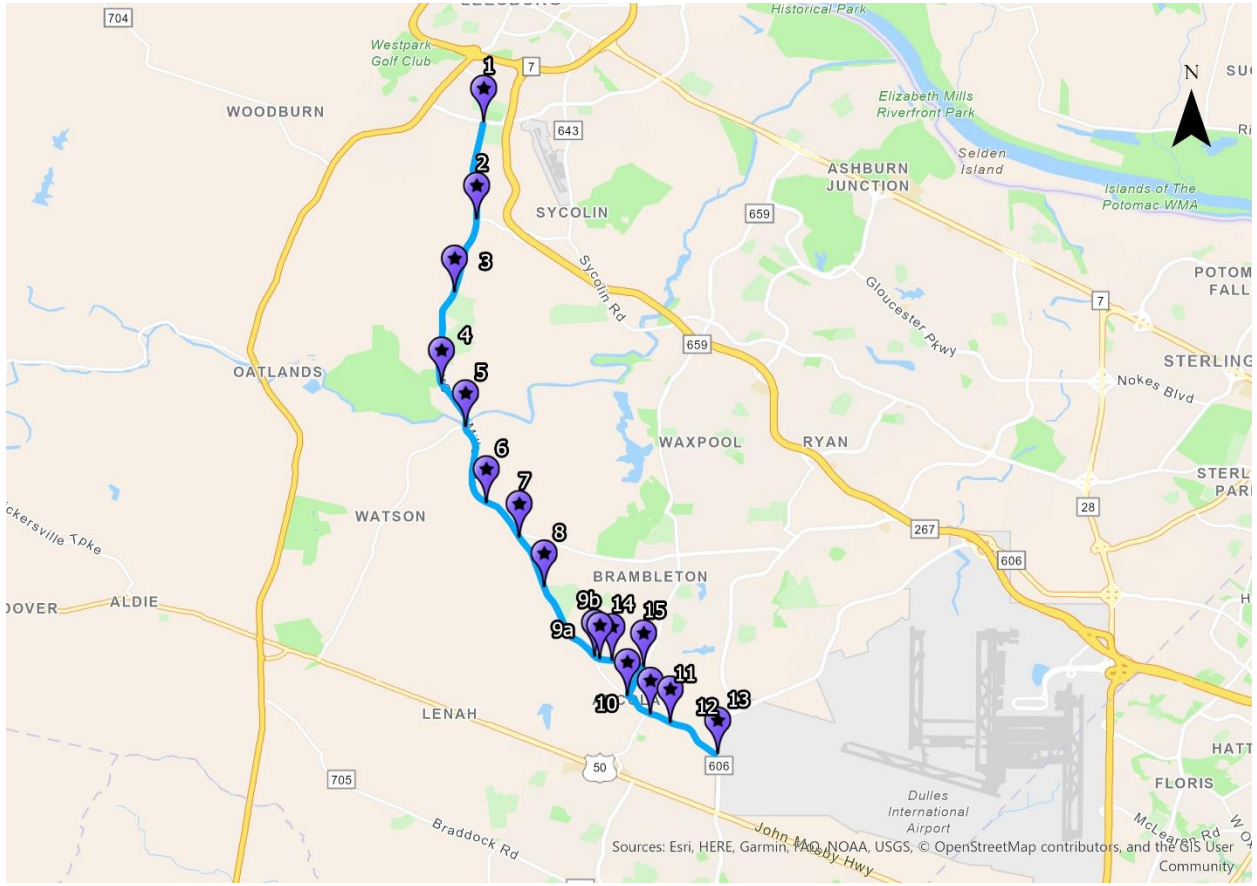
Case Study: University of Southern Maine - Small

- 2 Locations being studied
- Low volume of traffic
- USM is transitioning from commuter-campus to higher resident population
- Traffic analysis to accommodate a new 580-bed residence hall
- Illustrate project impacts to complete local permitting and submit MaineDOT application



Case Study: EMR and AMD Planning Study - Medium

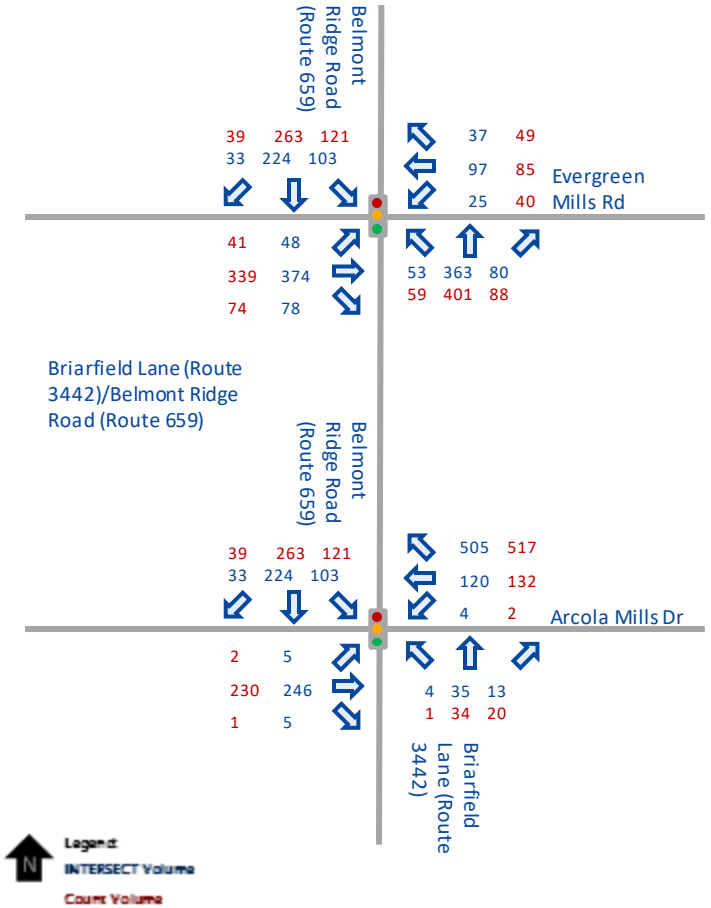
- Corridor Study
- 13 locations being studied
- Traffic Analysis to develop representative existing conditions
- Allowed study to proceed without significant delays
- Integrated data validation and verification process leveraging existing counts for calibration
- Level of accuracy in capturing average travel behavior was greater when compared to traditional manual counts



STEP 4

Intersect's Process and Data Validation

Belmont Ridge Road (Route 659)



Speed [mph]

Belmont Ridge Road (Route 659)

	1		2		3		4	
Time Period	NB	SB	WB	EB	NB	SB	WB	EB
7:30-7:45	34	33	31	32	30	33	29	27
7:45-8:00	34	33	27	31	32	33	29	29
8:00-8:15	33	29	23	32	30	33	26	29
8:15-8:30	34	27	29	32	30	30	28	28
16:45-17:00	34	30	29	29	31	28	29	29
17:00-17:15	33	30	31	31	29	28	30	29
17:15-17:30	32	28	28	30	29	25	28	27
17:30-17:45	35	27	29	29	29	25	28	25

Briarfield Lane (Route 3442)/Belmont Ridge Road (Route 659)

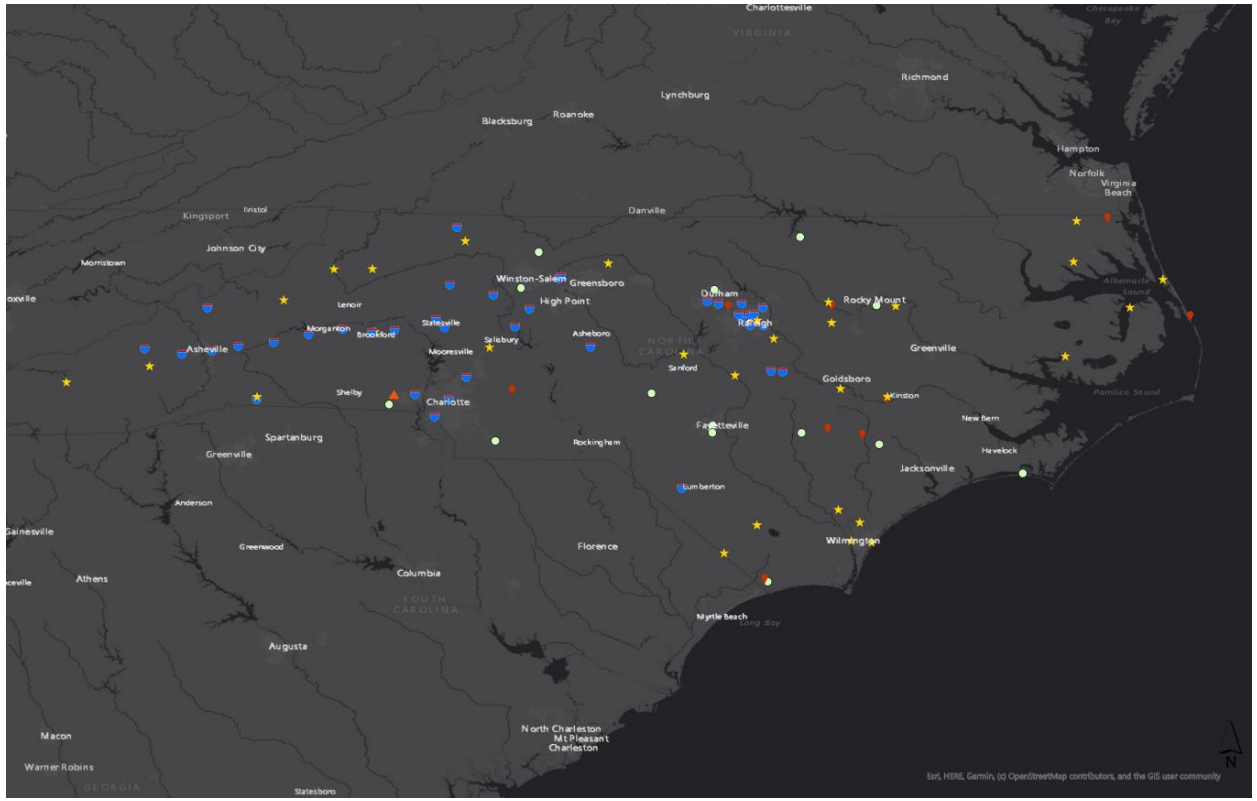
	1		2		3		4	
Time Period	NB	SB	WB	EB	NB	SB	WB	EB
7:30-7:45	25	24	33	28	18	25	33	35
7:45-8:00	24	31	28	27	24	13	29	29
8:00-8:15	26	27	31	29	22	14	32	32
8:15-8:30	26	30	31	30	23	29	33	34
16:45-17:00	22	28	27	25	27	23	30	30
17:00-17:15	21	21	25	24	24	18	29	29
17:15-17:30	21	24	23	23	22	16	28	29
17:30-17:45	20	22	27	22	24	20	30	26

Travel Time

Direction	Intersections From	Intersections To	AM Peak	PM Peak
	1	**13**	**17 minutes 48 seconds**	**18 minutes 1 seconds**
From A to B	1	2	2 minutes 15 seconds	2 minutes 13 seconds
	2	3	1minute 31seconds	1minute 31seconds
	3	4	1minute 36 seconds	1minute 32 seconds
	4	5	1minute 14 seconds	1minute 13 seconds
	5	6	1minute 36 seconds	1minute 36 seconds
	6	7	1minute 2 seconds	1minute 0 seconds
	7	8	1minute 21seconds	1minute 19 seconds
	8	9b	1minute 41seconds	1minute 43 seconds
	9b	9a	0 minutes 18 seconds	0 minutes 18 seconds
	9a	14	0 minutes 18 seconds	0 minutes 19 seconds
	14	15	0 minutes 46 seconds	0 minutes 48 seconds
	15	10	0 minutes 59 seconds	1minute 16 seconds
	10	11	0 minutes 58 seconds	1minute 4 seconds
	11	12	0 minutes 34 seconds	0 minutes 33 seconds
	12	13	1minute 40 seconds	1minute 35 seconds

Case Study: NCDOT – Large Scale

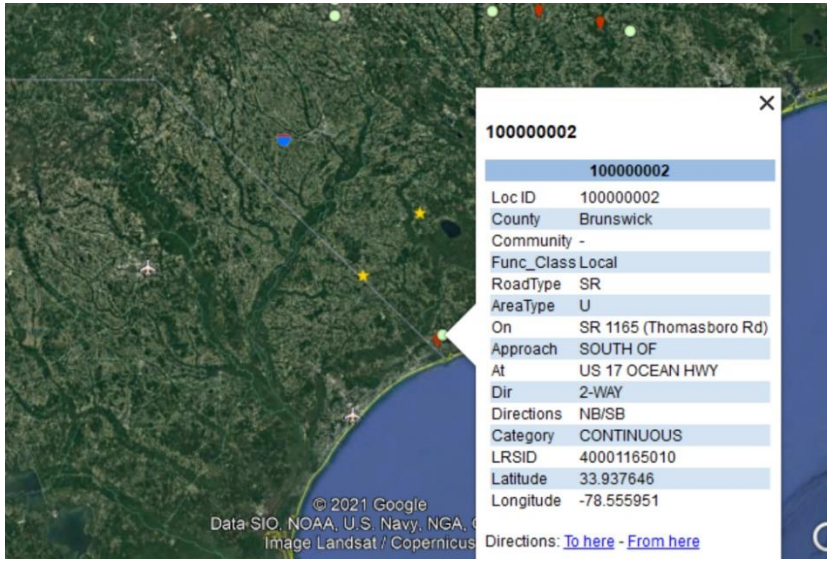
- VHB is managing NCDOT's statewide traffic count program
- Built a system that processes all requests, performs automated QC, and removed redundancy
- Project was paused because of pandemic
- Leverage probe data to generating data to understand seasonal traffic factors for 100 counties (PADT)
- Data used to calculate Volume to Capacity (V/C) ratios for identifying project prioritizations
- Developing a model, including data from continuous count stations for up to 55,000 locations in NC

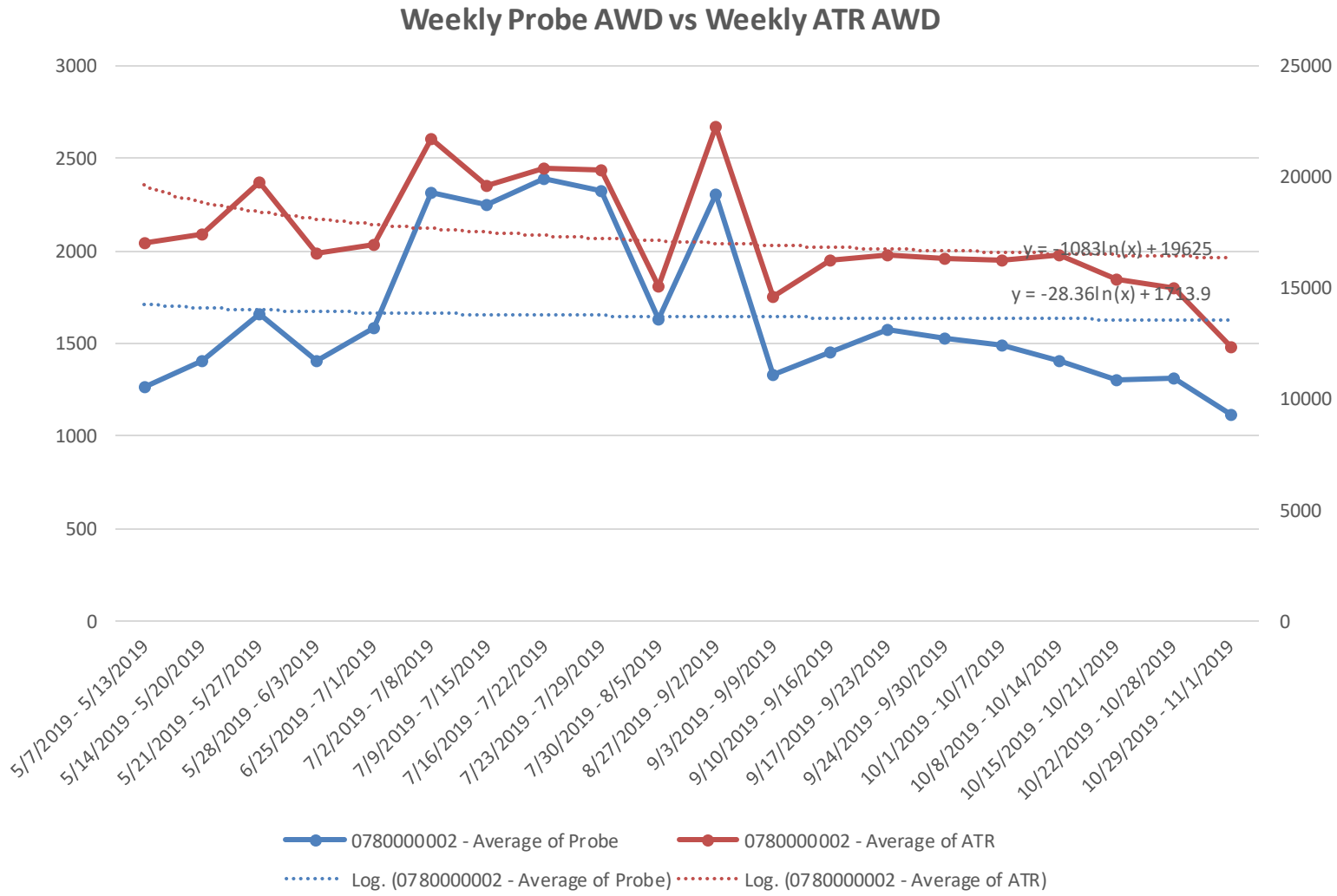


STEP 4

Intersect's Process and Data Validation

US 17 at Ocean Highway





Feedback & Questions