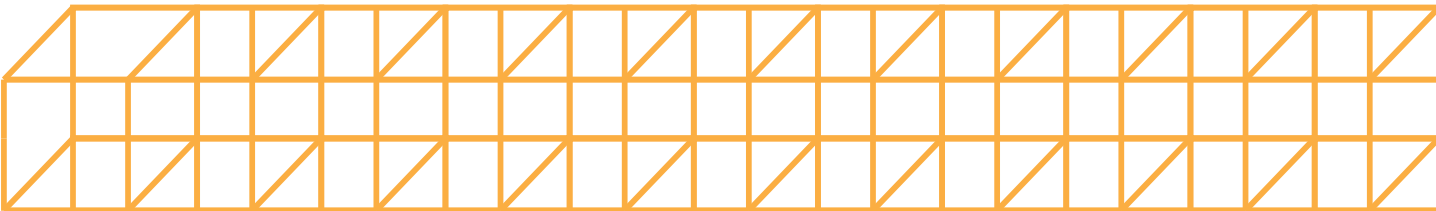

Data-Driven Statistical Approaches for Modern Traffic Analysis

TexITE Meeting, Houston, April 10, 2026



Presenters



Chung Tran

Senior Traffic Modeling
Analyst, WSB



Scott Washburn

Senior Project Manager,
WSB

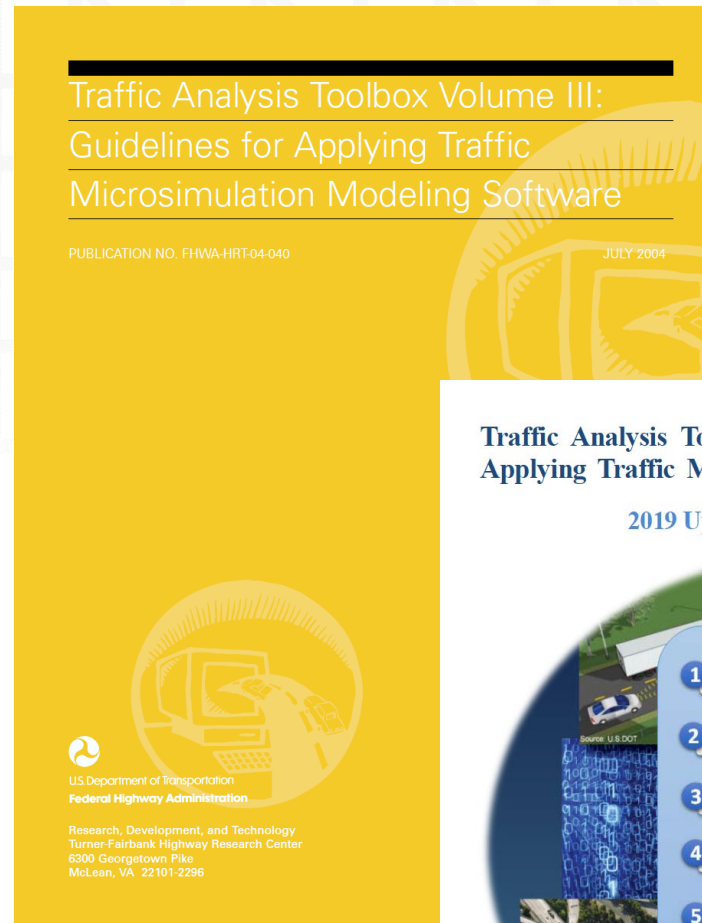
Professor Emeritus,
University of Florida

Outline

- FHWA TAT Vol. 3
 - Background
 - Cluster analysis process—
conceptual overview and data
needs
 - Level of adoption
- Software tool development
 - Overview
 - Future possibilities

Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software

- 2004 Version
- 2019 Update



Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software

2019 Update to the 2004 Version





2004 Version

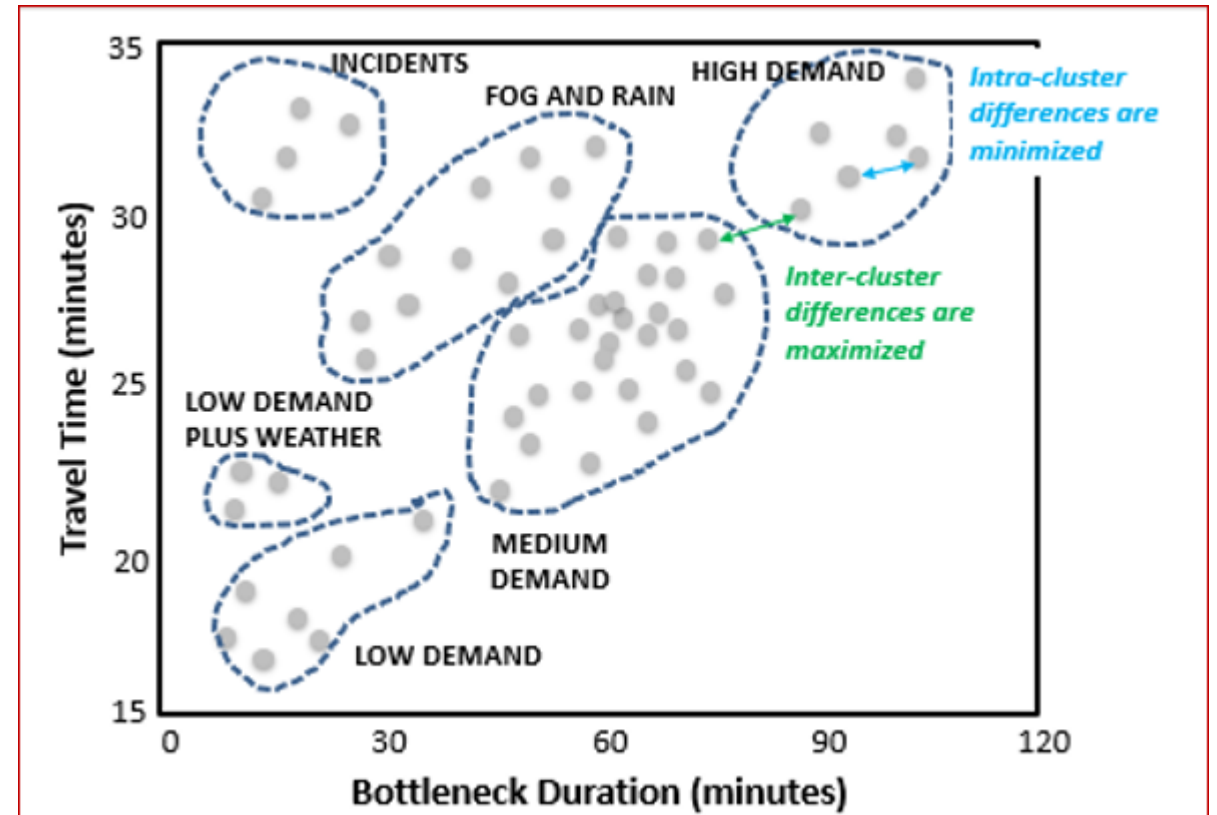
- 'Typical' day
 - Limits traffic volume variability
 - Network traffic volume inconsistency
 - Usually excludes impacts of adverse weather conditions and incidents
 - Analysis input conditions often do not correspond to any actual day
- GEH 'statistic'
- Some subjective calibration criteria (e.g., "To analyst's satisfaction")

2019 Update

- 365 days of data
 - Accounts for full year of traffic volume variability
 - Includes impacts of adverse weather conditions and incidents
 - Can also include other factors as desired (e.g., work zones)
- Use cluster analysis
 - Identifies logical groupings of conditions for given performance
 - Identifies days within clusters with conditions representative of the given cluster
- Variation envelopes and acceptability criteria for simulation calibration

Conceptual Overview of Cluster Analysis Process

- Method to automatically sort items into similar groups
 - Typically without a priori specification of group settings
 - Unsupervised learning method; i.e., no training data set and data are not “labeled”
 - Grouping is based on similarity of data attributes
 - ‘Similarity’ often defined by distance to cluster centroid



2019 TAT Vol. 3

Recommended Data Items

Traffic Volumes

The screenshot displays the RITIS Transportation System Status interface. The top navigation bar includes 'Transportation System Status', 'Data Archive', and 'Personal Traffic Alerts'. A user profile for 'Scott Washburn' is visible in the top right. The main content area is divided into a sidebar on the left and a map on the right.

Detector Data Downloader Sidebar:

- Showing 75,283 of 75,283 detectors
- Detectors list:

<input type="checkbox"/>	AUSTINTX	33	♥
<input type="checkbox"/>	AZDOT	582	♥
<input type="checkbox"/>	CALTRANS	23,404	♥
<input type="checkbox"/>	DELDOT	1,714	♥
<input checked="" type="checkbox"/>	FDOT	18,397	♥
<input type="checkbox"/>	GDOT	2,614	♥
<input type="checkbox"/>	HERE	1,265	♥
<input type="checkbox"/>	ILDOT	2,996	♥
<input type="checkbox"/>	MDOT_CHART	1,683	♥
<input type="checkbox"/>	MIDOT	12,210	♥
<input type="checkbox"/>	MODOT	7,349	♥
<input type="checkbox"/>	ORDOT	571	♥
<input type="checkbox"/>	SPEEDINFO	100	♥
<input type="checkbox"/>	TDOT	1,749	♥

Export Options Sidebar:

- 18,397 detectors selected
- 1. Select a date range: 01/03/2026 through 01/03/2026
- 2. Select days of week: Sun Mon Tue Wed Thu Fri Sat
- 3. Select time range: 12:00 AM to 11:59 PM
- 4. Data
- Submit

Map: A map of Orlando, Florida, showing various roads and landmarks. Numerous blue circular markers with white numbers are overlaid on the map, representing traffic volume data points. Landmarks include Lake Down, Turkey Lake, Lake Sheen, Big Sand Lake, and several golf courses like Metrowest Country Club and Orange Tree Country Club.

2019 TAT Vol. 3 Recommended Data Items

Weather Events



The screenshot shows the homepage of the Weather Data Environment website. At the top, it features the U.S. Department of Transportation Federal Highway Administration logo and the text "Weather Data Environment" in orange and white. Below the header is a navigation bar with links for Home, Data, About, and Feedback, along with a Login button. The main content area is divided into two sections. On the left is a large banner with a blue background showing a globe and the text "WEATHER DATA ENVIRONMENT". On the right is a "Latest News" section with a dark blue background, containing a link to "Subscribe to webinar updates" and a "READ MORE" button. Below the banner and news section is a "Welcome to the Weather Data Environment" section with a paragraph of text describing the project.

U.S. Department of Transportation
Federal Highway Administration

Weather Data
Environment

Home Data About Feedback Login

WEATHER DATA
ENVIRONMENT

Latest News

Subscribe to webinar updates Ongoing

National Operations Center of Excellence for Road Weather Management webinar updates.

READ MORE

Welcome to the Weather Data Environment

The Weather Data Environment (WxDE) is a research project that collects and shares transportation-related weather data with a particular focus on weather data related to connected vehicle applications. The WxDE collects data in real time from both fixed environmental sensor stations and mobile sources. The WxDE computes value-added enhancements to this data, such as by computing quality-check values for observed data and computing inferred weather parameters from vehicle data (e.g., inferring precipitation based on windshield wiper activation). The WxDE archives both collected and computed data. The WxDE supports subscriptions for access to real-time data in near real time generated by individual weather-related connected vehicle projects.

2019 TAT Vol. 3

Recommended Data Items



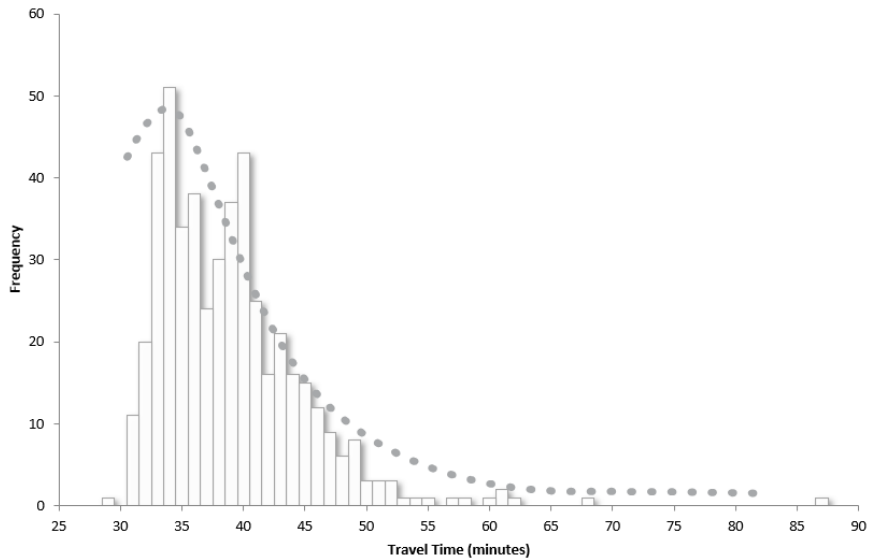
Incident Events

RITIS		Transportation System Status		Data Archive	Personal Traffic Alerts		
Incident List	Traffic Map	Traffic Map (Beta)	Incident Overview	Traffic Cameras	RSS Feed	COVID-19 Impact	
Applied Filters: Road is equal to I-4.							
State ▲	Source	Location	Type	Updated	Start Time	Lane Status	Event Details
FL	FDOT	Westbound on I-4 ramp from Mile Marker 46: Rest Area	Disabled Vehicle	3 hrs 5 mins ago	01/08/26 05:39 AM		
FL	FDOT	Westbound on I-4 ramp to Exit 28: W Memorial Blvd	Disabled Vehicle	3 hrs 5 mins ago	01/08/26 05:35 AM		
FL	FDOT	Westbound on I-4 at MM 97 with congestion from at MM 101A/CR-46A to at MM 97	Traffic Congestion	26 mins ago	01/08/26 06:47 AM		
FL	FDOT	Westbound on I-4 ramp to Exit 28: W Memorial Blvd	Disabled Vehicle	3 hrs 5 mins ago	01/08/26 05:34 AM		
FL	FDOT	Westbound on I-4 ramp to Exit 28: W Memorial Blvd	Disabled Vehicle	3 hrs 5 mins ago	01/08/26 05:33 AM		
FL	FDOT	Westbound on I-4 before MM 63 with Right shoulder blocked	Disabled Vehicle	1 hr 48 mins ago	01/08/26 07:09 AM		<ul style="list-style-type: none"> Waze Incident reported: Waze ID: [link]
FL	Waze	I-4	Disabled Vehicle	4 mins ago	01/08/26 08:53 AM	—	Hazard on shoulder car stopped at I-4 W
FL	FDOT	Westbound on I-4 ramp from Mile Marker 46: Rest Area	Disabled Vehicle	3 hrs 5 mins ago	01/07/26 10:56 PM		
FL	FDOT	Eastbound on I-4 beyond Mile Marker 40 with Right shoulder blocked	Incident	59 mins ago	01/08/26 08:13 AM		<ul style="list-style-type: none"> Vin 679981 presat at 5
FL	FDOT	Westbound on I-4 at MM 84A/SR-50 with congestion from at MM 85/Princeton St to at MM 84A/SR-50	Traffic Congestion	4 mins ago	01/08/26 08:38 AM		
FL	Waze	I-4	Foggy Conditions	1 hr 38 mins ago	01/08/26 07:20 AM	—	Hazard weather fog at I-4 W
FL	FDOT	Westbound on I-4 ramp from Mile Marker 46: Rest Area	Disabled Vehicle	3 hrs 5 mins ago	01/07/26 10:55 PM		
FL	FDOT	Eastbound on I-4 at MM 84/Ivanhoe Blvd with congestion from at MM 81/W Kaley Ave to at MM 84/Ivanhoe Blvd	Traffic Congestion	13 mins ago	01/08/26 07:20 AM		
FL	FDOT	Westbound on I-4 beyond Mile Marker 46: Rest Area	Disabled Vehicle	3 hrs 5 mins ago	01/07/26 10:47 PM		
FL	Waze	I4 WEST in Hillsborough County	Foggy Conditions	12 mins ago	01/08/26 07:45 AM	—	Hazard weather fog
FL	FDOT	Eastbound on I-4 ramp to Exit 44: State Road 559	Incident	2 hrs 59 mins ago	01/08/26 06:11 AM		Vin 450781

2019 TAT Vol. 3

Recommended Data Items

Travel Times



The image shows a screenshot of the 'Massive Data Downloader' web application interface on the left and a map of Tennessee on the right. The interface is divided into six numbered steps for configuring a data download:

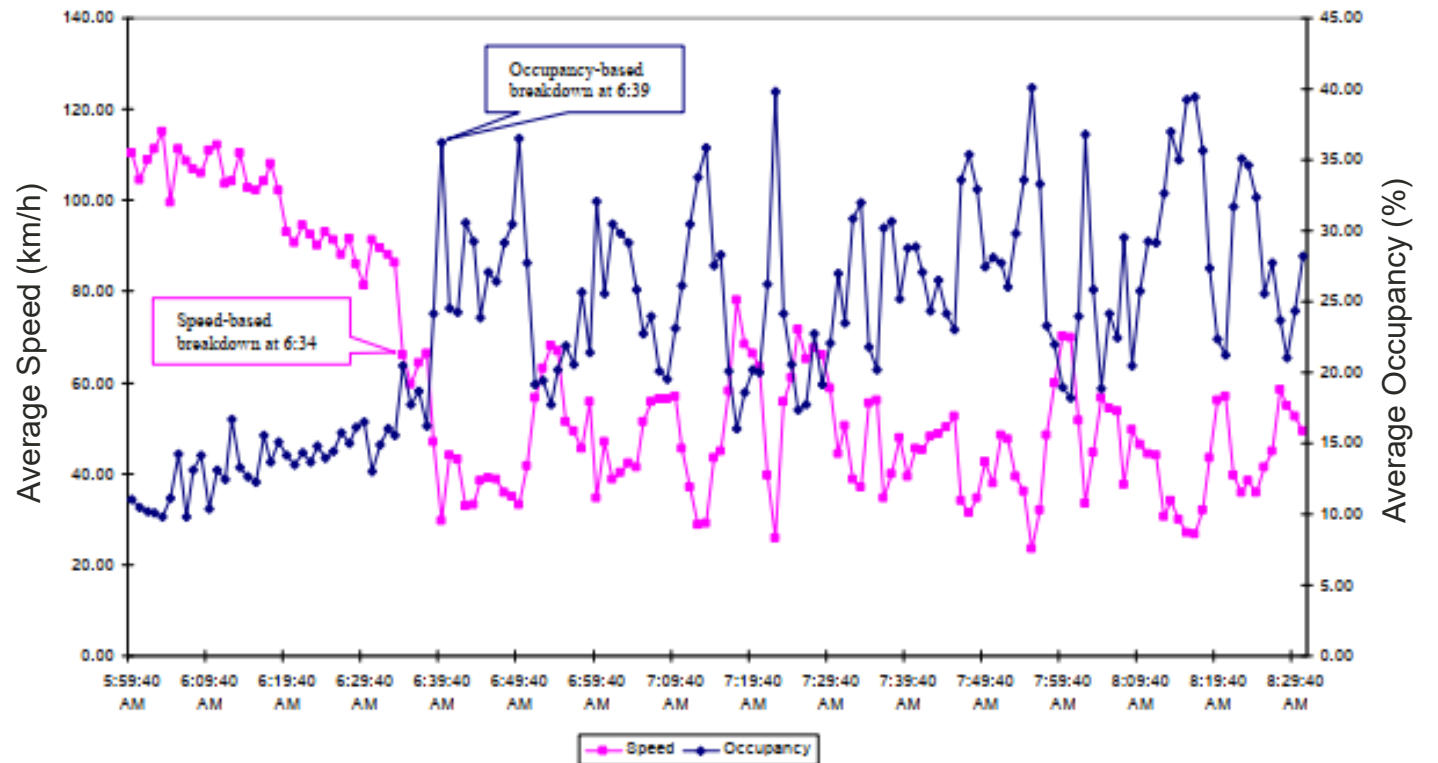
- Select a country:** United States
- Select roads:** XID segments from INRIX. Search in Tennessee. Your selected roads: TN-109 bearing north. Intersections: 24. 39 miles of roadway selected (78 XID segments).
- Select one or more date ranges:** 02/01/2018 - through - 02/24/2022.
- Select days of week:** Sun, Mon, Tue, Wed, Thu, Fri, Sat (all selected).
- Select one or more times of day:** 12:00 AM - to - 11:59 PM.
- Select data sources and measures:** INRIX, Speed, Historic average speed, Reference speed, Travel time, C-Value, Confidence score. Quality threshold for INRIX confidence score: 30.

The map on the right shows a purple line tracing a route through Tennessee, starting near Nashville and heading north towards the northern border. Major cities like Nashville, Hendersonville, and Gallatin are visible.

2019 TAT Vol. 3

Recommended Data Items

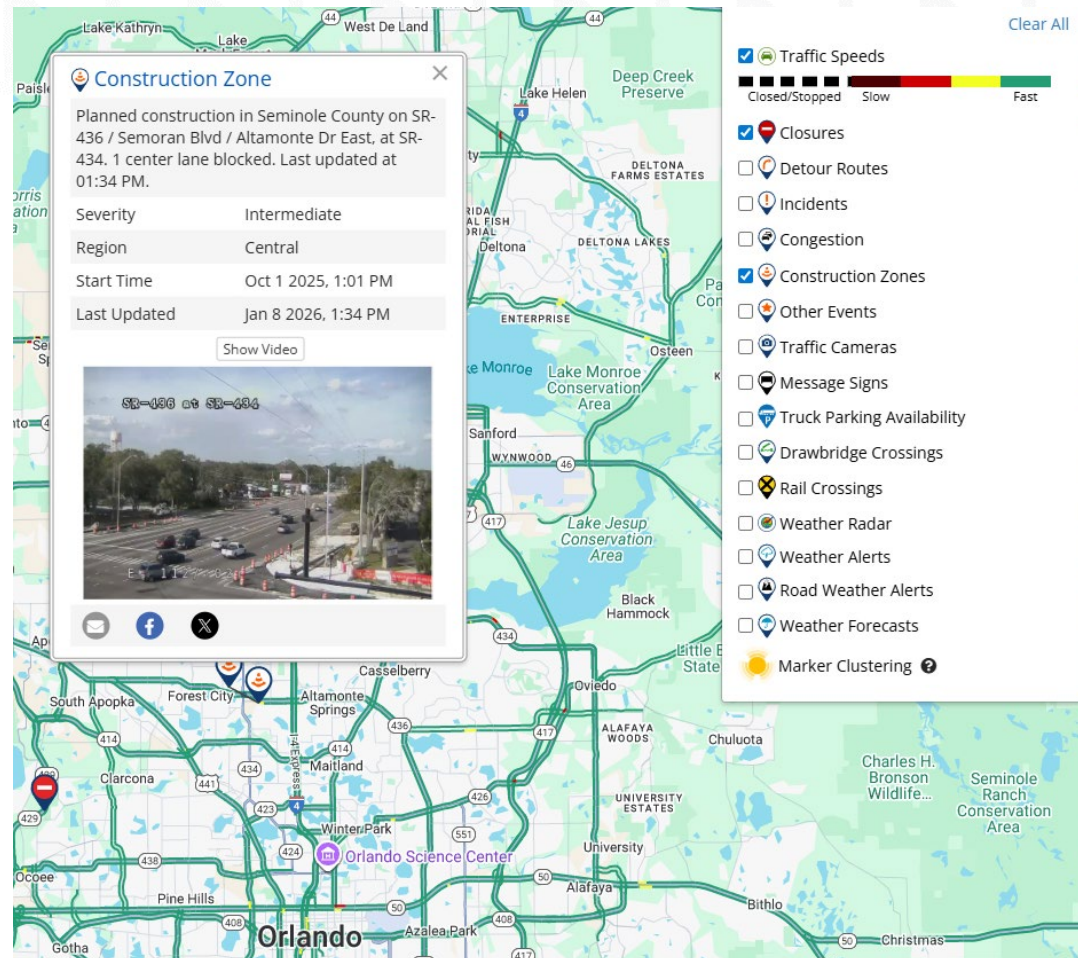
Bottleneck Throughput Volumes



2019 TAT Vol. 3

Other Potential Data Items

Work Zone Activity



2019 TAT Vol. 3 Other Potential Data Items

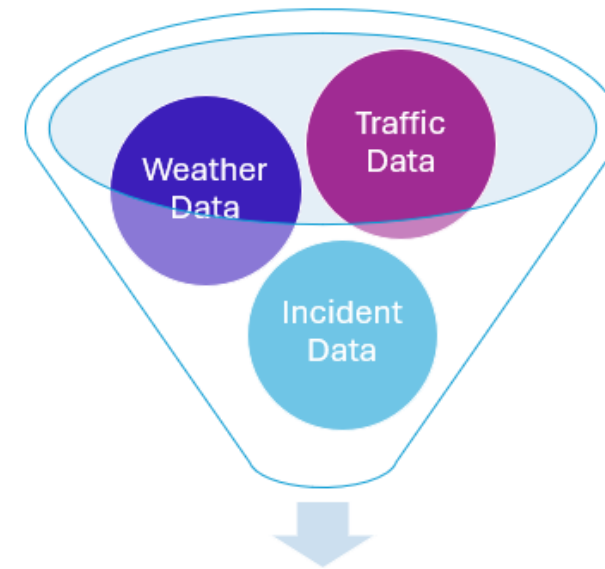
Special Events

The screenshot shows the 'UPCOMING EVENTS' page for Hard Rock Stadium. The page features a dark blue header with navigation links: STADIUM, EVENTS, LUXURY & SUITES, PLAN YOUR VISIT, and HOST YOUR EVENT. Below the header is a grid of six event cards, each with a promotional image, event name, date, and a 'LEARN MORE' or 'BUY NOW' button.

Event Name	Date	Action
2026 NATIONAL CHAMPIONSHIP JANUARY 19 MIAMI	January 19, 2026	LEARN MORE
JAZZ IN THE GARDENS	March 7-8, 2026	BUY NOW
MIAMI OPEN 2026	March 15 - 29, 2026	LEARN MORE
FORMULA 1 CRYPTO.COM MIAMI GRAND PRIX	May 1-3, 2026	LEARN MORE
FIFA WORLD CUP 2026	June 15 - July 18, 2026	BUY NOW
BRUNO MARS ROMANTIC TOUR	September 19, 2026	LEARN MORE

Data Aggregation

- The disparate data sets must be aggregated into a single dataset to facilitate the calculations



Combined Data Set



Data Aggregation

TAT Vol. 3, 2019 Update

Table 1. Data Assembled for Travel Conditions Identification

- For example...

DAY	Day of Week	AM Peak (6-9 AM) Demand (vph)	AM Peak (6-9 AM) Weather		AM Peak (6-9 AM) Incident		AM Peak (6-9 AM) Travel Time (min)			AM Peak (6-9 AM) Bottleneck Throughput (vph)		
		Detector #2; Avg. Count (vph)	Precipitation (mm)	Wind Speed (mph)	Incident Type	Lanes Blocked	WH to CBD (VIB)	WH to CBD (Tunnel-GP)	WH to CBD (Tunnel-HOV)	Marine Causeway-V.I.Bridge Link	V. I. Bridge Exit at Moseley Street	Komodo Tunnel Exit at Osceola Ave
2-Jan-12	2	4650	0.034	4.54	Disabled	Single Lane	36	32	27	2525	1934	2042
3-Jan-12	3	4557	0.192	5.62	Non-Injury Collision	Single Lane	46	39	33	2015	1767	1652
4-Jan-12	4	4253	0.006	4.34	Debris	Multiple Lane	44	35	30	2478	1835	1760
5-Jan-12	5	5126	0.016	4.77	Non-Injury Collision	Shoulder/Median	26	24	21	2756	2105	2344
6-Jan-12	6	3529	0.04	6.18	Debris	Multiple Lane	43	36	32	2013	1843	1742
16-Jan-12	2	2875	0.07	1.55	Non-Injury Collision	HOV	49	40	36	1524	1690	1594
17-Jan-12	3	2783	0	3.08	Injury Collision	Single Lane	51	44	38	2183	1664	1418
18-Jan-12	4	3071	0.034	4.60	Disabled	Single Lane	35	32	28	1735	1956	2052
19-Jan-12	5	4348	0.298	6.13	Debris	Multiple Lane	44	36	32	1957	1820	1720
20-Jan-12	6	4119	0	3.39	Debris	Single Lane	30	27	22	2517	2084	2258
23-Jan-12	2	3799	0.37	10.23	Abandoned Vehicle	Shoulder/Median	60	53	42	2352	1550	1287
24-Jan-12	3	4872	0.076	1.70	Disabled	HOV	40	34	33	1753	1919	1943
25-Jan-12	4	3302	0	4.73	Disabled	Shoulder/Median	26	22	21	1586	2166	2431
26-Jan-12	5	3952	0	2.39	Non-Injury Collision	Single Lane	46	39	32	1957	1796	1681
27-Jan-12	6	3913	0	1.77	Abandoned Vehicle	Shoulder/Median	56	52	41	2722	1551	1272
30-Jan-12	2	4052	0.014	2.23	Debris	Multiple Lane	43	34	31	2723	1858	1795
31-Jan-12	3	4704	0	4.01	Disabled	Single Lane	35	32	28	1694	1940	2033



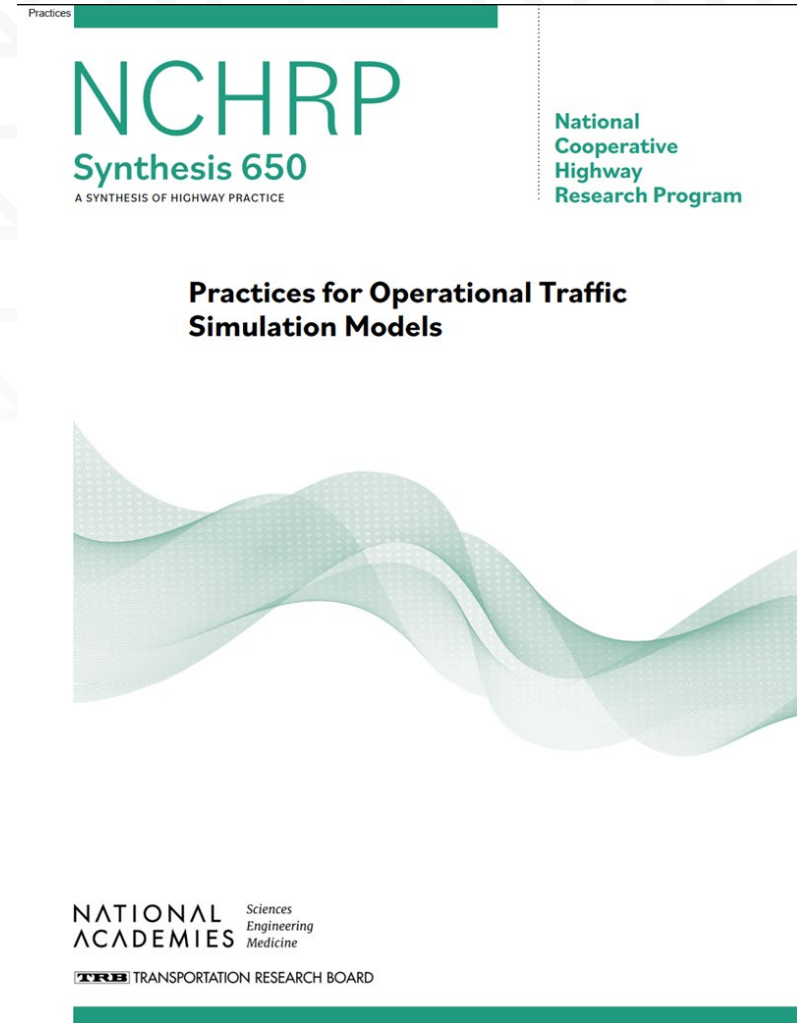
2019 TAT Vol. 3 Process Guidance



- Generally silent on:
 - Data collection, formatting, and management process
 - Data QC process
 - Identification of bottlenecks and determination of bottleneck throughput
- Statistical software tool used for example calculations, WEKA, (<https://waikato.github.io/weka-wiki/>), is somewhat obscure in the U.S.

2019 TAT Vol. 3 Adoption

- From page 2...
 - Synthesis findings indicate that responding DOTs most often use their own state-specific guidance (19 DOTs), followed by ad hoc project-based decisions (15 DOTs) for the calibration of operational traffic simulation models.
 - 6 responding DOTs primarily use the 2004 version of the TAT.
 - 4 responding DOTs primarily employ the 2019 version.
 - 5 responding DOTs use resources from other states.
 - Although there is general movement toward the use of the guidelines in the 2019 TAT, data availability for the cluster analysis is viewed as a significant challenge to broader implementation.



Henry Brown, Praveen Edara, Dae Yeol Chang, Britton Johnson (Hammit), and Ahmad Abdallah. Practices for Operational Traffic Simulation Models. National Academies Press, Washington, D.C., May 2025. ISBN 978-0-309-73560-5. doi: 10.17226/29076. URL <https://nap.nationalacademies.org/catalog/29076>.

Software Tool Development

- WSB is developing a purpose-built software tool to reduce burden of performing 2019 TAT Vol. 3 cluster analysis process
- Initial effort is being done in support of Reno 'spaghetti bowl' operations analysis for Nevada DOT
- Building upon several previous software development efforts and adding cluster analysis process

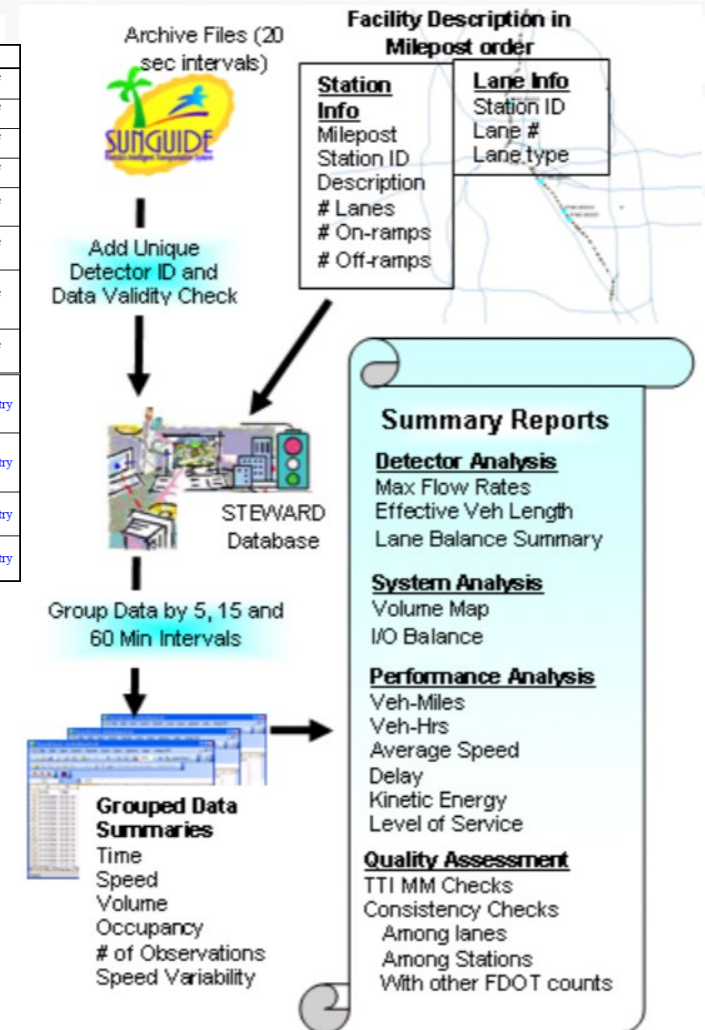


Software Tool Development

- Development and management of FDOT Central Data Warehouse (aka STEWARD) before turning over to RITIS

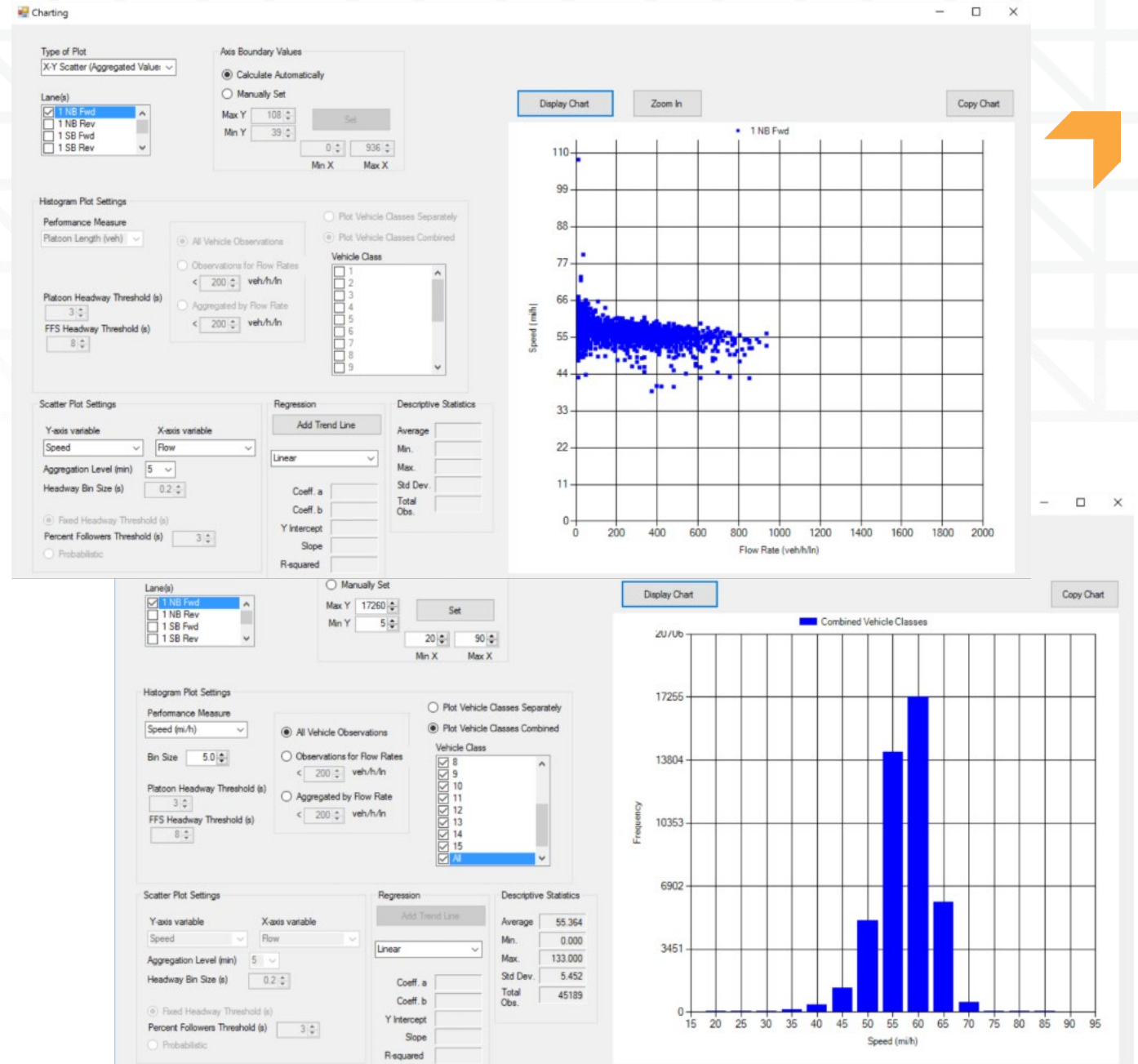
Criterion	Threshold Value(s)	Action		
1	Communication failures – controller error codes	If VOLUME or OCCUPANCY (OCC) or SPEED equals "-1" or "255" or missing	Set values with error codes to missing/null, assign missing value flag/code	Remove record
2	Zero SPEED (or OCC) when VOLUME is non-zero	If SPEED=0 & VOLUME>0 (or OCC=0)	Flag and remove entire record; write failed record to off-line database	Remove record
3	Zero VOLUME when SPEED is non-zero	If VOLUME=0 & SPEED>0 (or OCC>0)	Flag and remove entire record; write failed record to off-line database	Remove record
4	Zero SPEED and VOLUME when OCC is non-zero	If VOLUME=SPEED=0 & OCC>0	Flag and remove entire record; write failed record to off-line database	Remove record
5	Maximum OCCUPANCY exceeded	If OCC > 95% for 20-30 sec If OCC > 80% for 1-5 min	Flag and remove entire record; write failed record to off-line database	Remove record
6	Maximum estimated DENSITY exceeded	IF ((VOLUME*(3600/ELAPSED_TIME))/SPEED) > 220 where ELAPSED_TIME is the nominal polling cycle length in seconds	Flag and remove entire record; write failed record to off-line database	Remove record
7	Too many consecutive identical VOLUME&OCC&SPEED values (including VOLUME=OCC=SPEED=0)	No more than 8 consecutive identical VOLUME, OCC, SPEED values	Flag and remove entire record; write failed record to off-line database	Remove record
8	Zero SPEED when no vehicles present (No vehicles passed the detection zone during the time period)	If VOLUME=SPEED=OCC=0	Flag and remove entire record; write failed record to off-line database	Remove record
9	Maximum VOLUME exceeded	If VOLUME> 17 veh/20sec/ln If VOLUME> 25 veh/30sec/ln If VOLUME> 50 veh/min/ln	Flag VOLUME, write failed record to off-line database, interpolate between intervals to obtain VOLUME value	Impute entry
10	Maximum SPEED exceeded	If SPEED > 100 mph for 20-30 sec If SPEED > 80 mph for 1-5 min	Flag SPEED, write failed record to off-line database, interpolate between intervals to obtain SPEED value	Impute entry
11	Negative VOLUME	If VOLUME < 0 veh/h/ln	Flag VOLUME, interpolate between intervals to obtain VOLUME value	Impute entry
12	SPEED too low	If SPEED < 5 mph	Flag SPEED, interpolate between intervals to obtain SPEED value	Impute entry

- Automate downloading of data from FDOT SunGuide system
- Transform data
- Perform data quality checks
- Calculate performance measures
- Generate reports



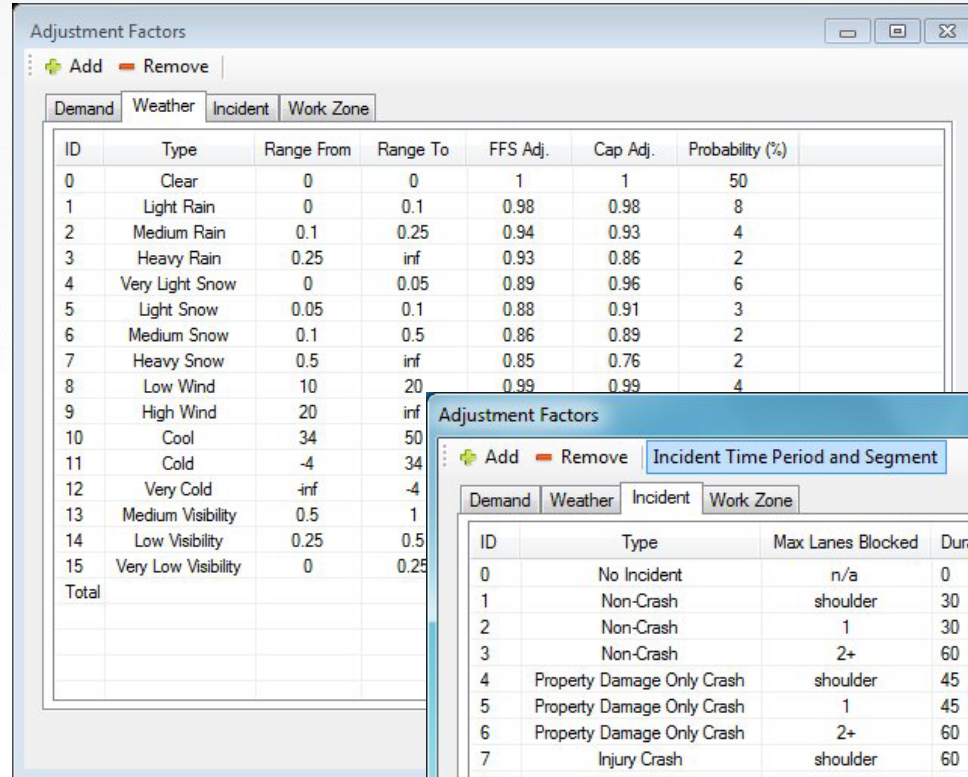
Software Tool Development

- Detector and probe vehicle data processing software

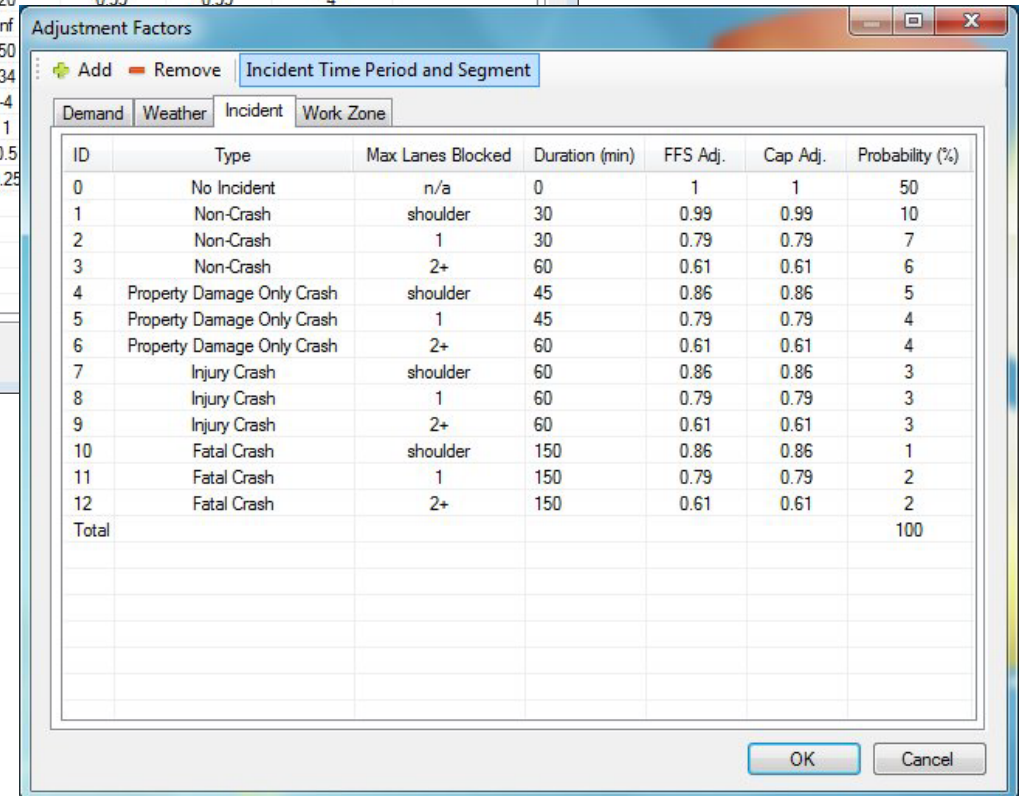


Software Tool Development

- HCM TTR and ATDM analysis software



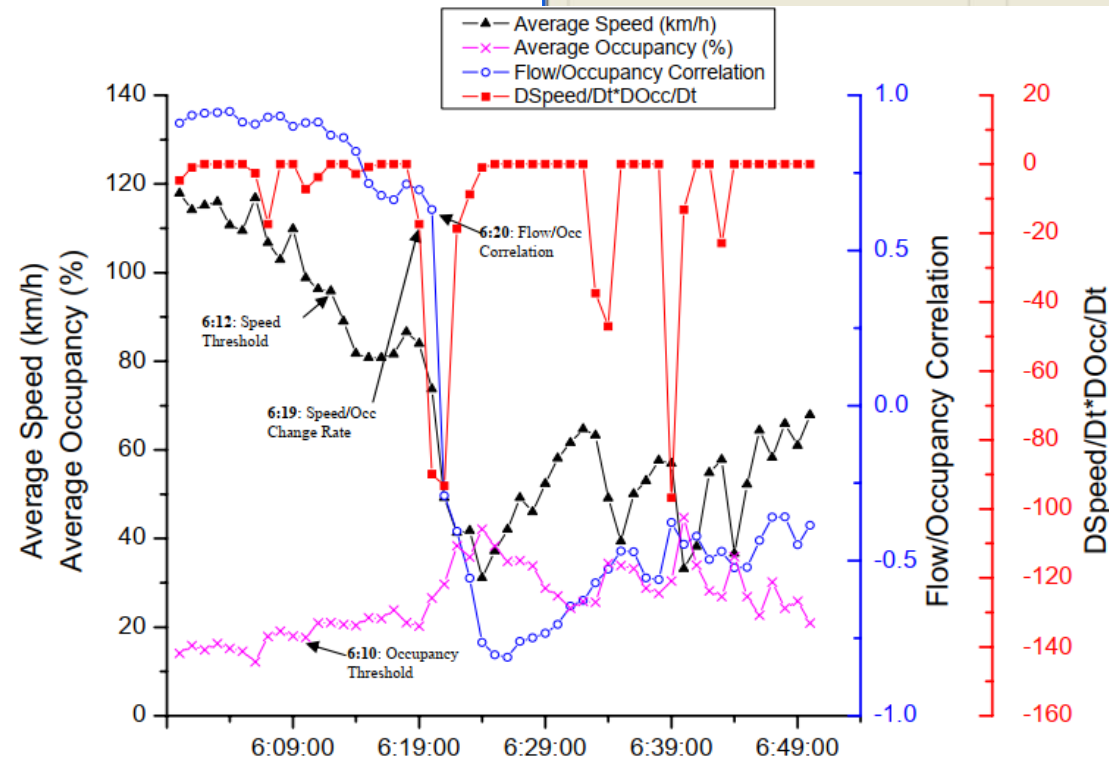
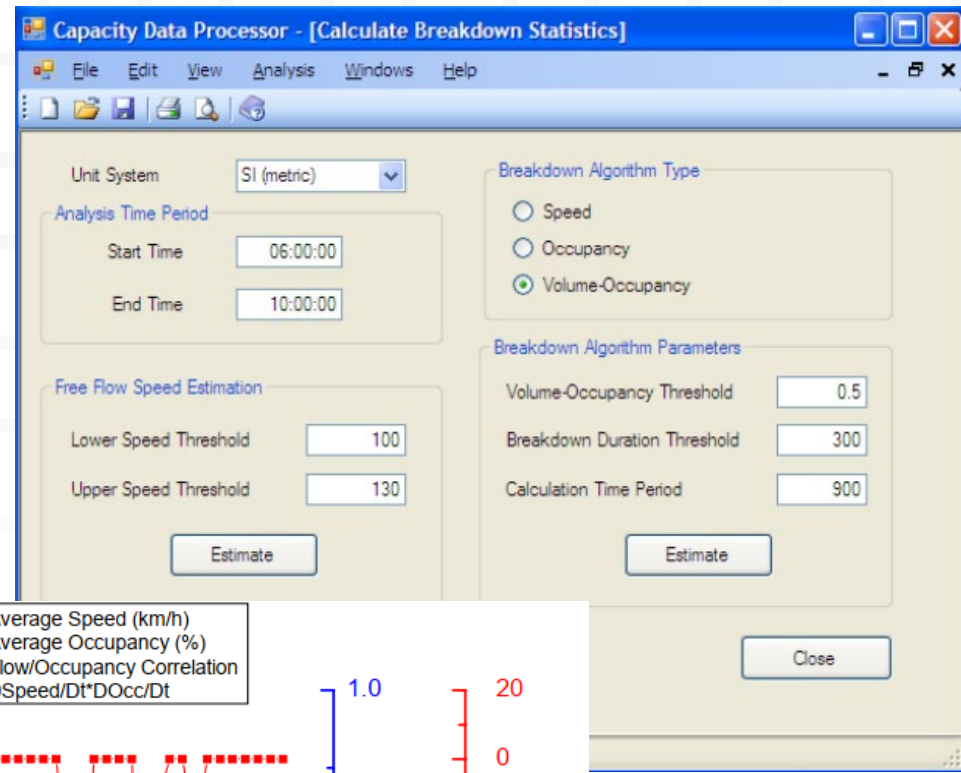
ID	Type	Range From	Range To	FFS Adj.	Cap Adj.	Probability (%)
0	Clear	0	0	1	1	50
1	Light Rain	0	0.1	0.98	0.98	8
2	Medium Rain	0.1	0.25	0.94	0.93	4
3	Heavy Rain	0.25	inf	0.93	0.86	2
4	Very Light Snow	0	0.05	0.89	0.96	6
5	Light Snow	0.05	0.1	0.88	0.91	3
6	Medium Snow	0.1	0.5	0.86	0.89	2
7	Heavy Snow	0.5	inf	0.85	0.76	2
8	Low Wind	10	20	0.99	0.99	4
9	High Wind	20	inf			
10	Cool	34	50			
11	Cold	-4	34			
12	Very Cold	-inf	-4			
13	Medium Visibility	0.5	1			
14	Low Visibility	0.25	0.5			
15	Very Low Visibility	0	0.25			
Total						



ID	Type	Max Lanes Blocked	Duration (min)	FFS Adj.	Cap Adj.	Probability (%)
0	No Incident	n/a	0	1	1	50
1	Non-Crash	shoulder	30	0.99	0.99	10
2	Non-Crash	1	30	0.79	0.79	7
3	Non-Crash	2+	60	0.61	0.61	6
4	Property Damage Only Crash	shoulder	45	0.86	0.86	5
5	Property Damage Only Crash	1	45	0.79	0.79	4
6	Property Damage Only Crash	2+	60	0.61	0.61	4
7	Injury Crash	shoulder	60	0.86	0.86	3
8	Injury Crash	1	60	0.79	0.79	3
9	Injury Crash	2+	60	0.61	0.61	3
10	Fatal Crash	shoulder	150	0.86	0.86	1
11	Fatal Crash	1	150	0.79	0.79	2
12	Fatal Crash	2+	150	0.61	0.61	2
Total						100

Software Tool Development

- Bottleneck identification and throughput calculation software





Software Tool Development

- Cluster analysis and variation envelope calculations will be incorporated
- No need for Excel spreadsheets
- No need for separate statistical analysis software
- Thus, an all-in-one purpose-built software tool
- Written in C#/.NET—among many advantages, it offers much faster execution speed over scripting type languages such as Excel VBA and Python
- Tool can eventually be customized to meet needs/desires of other DOTs or agencies

Software Tool Development— Future Possibilities



- With this purpose-built software tool, agencies may be more likely to apply the 2019 method
- Such a tool can facilitate further evaluation of the 2019 method, for example...
 - Quality of simulation calibration results relative to 2004 approach
 - Cluster analysis method variations (initial clustering, stopping criterion, partitional vs hierarchical vs Bayesian algorithms, etc.)
 - Variation envelopes and acceptability criteria for simulation calibration
- Additional application areas (e.g., TSMO, IJR, TTR)

Software Tool Development

FWHA TAT Vol. 3 Cluster Analysis

File Edit View Tools Windows Help

Input Data Values

	Record ID	Date	Day of Week	Traffic Volume (veh/h)	Precipitation (mm)	Wind Speed (mi/h)	Incident Type	Lanes Blocked	Travel Time (min), Route 1	Travel Time (min), Route 2	Travel Time (min), Route 3	Bottleneck Throughput (veh/h), Route 1	Bottleneck Throughput (veh/h), Route 2	Bottleneck Throughput (veh/h), Route 3
▶ 1	1	1/2/2012 12:00...	2	4650	0.034	4.54	DisabledVehicle	SingleLane	36.0	32.0	27.0	2525	1934	2042
2	2	1/3/2012 12:00...	3	4557	0.192	5.62	NoninjuryCol...	SingleLane	46.0	39.0	33.0	2015	1767	1652
3	3	1/4/2012 12:00...	4	4253	0.006	4.34	Debris	MultipleLane	44.0	35.0	30.0	2478	1835	1760
4	4	1/5/2012 12:00...	5	5126	0.016	4.77	NoninjuryCol...	ShoulderMedian	26.0	24.0	21.0	2756	2105	2344
5	5	1/6/2012 12:00...	6	3529	0.040	6.18	Debris	MultipleLane	43.0	36.0	32.0	2013	1843	1742
6	6	1/16/2012 12:00...	2	2875	0.070	1.55	NoninjuryCol...	HOV	49.0	40.0	36.0	1524	1690	1594
7	7	1/17/2012 12:00...	3	3051	0.000	3.08	InjuryCollision	SingleLane	51.0	44.0	38.0	2183	1664	1418
8	8	1/18/2012 12:00...	4	3029	0.034	4.60	DisabledVehicle	SingleLane	35.0	32.0	28.0	1735	1956	2052
9	9	1/19/2012 12:00...	5	4605	0.298	6.13	Debris	MultipleLane	44.0	36.0	32.0	1957	1820	1720
10	10	1/20/2012 12:00...	6	4737	0.000	3.39	Debris	SingleLane	30.0	27.0	22.0	2517	2084	2258
11	11	1/23/2012 12:00...	2	3294	0.370	10.23	AbandonedV...	ShoulderMedian	60.0	53.0	42.0	2352	1550	1287
12	12	1/24/2012 12:00...	3	4492	0.076	1.70	DisabledVehicle	HOV	40.0	34.0	33.0	1753	1919	1943
13	13	1/25/2012 12:00...	4	3618	0.000	4.73	DisabledVehicle	ShoulderMedian	26.0	22.0	21.0	1586	2166	2431
14	14	1/26/2012 12:00...	5	4772	0.000	2.39	NoninjuryCol...	SingleLane	46.0	39.0	32.0	1957	1796	1681
15	15	1/27/2012 12:00...	6	2736	0.000	1.77	AbandonedV...	ShoulderMedian	56.0	52.0	41.0	2722	1551	1272
16	16	1/30/2012 12:00...	2	3494	0.014	2.23	Debris	MultipleLane	43.0	34.0	31.0	2723	1858	1795
17	17	1/31/2012 12:00...	3	4396	0.000	4.01	DisabledVehicle	SingleLane	35.0	32.0	28.0	1694	1940	2033

0 1 2 3 4 5 6 7 8 9 10

Number of Clusters

		Bottleneck Throughput, Route 2	Bottleneck Throughput, Route 3	Sum of Squares							
▶ 1	0.340	0.285	0.295	0.803	0.745	0.726	0.762	0.488	0.194	0.183	3.737
2	0.582	0.195	0.294	0.500	0.456	0.403	0.476	0.470	0.518	0.483	1.700
3	0.626	0.045	0.329	0.200	0.135	0.174	0.133	0.568	0.810	0.823	1.862

Software Tool Development

FHWA TAT Vol. 3 Cluster Analysis

File Edit View Tools Windows Help

Input Data Values

Normalized Data Values

Record ID	Date	Day of Week	Traffic Volume	Precipitation	Wind Speed	Incident Severity	Travel Time, Route 1	Travel Time, Route 2	Travel Time, Route 3	Bottleneck Throughput, Route 1	Bottleneck Throughput, Route 2	Bottleneck Throughput, Route 3
1	1/2/20...	2	0.801	0.092	0.344	0.364	0.294	0.323	0.286	0.813	0.623	0.664
2	1/3/20...	3	0.762	0.519	0.469	0.636	0.588	0.548	0.571	0.399	0.352	0.328
3	1/4/20...	4	0.635	0.016	0.321	0.545	0.529	0.419	0.429	0.774	0.463	0.421
4	1/5/20...	5	1.000	0.043	0.371	0.091	0.000	0.065	0.000	1.000	0.901	0.925
5	1/6/20...	6	0.332	0.108	0.533	0.545	0.500	0.452	0.524	0.397	0.476	0.406
6	1/16/2...	2	0.058	0.189	0.000	0.727	0.676	0.581	0.714	0.000	0.227	0.278
7	1/17/2...	3	0.132	0.000	0.176	0.818	0.735	0.710	0.810	0.535	0.185	0.126
8	1/18/2...	4	0.123	0.092	0.351	0.364	0.265	0.323	0.333	0.171	0.659	0.673
9	1/19/2...	5	0.782	0.805	0.528	0.545	0.529	0.452	0.524	0.351	0.438	0.387
10	1/20/2...	6	0.837	0.000	0.212	0.182	0.118	0.161	0.048	0.806	0.867	0.851
11	1/23/2...	2	0.233	1.000	1.000	1.000	1.000	1.000	1.000	0.672	0.000	0.013
12	1/24/2...	3	0.735	0.205	0.017	0.455	0.412	0.387	0.571	0.186	0.599	0.579
13	1/25/2...	4	0.369	0.000	0.366	0.000	0.000	0.000	0.000	0.050	1.000	1.000
14	1/26/2...	5	0.852	0.000	0.097	0.636	0.588	0.548	0.524	0.351	0.399	0.353
15	1/27/2...	6	0.000	0.000	0.025	1.000	0.882	0.968	0.952	0.972	0.002	0.000
16	1/30/2...	2	0.317	0.038	0.078	0.545	0.500	0.387	0.476	0.973	0.500	0.451
17	1/31/2...	3	0.695	0.000	0.283	0.364	0.265	0.323	0.333	0.138	0.633	0.657

16	4	1/5/2012 12:00:00 A...	6	1.973	1.242	0.638
17	13	1/25/2012 12:00:00 ...	6	1.976	1.269	0.715

Software Tool Development

FHWA TAT Vol. 3 Cluster Analysis

File Edit View Tools Windows Help

Input Data Values

Normalized Data Values

Record ID	Date	Day of	Traffic	Precipitation	Wind	Incident	Travel Time, Route 1	Travel Time, Route 2	Travel Time, Route 3	Bottleneck Throughput, Route 1	Bottleneck Throughput, Route 2	Bottleneck Throughput, Route 3	Sum of Squares
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
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16													
17													

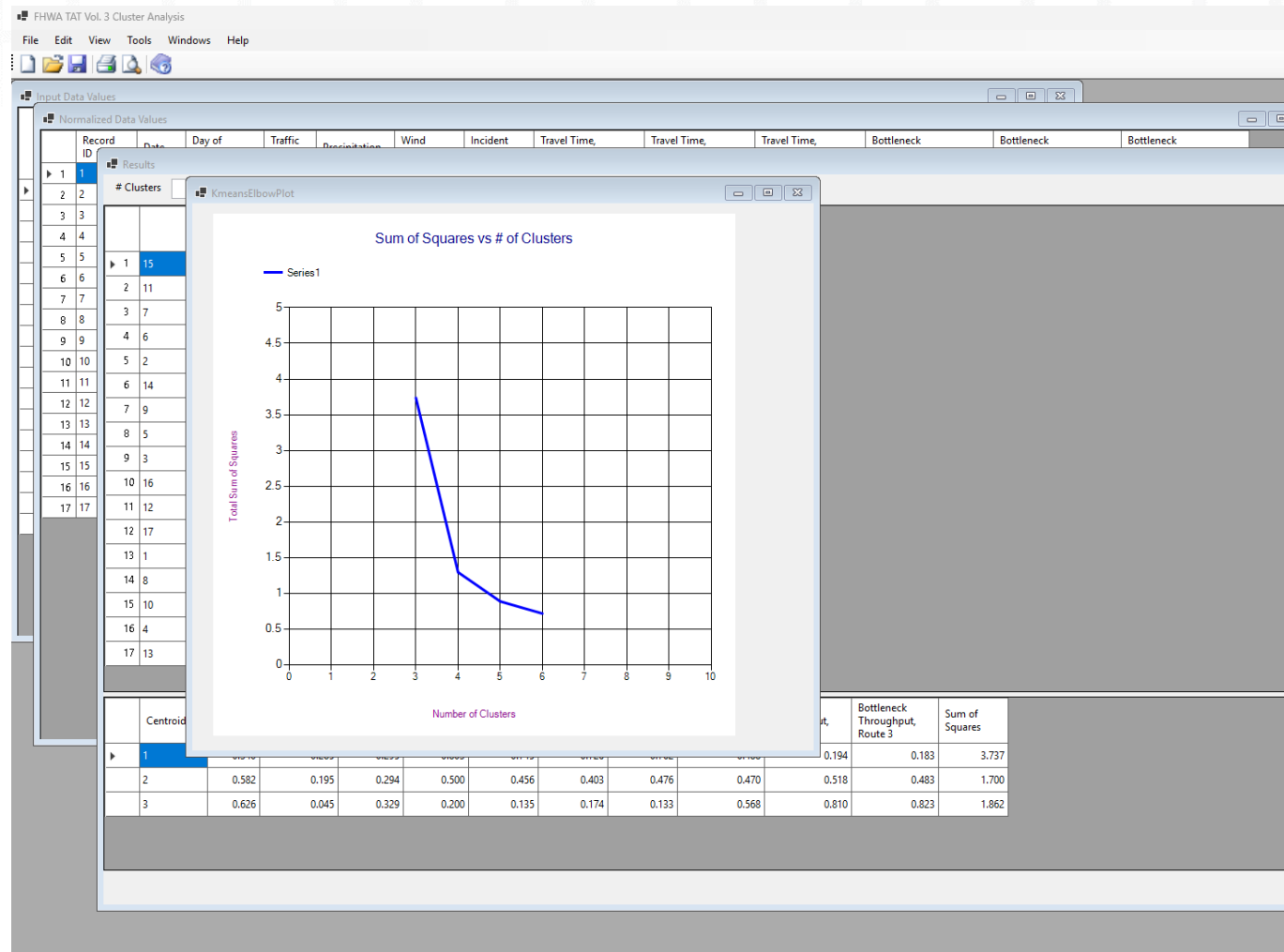
Results

Clusters: 3 Iteration #: 0 View Elbow Plot

Record ID	Date	Current Cluster	Dist to Cluster 1 Centroid	Dist to Cluster 2 Centroid	Dist to Cluster 3 Centroid
1	1/27/2012 12:00:00 ...	1	0.852	1.476	2.116
2	1/23/2012 12:00:00 ...	1	1.165	1.725	2.379
3	1/17/2012 12:00:00 ...	1	0.383	0.939	1.623
4	1/16/2012 12:00:00 ...	2	0.676	0.947	1.576
5	1/3/2012 12:00:00 A...	3	0.662	0.539	1.214
6	1/26/2012 12:00:00 ...	2	0.783	0.504	1.110
7	1/19/2012 12:00:00 ...	3	0.941	0.713	1.233
8	1/6/2012 12:00:00 A...	3	0.695	0.387	0.964
9	1/4/2012 12:00:00 A...	3	0.830	0.381	0.865
10	1/30/2012 12:00:00 ...	4	0.912	0.633	0.986
11	1/24/2012 12:00:00 ...	4	1.017	0.458	0.874
12	1/31/2012 12:00:00 ...	4	1.232	0.535	0.598
13	1/2/2012 12:00:00 A...	5	1.249	0.557	0.500
14	1/18/2012 12:00:00 ...	4	1.189	0.673	0.751
15	1/20/2012 12:00:00 ...	6	1.716	0.968	0.359
16	1/5/2012 12:00:00 A...	6	1.973	1.242	0.638
17	1/25/2012 12:00:00 ...	6	1.976	1.269	0.715

Centroid	Traffic Volume	Precipitation	Wind Speed	Incident Severity	Travel Time, Route 1	Travel Time, Route 2	Travel Time, Route 3	Bottleneck Throughput, Route 1	Bottleneck Throughput, Route 2	Bottleneck Throughput, Route 3	Sum of Squares
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2	0.582	0.195	0.294	0.500	0.456	0.403	0.476	0.470	0.518	0.483	1.700
3	0.626	0.045	0.329	0.200	0.135	0.174	0.133	0.568	0.810	0.823	1.862

Software Tool Development





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