Decision Support Systems for Transportation System Management and Operations (TSM&O)

FDOT Project BDV29-977-09

Presented by

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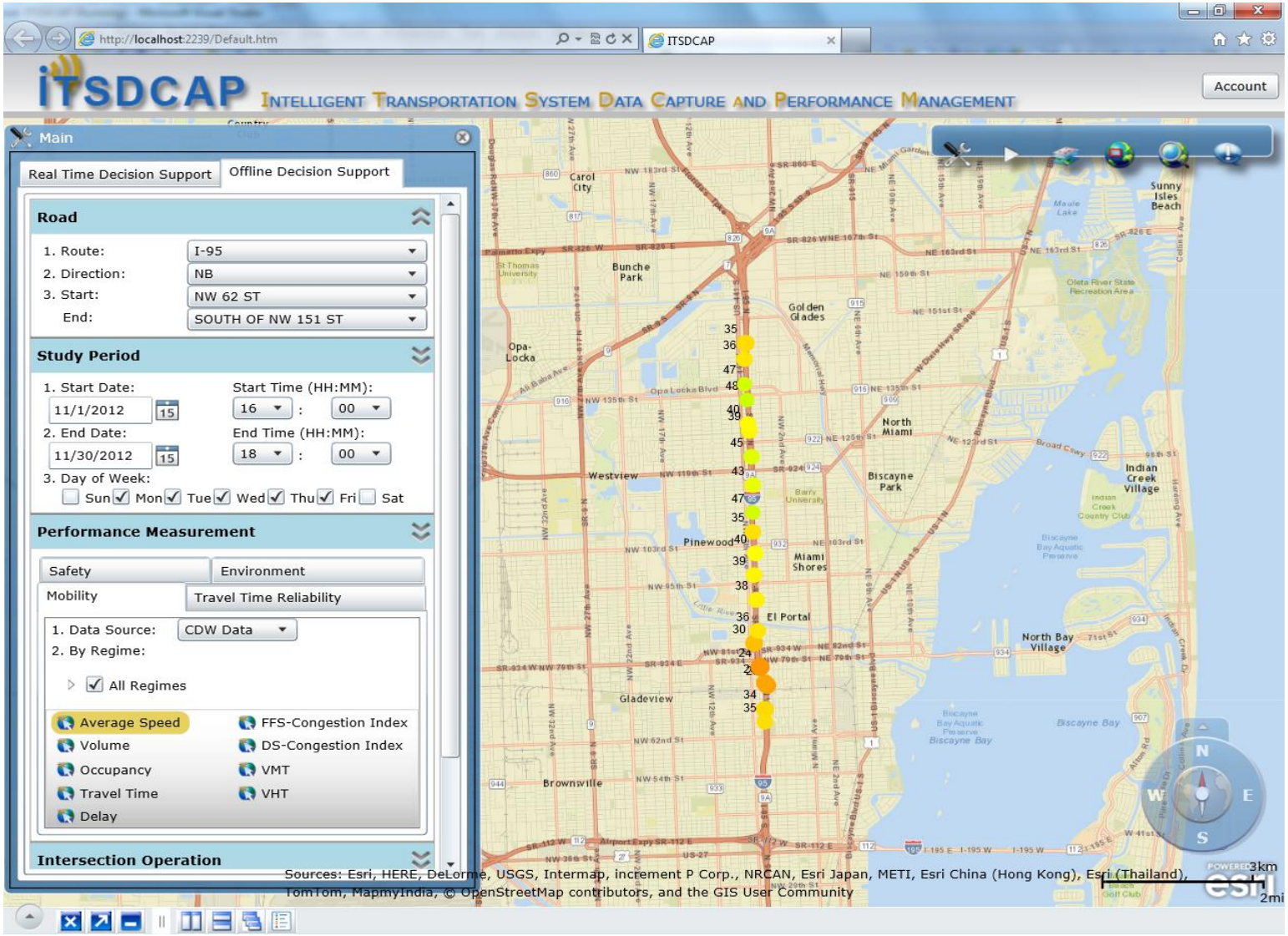
ITSDCAP Functionality

- Aggregation and cleaning of data from multiple sources
- Grouping and clustering of data
- Performance measurements and dashboard
- Real-time information sharing
- Prediction of system performance and impacts
- Decision support tools
- Benefit-cost analysis of advanced strategies
- Transportation model support

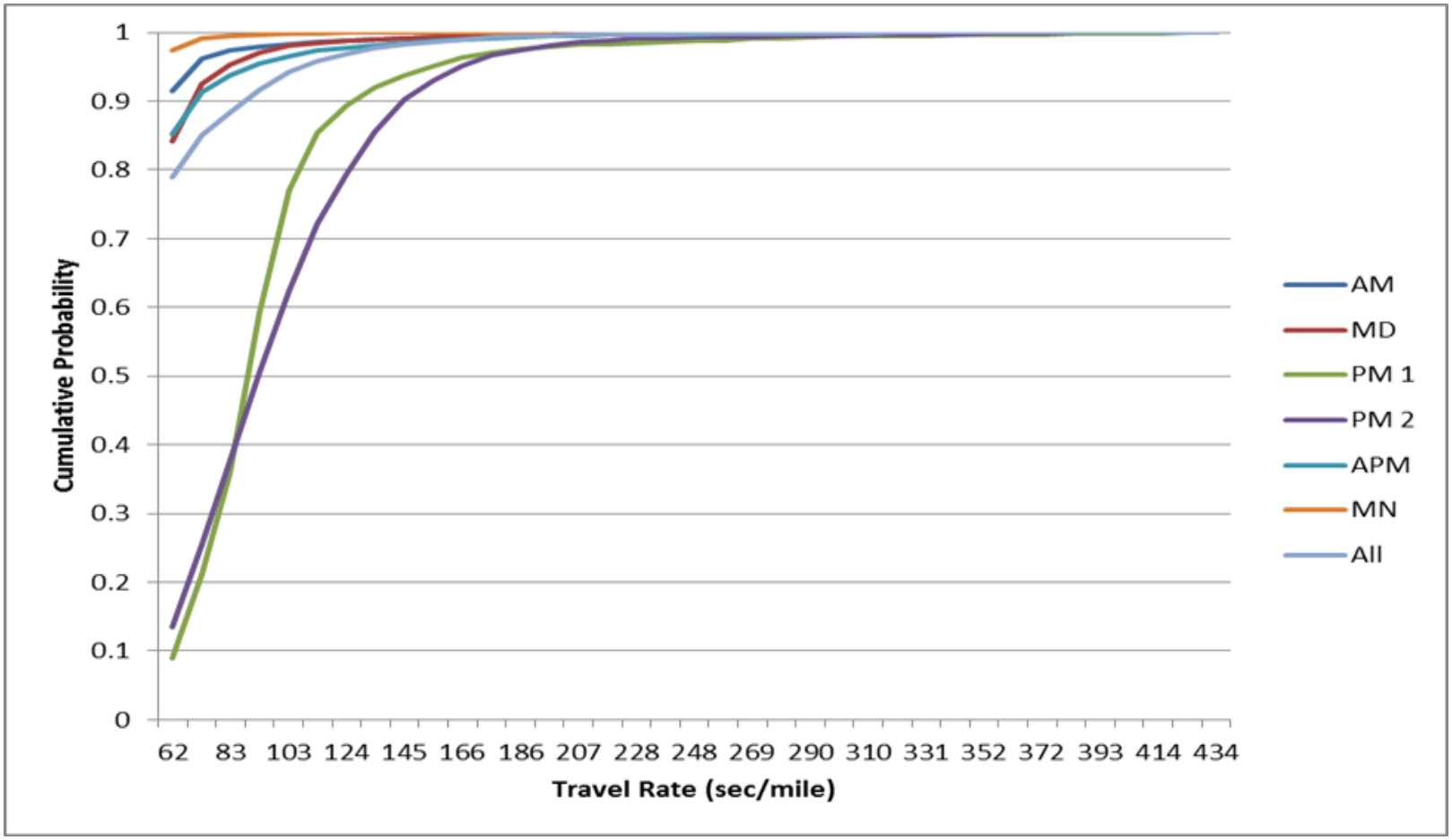
Support of TSM&O Performance Dashboard

- Estimation of performance measurements including mobility, reliability, safety and environmental impacts
- Agency specific dashboard format
  - Broward County
  - Miami-Dade County (SW 8th Street will be expanded to other corridors)
  - Soon Palm Beach County
  - Others

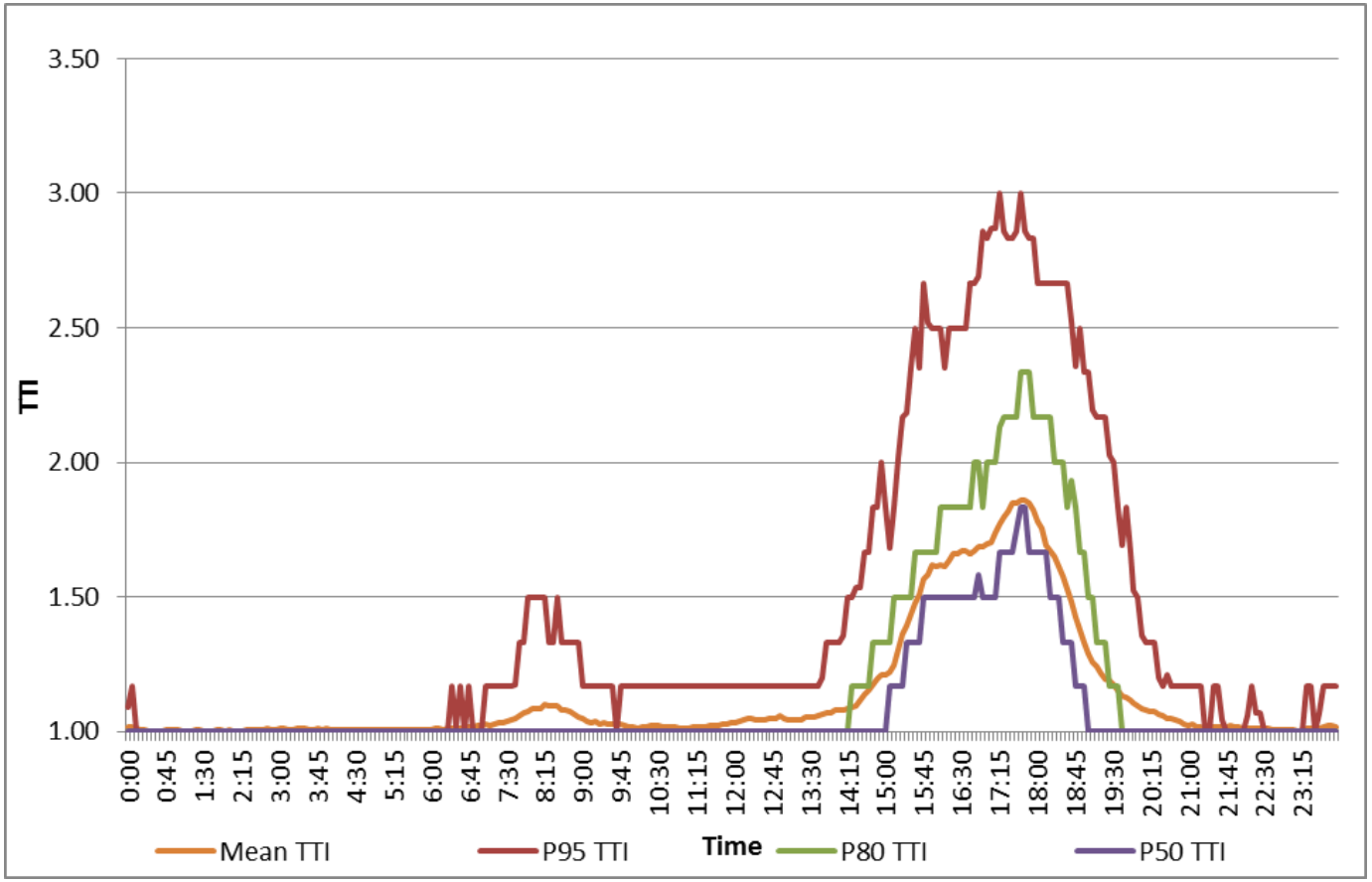
Mobility


http://localhost:2239/Default.htm
ITSDCAP
iTSDCAP INTELLIGENT TRANSPORTATION SYSTEM DATA CAPTURE AND PERFORMANCE MANAGEMENT
Account
Main
Real Time Decision Support
Offline Decision Support
Road
1. Route: I-95
2. Direction: NB
3. Start: NW 62 ST
End: SOUTH OF NW 151 ST
Study Period
1. Start Date: 11/1/2012
Start Time (HH:MM): 16 : 00
2. End Date: 11/30/2012
End Time (HH:MM): 18 : 00
3. Day of Week:
Sun Mon Tue Wed Thu Fri Sat
Performance Measurement
Safety
Environment
Mobility
Travel Time Reliability
1. Data Source: CDW Data
2. By Regime:
All Regimes
Average Speed
Volume
Occupancy
Travel Time
Delay
FFS-Congestion Index
DS-Congestion Index
VMT
VHT
Intersection Operation
Carol City
Bunche Park
Golden Glades
Opa-Locka
North Miami
Westview
Biscayne Park
Indian Creek Village
Pinewood
Miami Shores
El Portal
North Bay Village
Gladeview
Brownsville
Sunny Isles Beach
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
3km
2mi

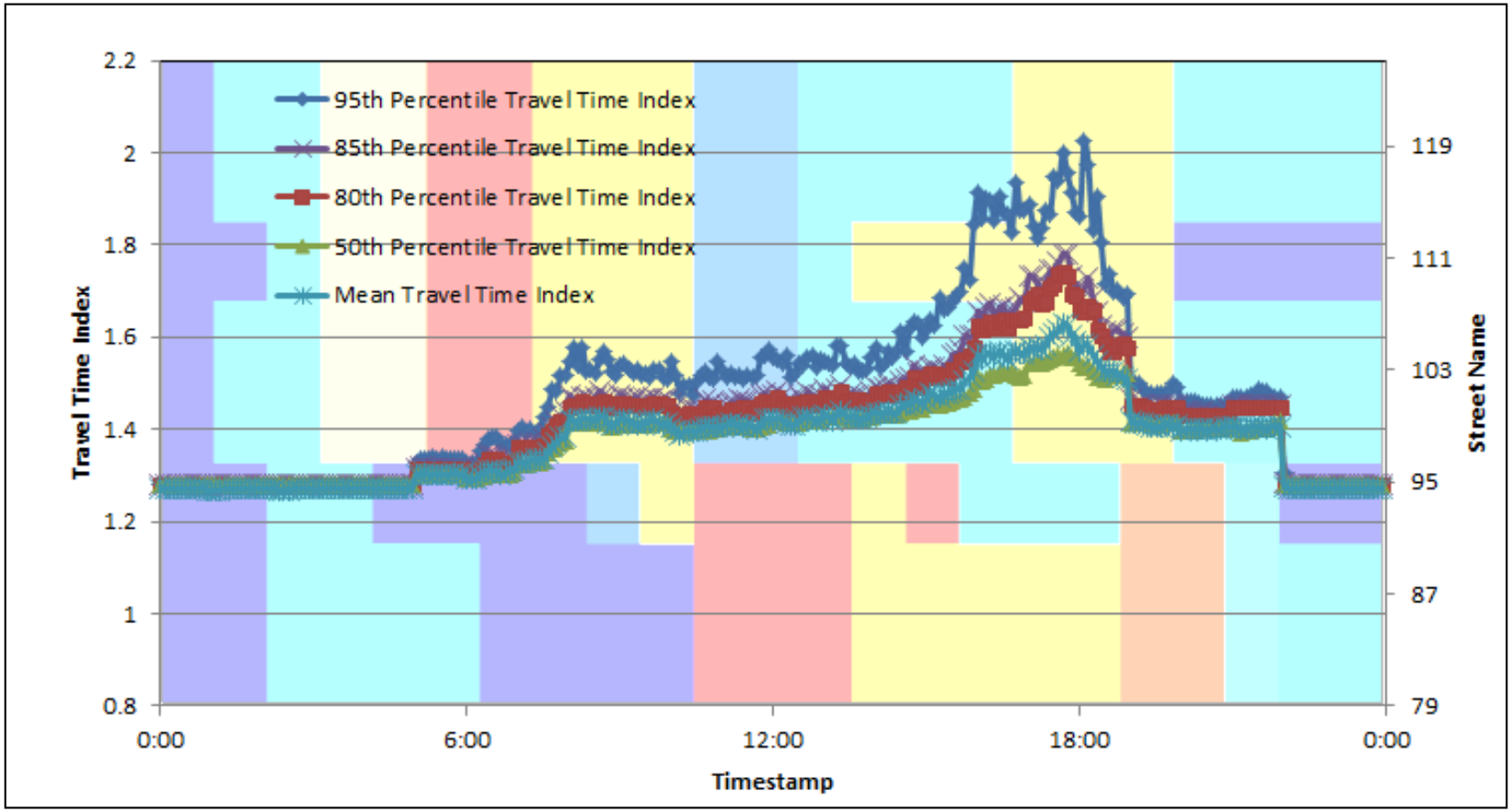
Reliability



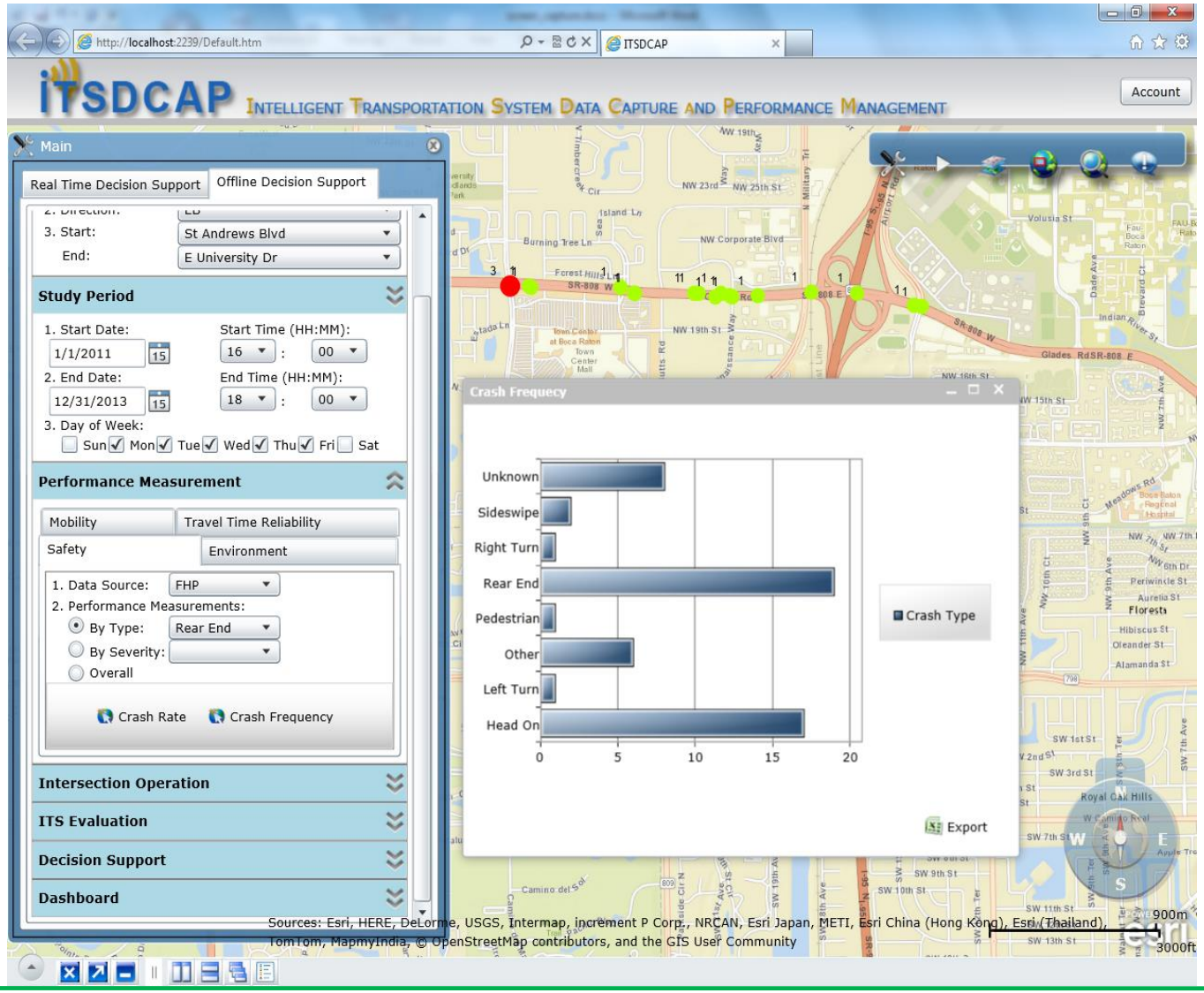
Reliability Utilization in DS on Freeways



Reliability Utilization in DS on Arterials

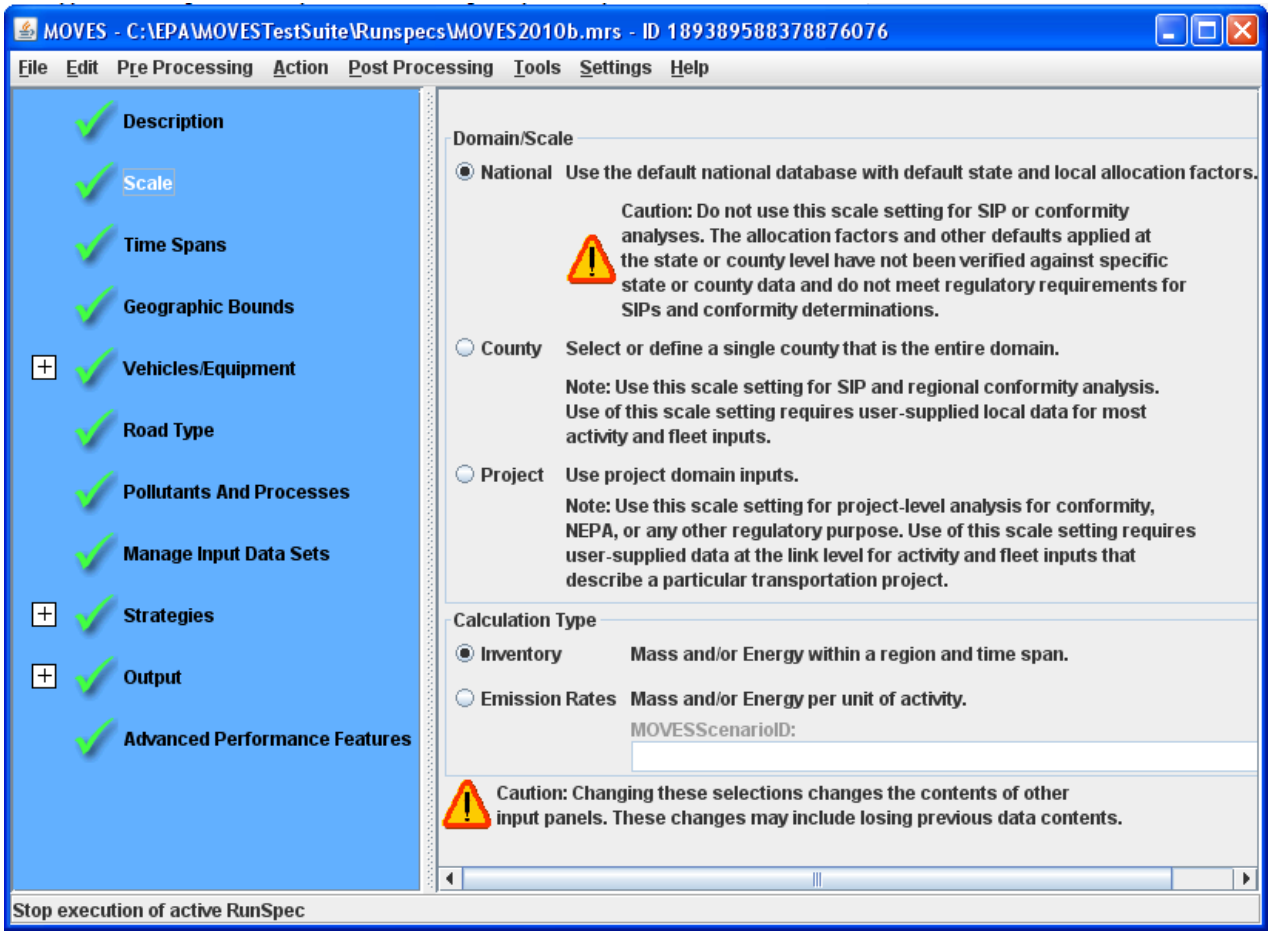


Safety (Based on CARS, FHP, or Incident Database

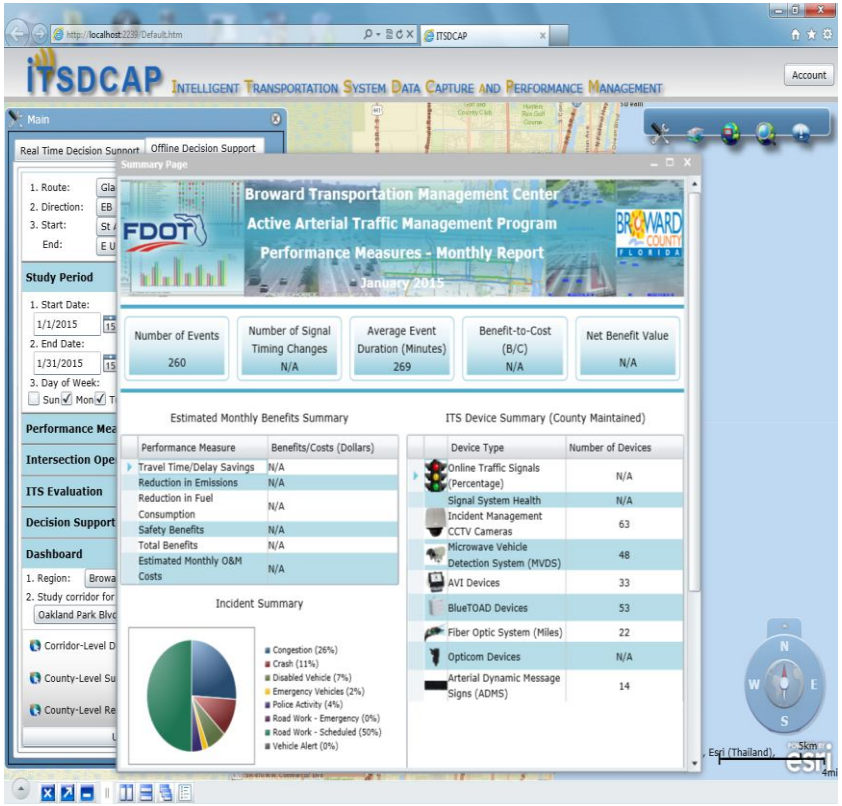


Fuel Consumption and Emissions

- EPA MOVES

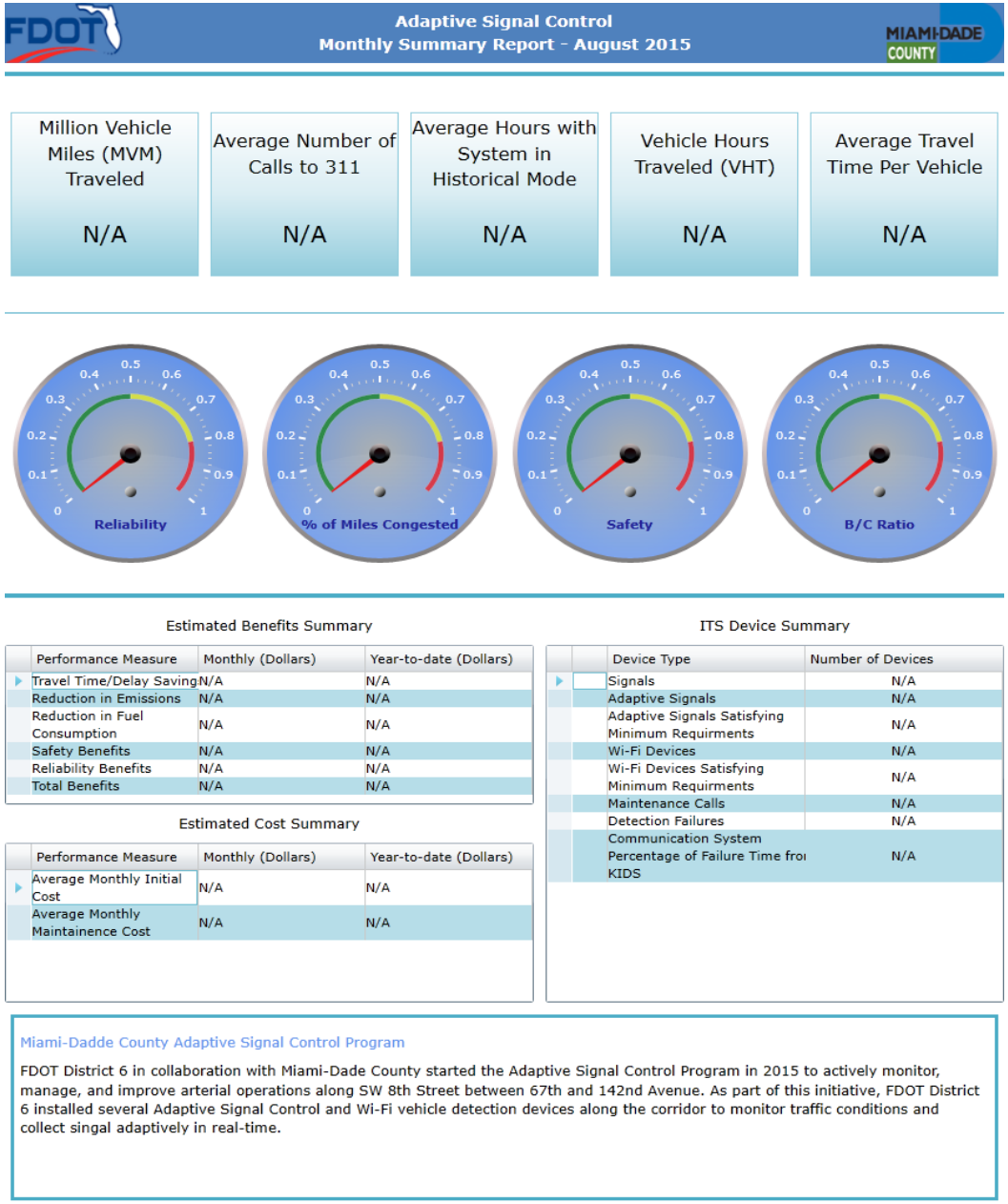


Broward and Palm Beach County Dashboard



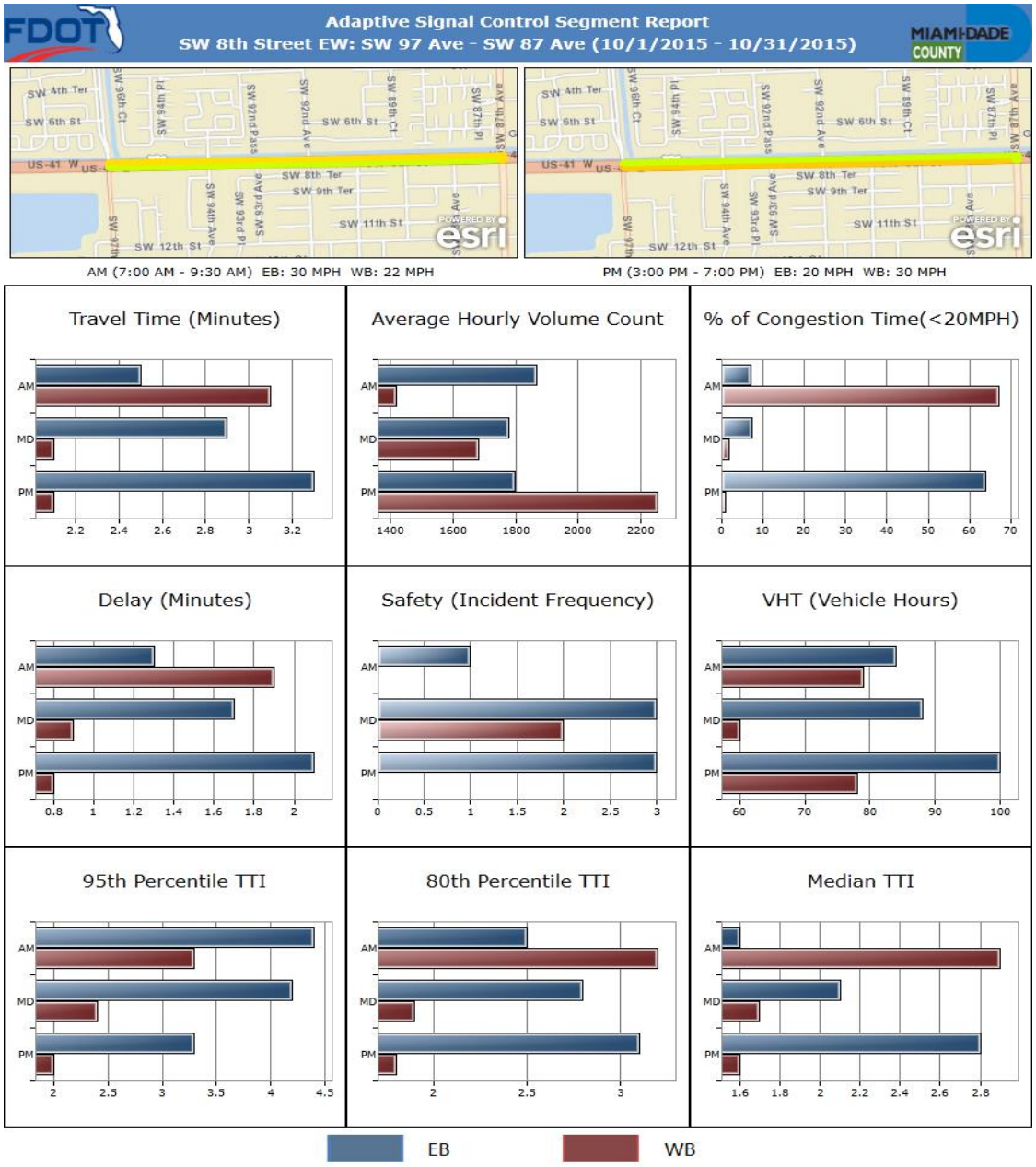
Miami-Dade County Dashboard

System-Wide

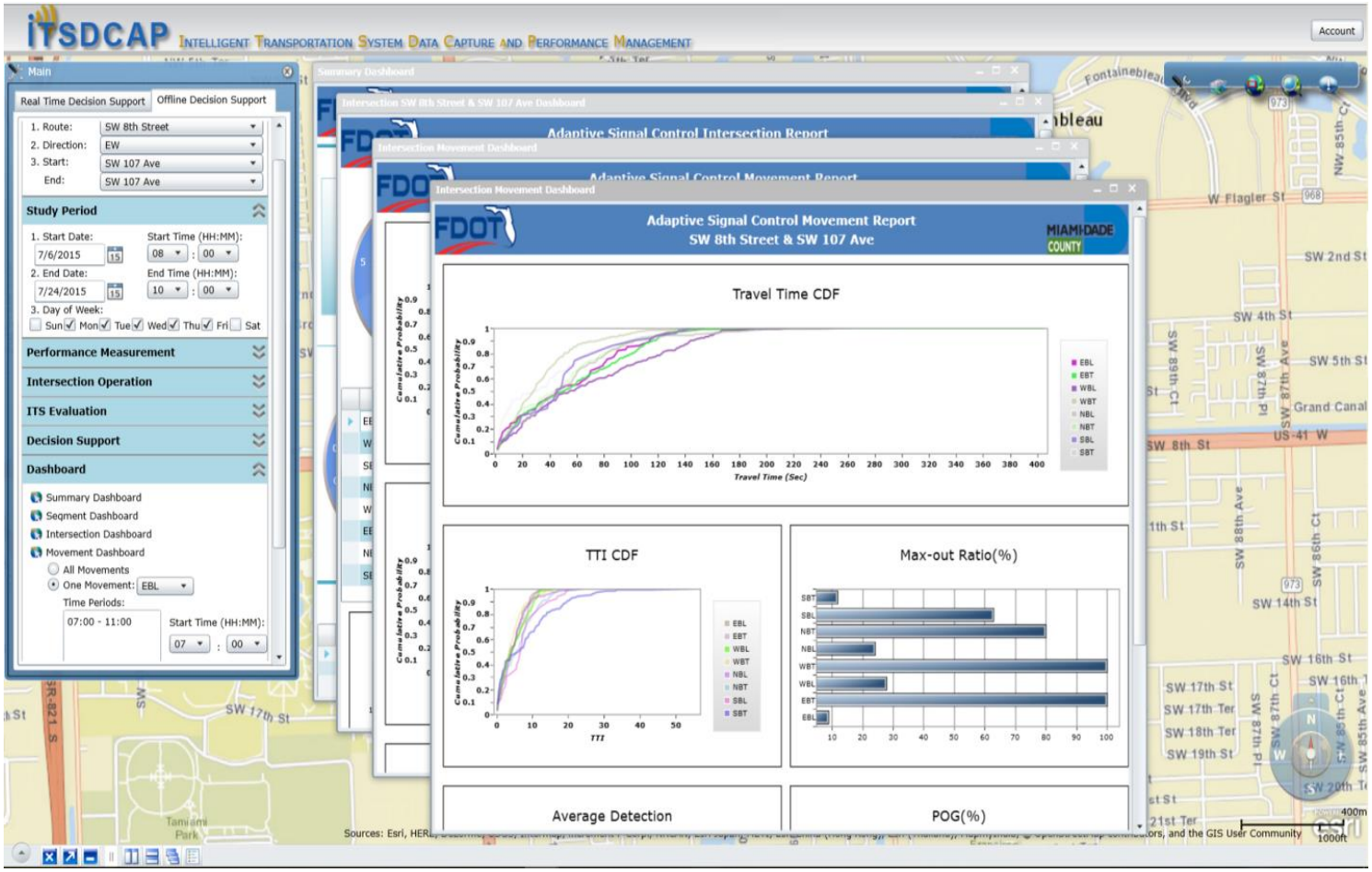


Miami-Dade County Dashboard

Corridor-based and Segment-based

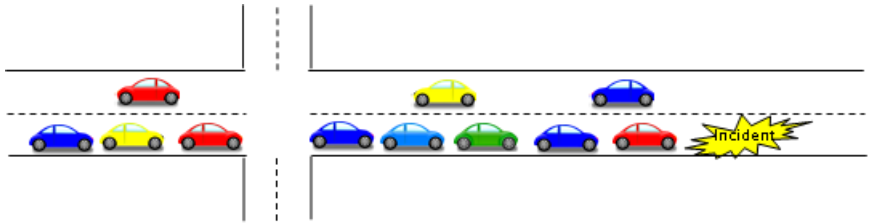


Intersection-Level Dashboard

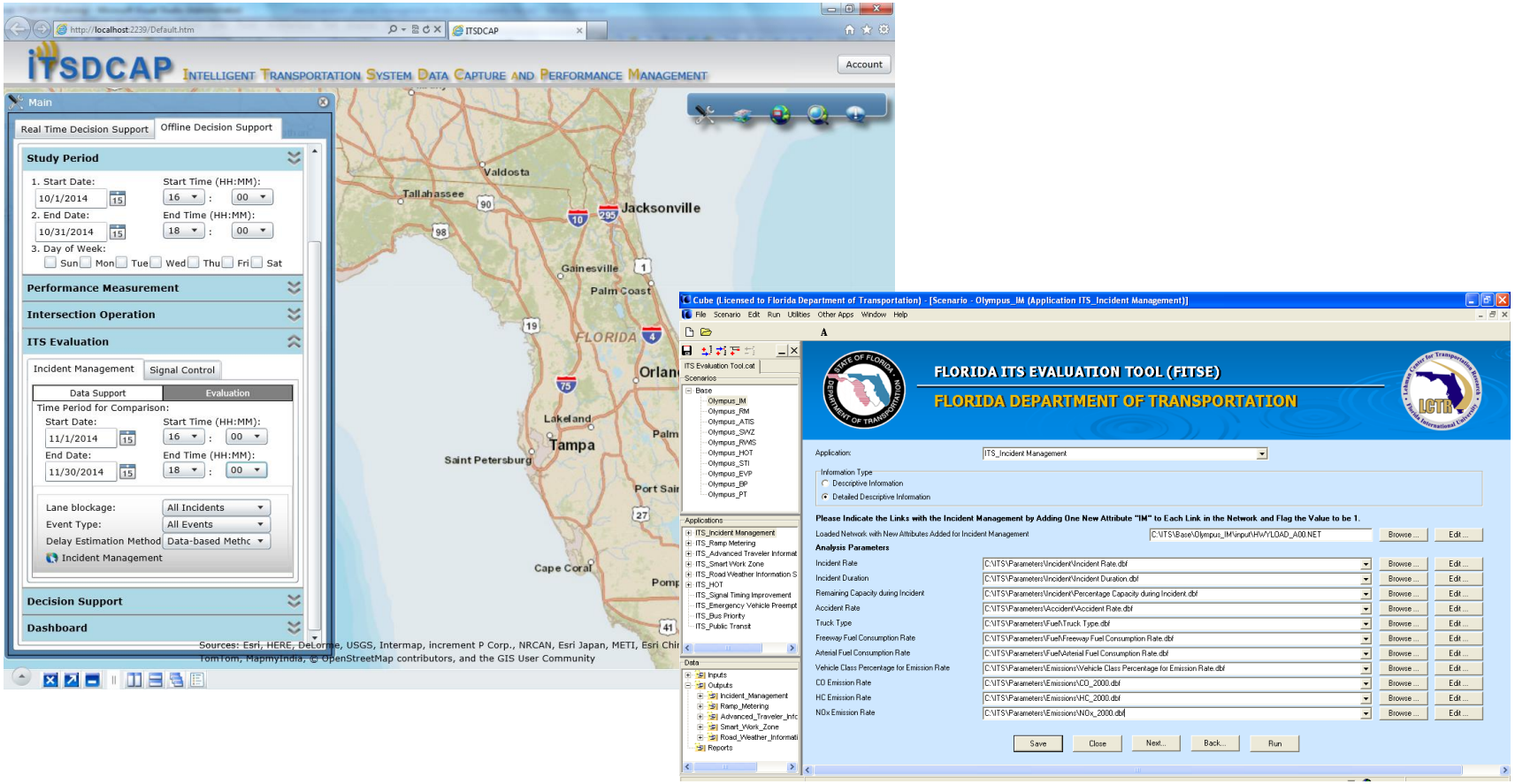


Benefit-Cost Module

- Two types of support
  - Provide data to sketch planning tools
  - Estimation of benefits based on data (currently only for incident management)
- Incident management benefits
  - Originally only for freeways – Now for freeways and arterials

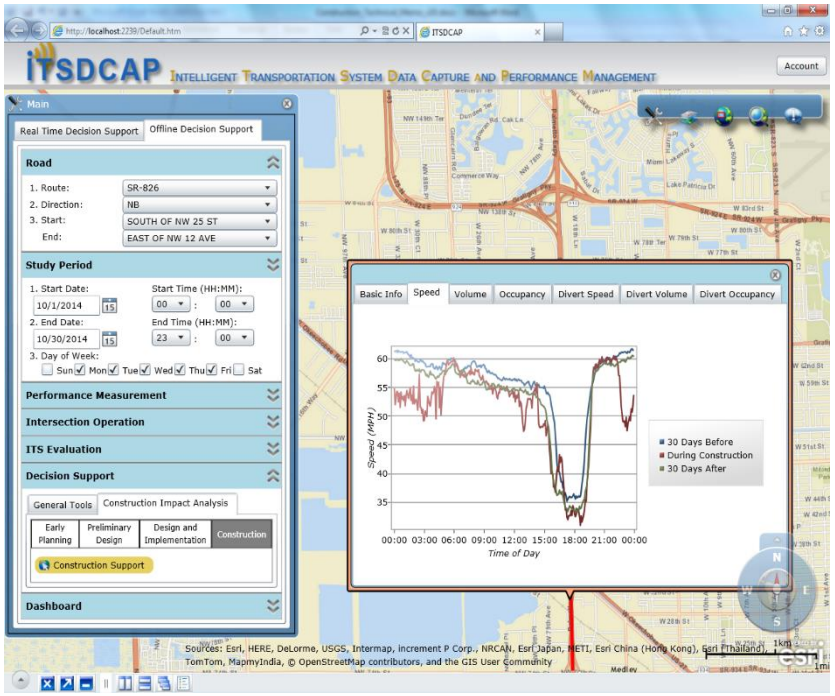


Benefit-Cost Module

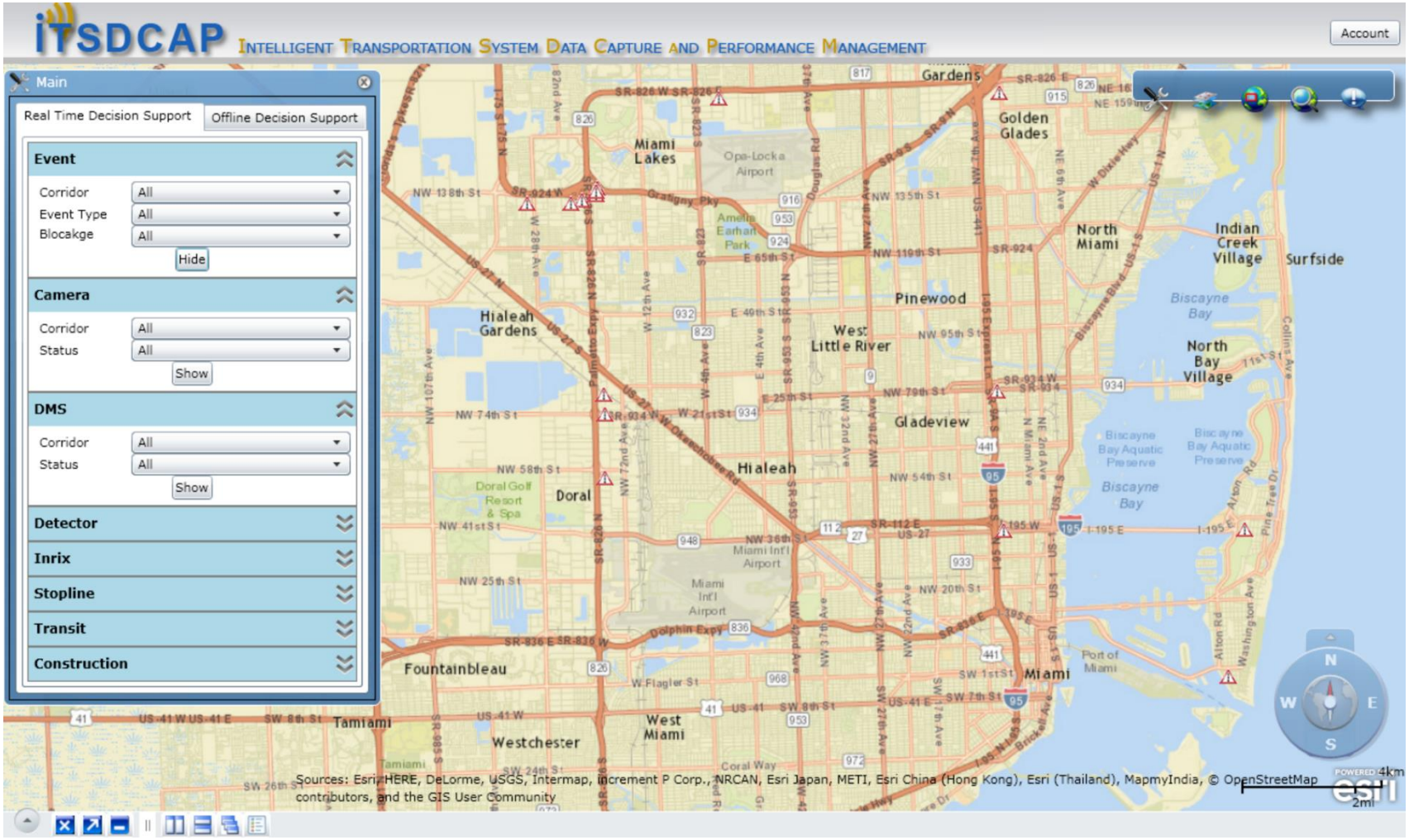


Estimation of Construction Impacts

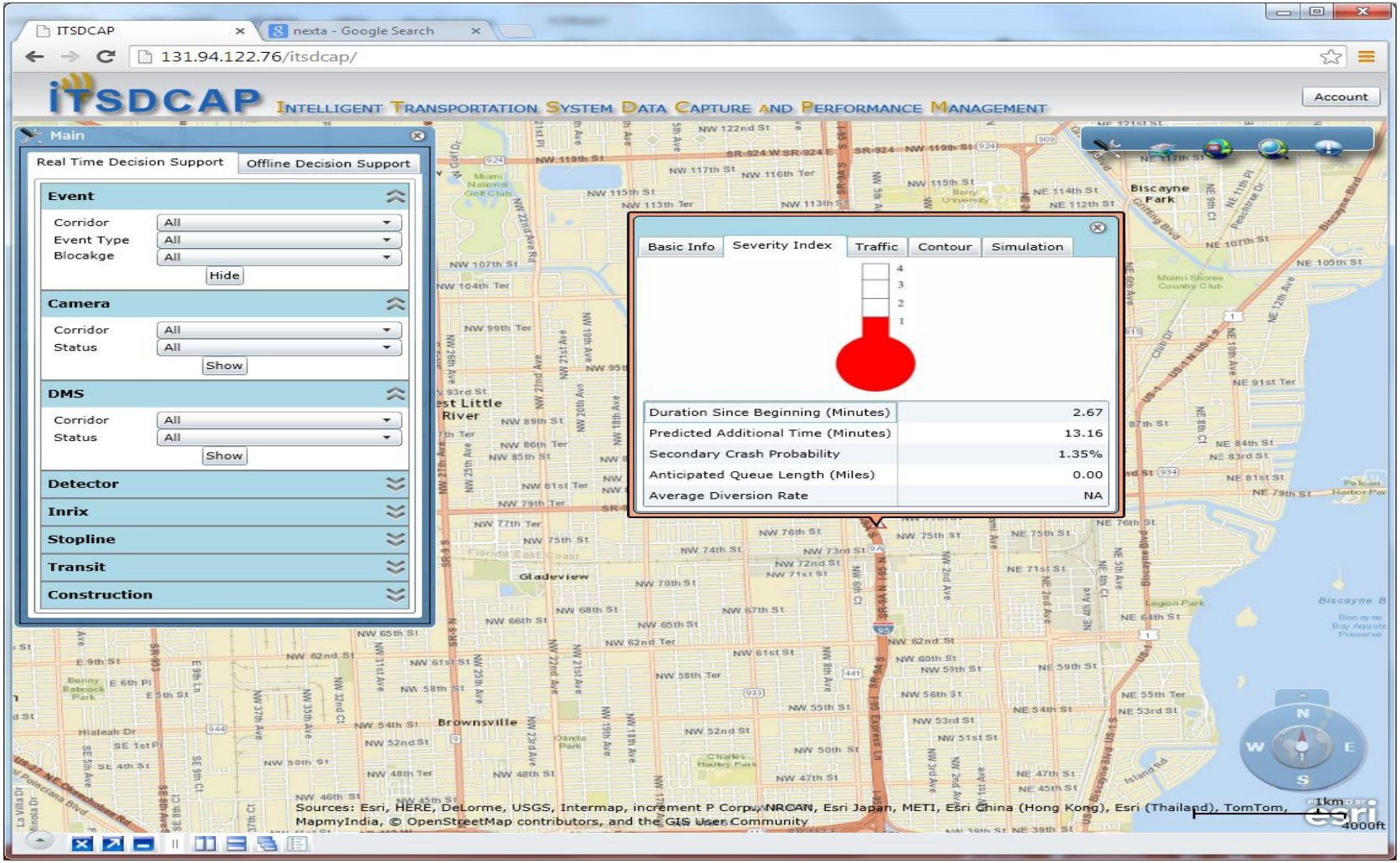
- Two types of support
  - Assessment based on real-world data
  - Providing the required inputs for external work zone analysis tools (e.g., demand and capacity values at the work zone).



Real-Time Information Sharing



Incident Impacts and Index

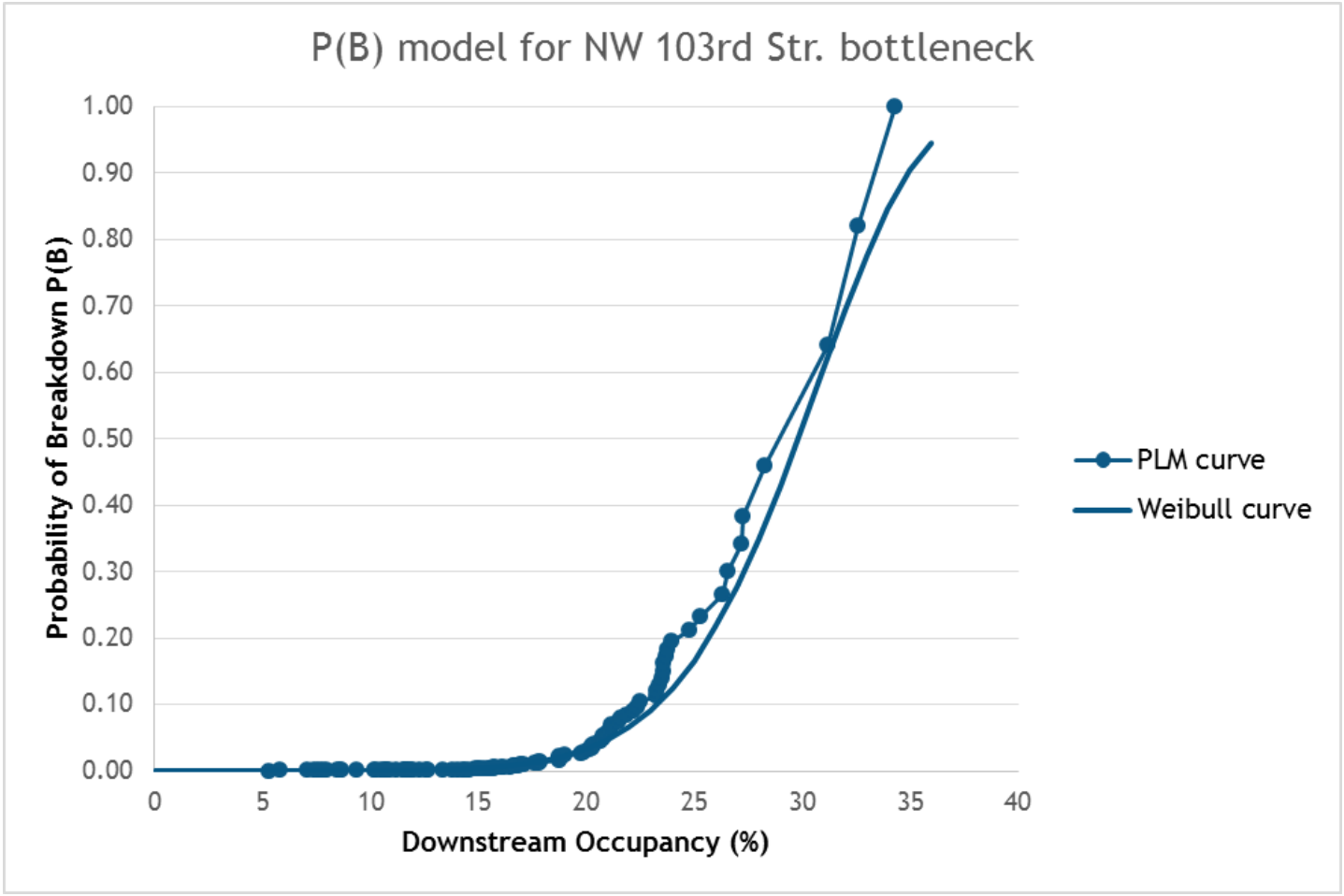


Estimation of Rain Impacts

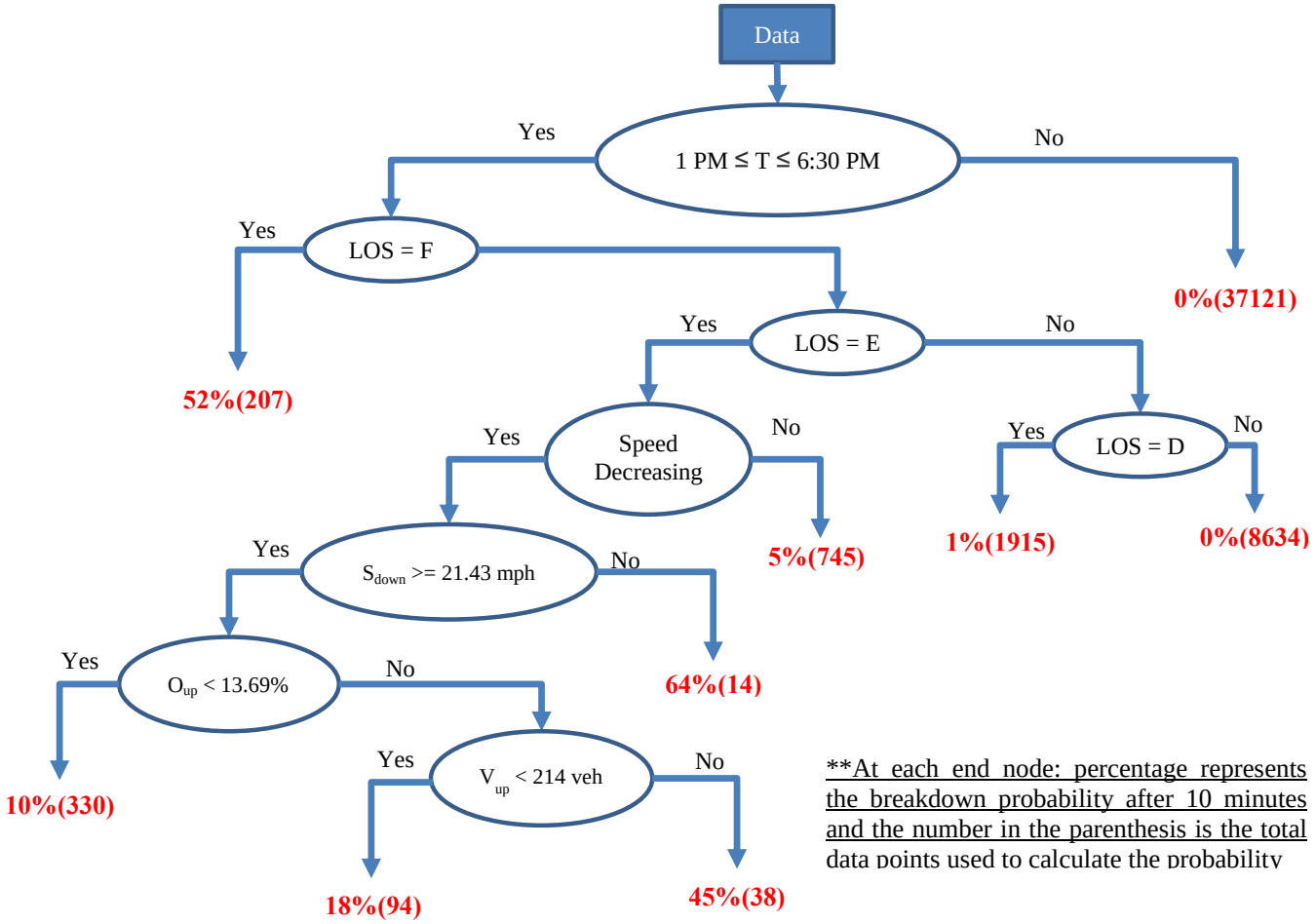
- Utilization of HCM procedures for the estimation of travel time with consideration of rain impacts

Scenario		Medium Rain				
		MAPE	RMSE	NRMSE	MSPE	RMSPE
No Prediction	15 min	0.107	13.326	0.132	0.016	0.127
	30 min	0.117	18.668	0.192	0.012	0.108
	45 min	0.111	15.890	0.175	0.010	0.101
	60 min	0.210	43.012	0.391	0.050	0.223
Prediction Using "Normal" Day Demands as Input	15 min	0.096	17.294	0.171	0.010	0.099
	30 min	0.103	23.187	0.239	0.013	0.115
	45 min	0.097	19.867	0.218	0.011	0.104
	60 min	0.219	46.868	0.426	0.050	0.223
Prediction Using Instantaneous Demands as Input	15 min	0.059	12.111	0.125	0.004	0.063
	30 min	0.061	12.561	0.127	0.004	0.063
	45 min	0.043	8.513	0.094	0.002	0.045
	60 min	0.148	34.157	0.311	0.024	0.155
Prediction with Forecasted Demands as Input	15 min	0.048	10.700	0.106	0.003	0.055
	30 min	0.045	8.913	0.098	0.002	0.047
	45 min	0.045	6.087	0.072	0.004	0.061
	60 min	0.088	11.627	0.117	0.008	0.092
		Heavy Rain				
No Prediction	15 min	0.126	17.103	0.244	0.019	0.139
	30 min	0.208	32.016	0.508	0.051	0.227
	45 min	0.121	11.597	0.153	0.009	0.096
	60 min	0.160	21.840	0.240	0.019	0.138
Prediction Using "Normal" Day Demands as Input	15 min	0.116	16.347	0.234	0.014	0.118
	30 min	0.108	16.523	0.262	0.013	0.116
	45 min	0.100	14.874	0.196	0.010	0.100
	60 min	0.146	26.217	0.288	0.022	0.149
Prediction Using Instantaneous Demands as Input	15 min	0.015	2.948	0.042	0.000	0.017
	30 min	0.086	16.895	0.268	0.008	0.092
	45 min	0.028	3.619	0.048	0.001	0.031
	60 min	0.044	10.675	0.117	0.003	0.054
Prediction with Forecasted Demands as Input	15 min	0.015	2.948	0.042	0.000	0.017
	30 min	0.043	7.432	0.118	0.003	0.056
	45 min	0.020	2.658	0.035	0.000	0.021
	60 min	0.036	6.768	0.078	0.001	0.037

Probability of Breakdown for Freeways



Probability of Breakdown on Arterials



**At each end node: percentage represents the breakdown probability after 10 minutes and the number in the parenthesis is the total data points used to calculate the probability

*Where, T = Time of Day, S_{down} = Downstream Speed, O_{up} = Upstream Occupancy, V_{up} = Upstream Volume

Ramp Metering Warrants

- On-going effort
- Currently based on simple characteristics including mainline volume, mainline speed, ramp volume, sum of mainline and ramp volume, ramp storage and acceleration distance.
- Researching utilization of dynamic traffic characteristics and measures such as the probability of breakdown, bottleneck attributes, and travel time reliability

CCTV and DMS Location Prioritization

- Incident statistics
- Reliability - travel time index
- Ranking utilizing a utility index

Potential Extensions

- Additional support for:
  - ATDM
  - ICM
  - Multi-modal
  - Planning for operations
  - Predictive modeling