Traffic and ITS Performance Reporting System

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Illinois Tollway

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"You cannot manage what you cannot measure."

-*Bill Hewlett, Co-Founder of HP and Lord Kelvin, Physicist*

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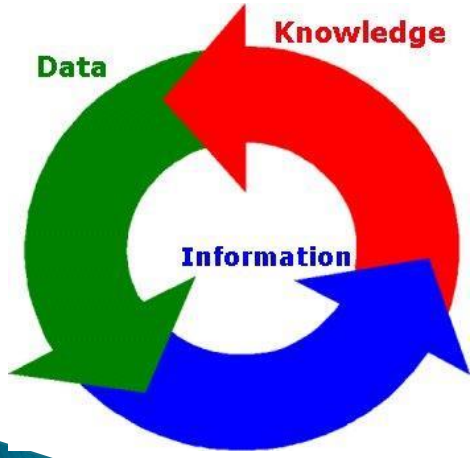
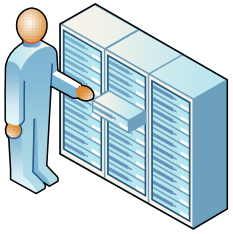
Measuring our Performance helps:

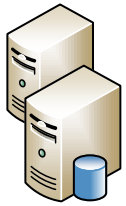
- Results-oriented management
- Demonstrating accountability
- Enhancing the decision-making process
- Justifying projects and cost/benefit analysis



TIMS SYSTEM DATA

System Management



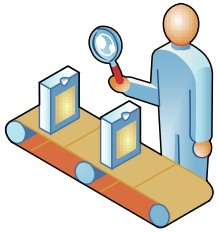


TIMS
Servers
Databases

TIMS
Application

Communications
Internal/External

ITS Assets



CCTV

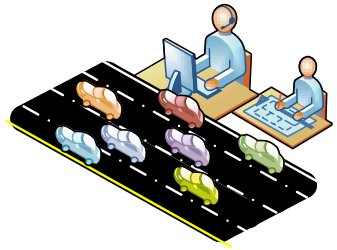
DMS

PCMS/
Contractor

Queue

Detection
Systems

Roadways



Volumes
Speed Profiles
Lane Utilization
Congestion

Travel Times

Events

Response Plans

Lane Clearance

Process for Evaluation of the Reporting Tool

- Industry review of available tools
- Review of 6 reporting tools
- Evaluation based on the following criteria:
  - Accessing archived database
  - User interface and reporting options
  - Support/Maintenance/References
  - Price

Chosen Performance Reporting Tool

- Capabilities of the tool to “drilldown”
- Customizable reports
- Level of support at a reasonable price

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How the Tollway Uses BIRST

- Monitor, report and evaluate traffic operations
- ITS field equipment inventory and status
- Monitor performance of existing and new ITS equipment
- Highlight event characteristics and locations
- Evaluate event/incident response times
- Future performance reporting

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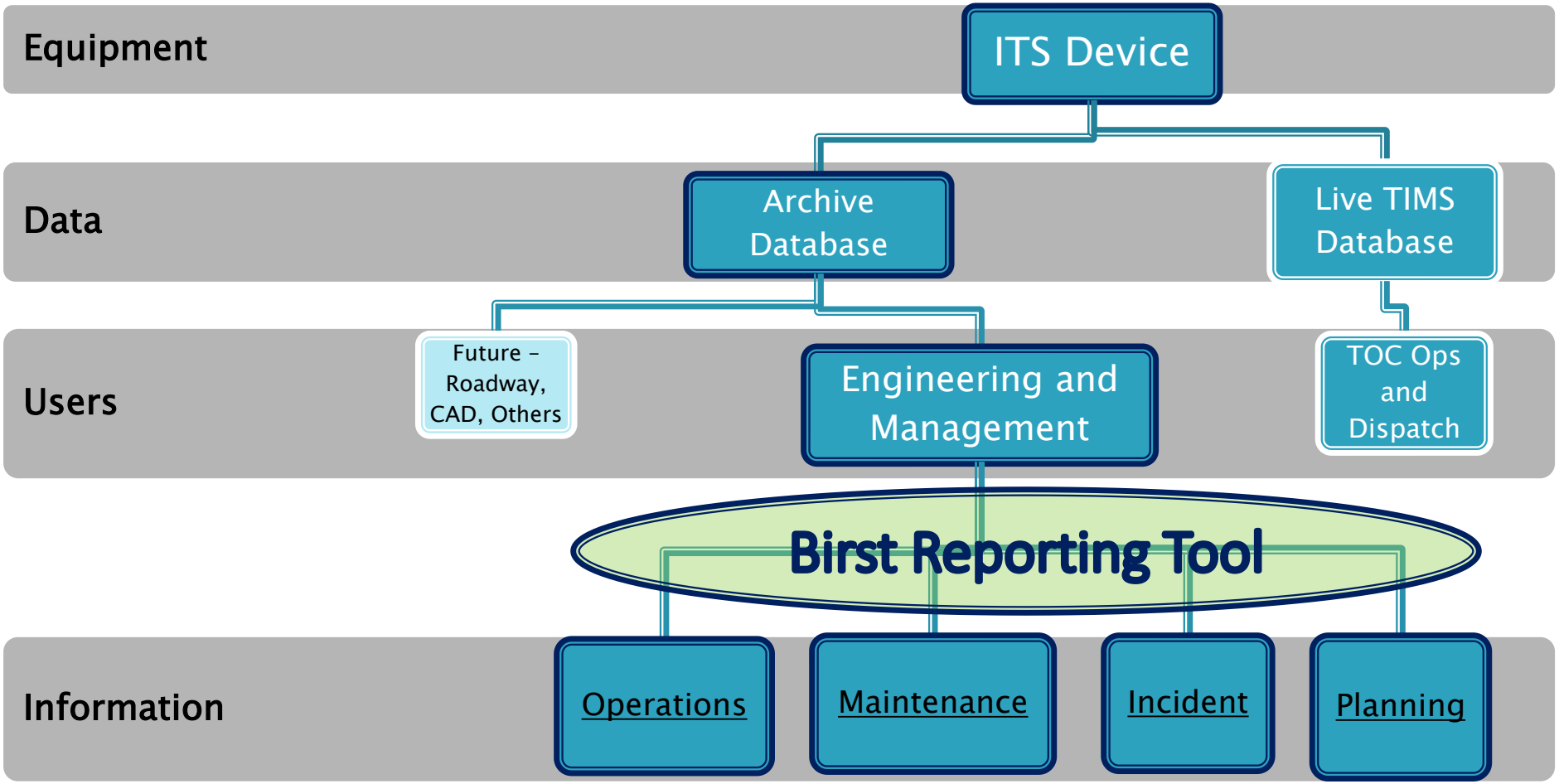
Using Information to gain Knowledge



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Information Used by Operations

- Traffic Flow and Congestion Areas
- Travel time segment comparison and evaluation
- Speed Profiles
- Smart Work Zone

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Traffic Flow/Congestion Analysis

Lane by Lane Data – Volume, Speed, Classification by time of day

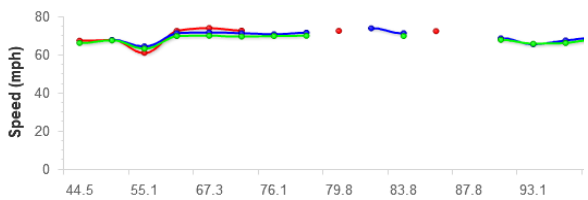
Lane by Lane VOS data

Historical Data for Station: IL088264 [47714_3] ***Route:*** I-88 ***Milepost:*** 44.5

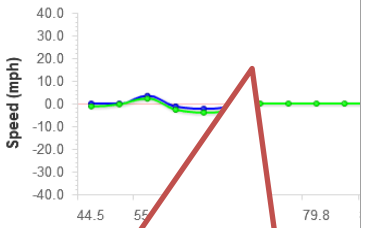
Archive Time	Lane Number	Direction	Lane Position	Lane Type	Status	Speed	Occupancy	Volume	Class 1+2+3	Class 4+5+6+7	Class 8+9+10	Class 11+12+13	Agency
5/29/14 9:59 AM	1	East	LEFT	Mainline	Detector Good	63	1.7%	3	1	0	2	0	ISTHA
[illegible]	2	East	RIGHT	Mainline	Detector Good	66	5.2%	5	1	0	1	3	ISTHA
[illegible]	[illegible]	East	LEFT	Mainline	Detector Good	61	.5%	2	2	0	0	0	ISTHA
5/29/14 9:58 AM	[illegible]	[illegible]	RIGHT	Mainline	Detector Good	68	2.0%	4	1	2	0	1	ISTHA
5/29/14 9:57 AM	1	East	LEFT	Mainline	Detector Good	61	1.1%	1	0	0	1	0	ISTHA
5/29/14 9:57 AM	2	East	RIGHT	Mainline	Detector Good	70	1.9%	4	2	0	1	1	ISTHA
5/29/14 9:56 AM	1	East	LEFT	Mainline	Detector Good	62	.3%	1	0	1	0	0	ISTHA
5/29/14 9:56 AM	2	East	RIGHT	Mainline	Detector Good	69	2.3%	2	0	0	0	2	ISTHA
5/29/14 9:55 AM	1	East	LEFT	Mainline	Detector Good	63	.7%	3	3	0	0	0	ISTHA
5/29/14 9:55 AM	2	East	RIGHT	Mainline	Detector Good	69	1.4%	2	1	0	0	1	ISTHA
5/29/14 9:54 AM	1	East	LEFT	Mainline	Detector Good	63	1.0%	4	3	1	0	0	ISTHA
5/29/14 9:54 AM	2	East	RIGHT	Mainline	Detector Good	70	3.8%	4	1	0	0	3	ISTHA
5/29/14 9:53 AM	1	East	LEFT	Mainline	Detector Good	63	3.0%	6	4	0	2	0	ISTHA
5/29/14 9:53 AM	2	East	RIGHT	Mainline	Detector Good	69	2.4%	3	1	0	0	2	ISTHA
5/29/14 9:52 AM	1	East	LEFT	Mainline	Detector Good	62	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	ISTHA
5/29/14 9:52 AM	2	East	RIGHT	Mainline	Detector Good	70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	ISTHA
5/29/14 9:51 AM	1	East	LEFT	Mainline	Detector Good	61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	ISTHA
5/29/14 9:51 AM	2	East	RIGHT	Mainline	Detector Good	72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	ISTHA
5/29/14 9:50 AM	2	East	RIGHT	Mainline	Detector Good	72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	ISTHA
5/29/14 9:49 AM	1	East	LEFT	Mainline	Detector Good	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	ISTHA
5/29/14 9:49 AM	2	East	RIGHT	Mainline	Detector Good	70	2.2%	[illegible]	[illegible]	0	0	0	2	ISTHA

1 of 6

Speed Profile - Monthly

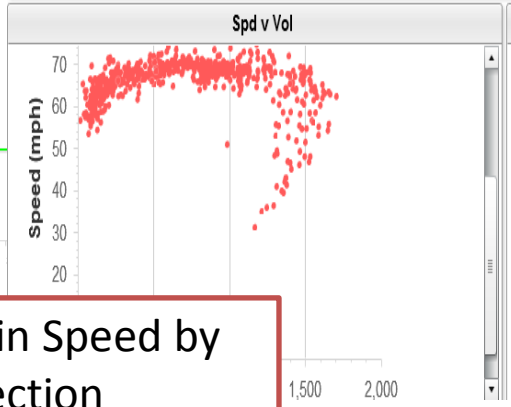


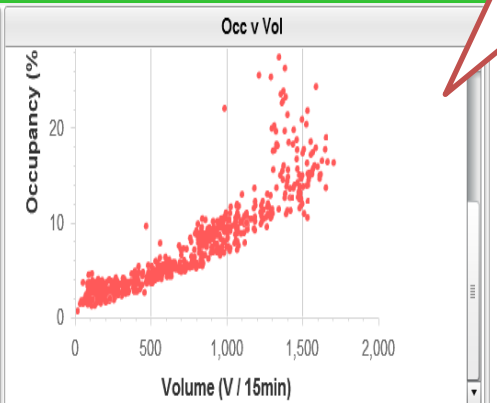
Change in Speed

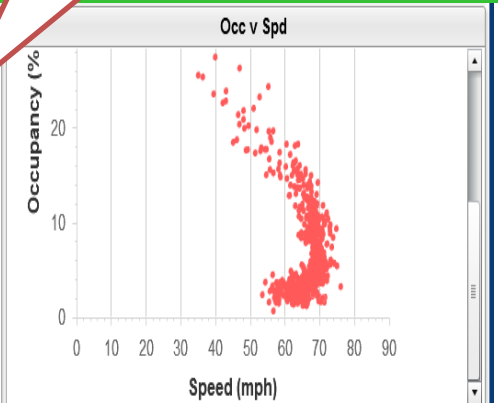


Monthly Trends in Speed by corridor and direction

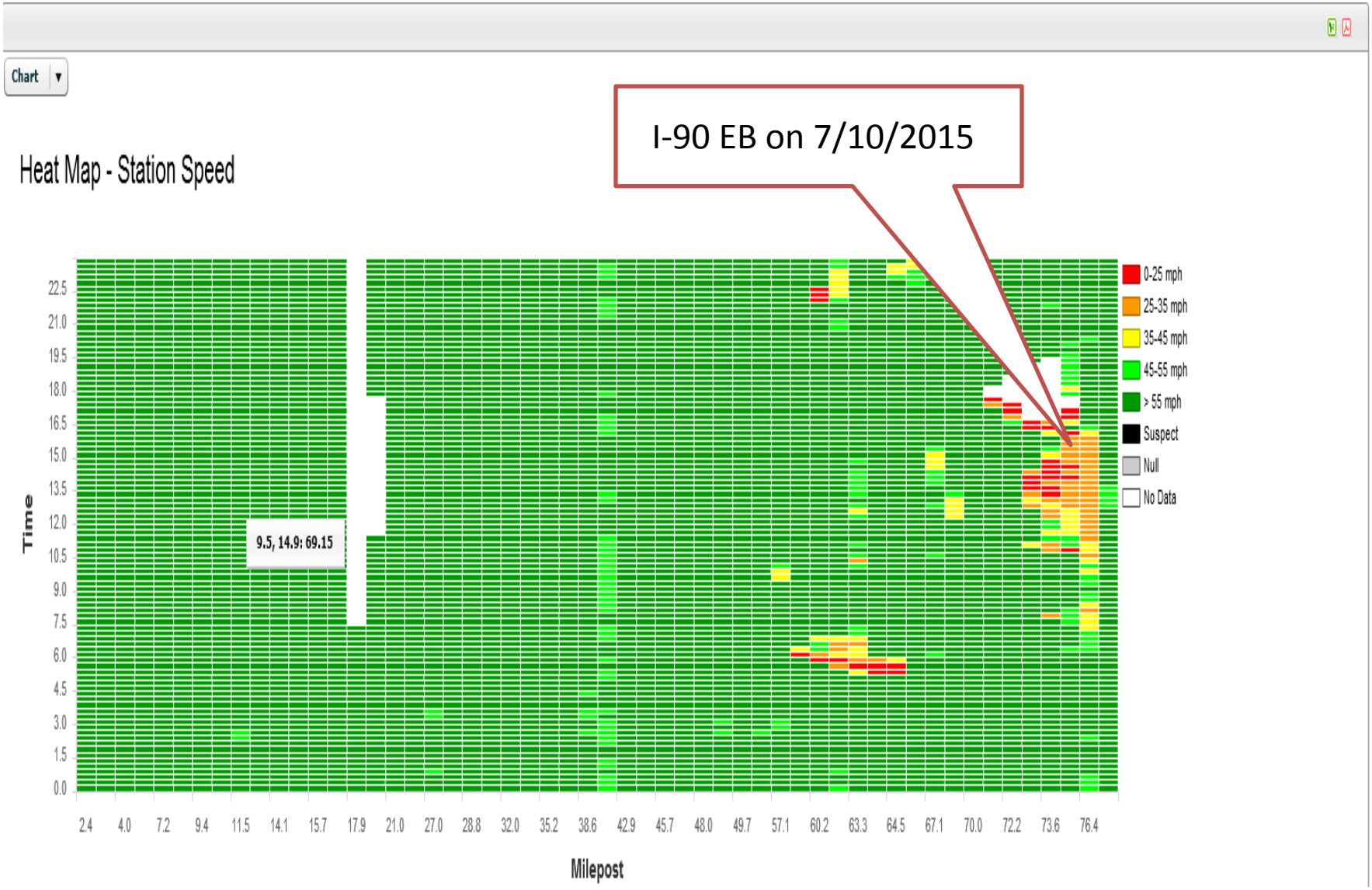
Volume-Occupancy-Speed Comparisons



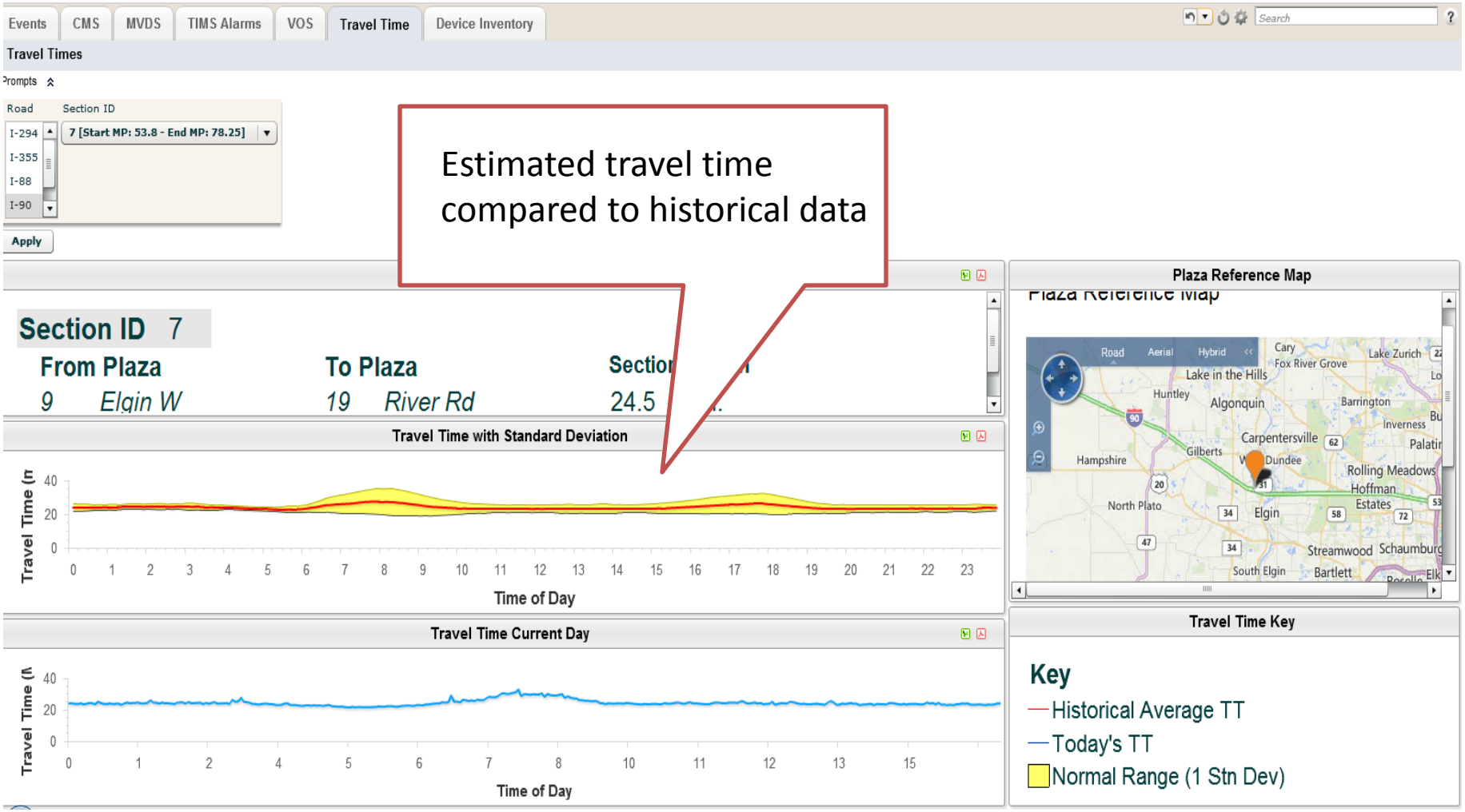




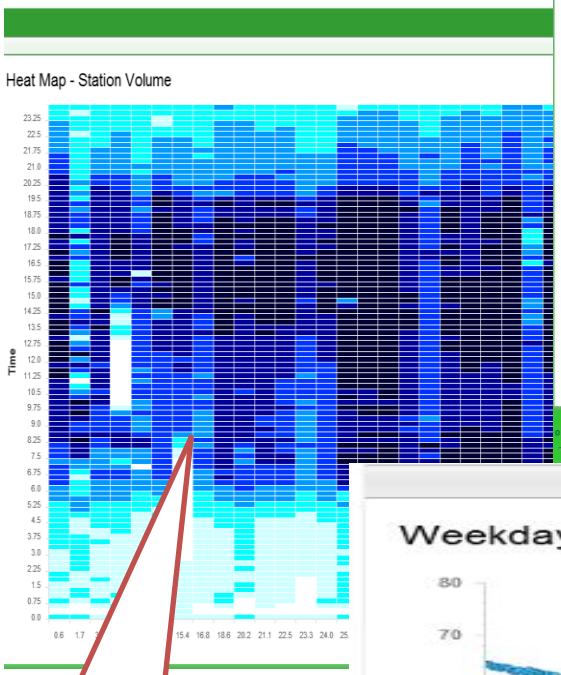
Traffic Flow/Congestion Analysis



Travel Time Segment Comparison



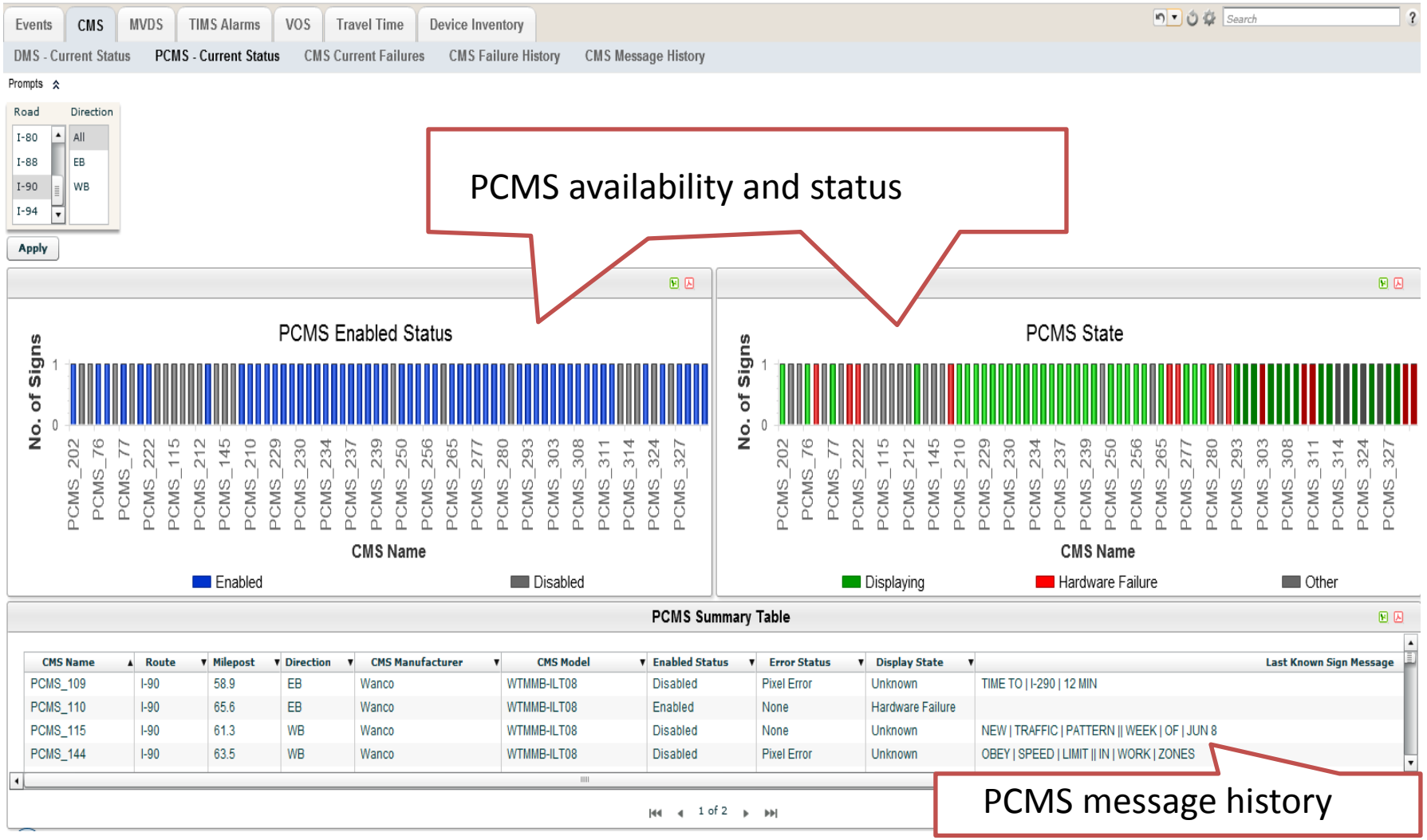
Volume/Speed Profiles



Corridor Volume over the day

-Speed by Corridor and Direction
-Compare days or months for any time period of the day

Smart Work Zone



CMS Name	Route	Milepost	Direction	CMS Manufacturer	CMS Model	Enabled Status	Error Status	Display State	Last Known Sign Message
PCMS_109	I-90	58.9	EB	Wanco	WTMMB-ILT08	Disabled	Pixel Error	Unknown	TIME TO | I-290 | 12 MIN
PCMS_110	I-90	65.6	EB	Wanco	WTMMB-ILT08	Enabled	None	Hardware Failure	
PCMS_115	I-90	61.3	WB	Wanco	WTMMB-ILT08	Disabled	None	Unknown	NEW | TRAFFIC | PATTERN || WEEK | OF | JUN 8
PCMS_144	I-90	63.5	WB	Wanco	WTMMB-ILT08	Disabled	Pixel Error	Unknown	OBEY | SPEED | LIMIT || IN | WORK | ZONES

Return to Chart

Information Used by Maintenance

- Device Inventory – total number by roadway, communication type and status
- ITS Asset Management – alarms, failures, and outages
- VDS validation and resulting changes in design and SPs

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ITS Device Inventory

Events | CMS | MVDS | TIMS Alarms | VOS | Travel Time | Device Inventory

Directory | Device Inventory - Cameras | Device Inventory - MVDS

Directory

Directory

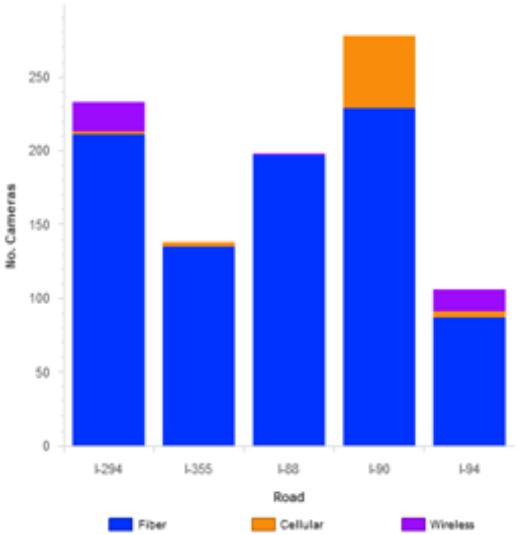
Camera Page

MVDS Page

CMS Page

Cameras

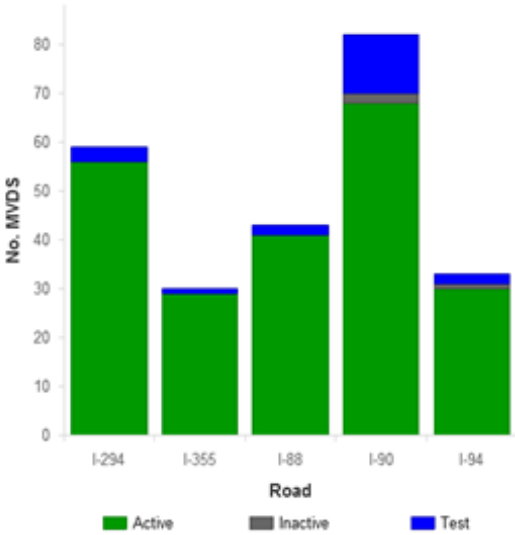
Count: **965** Active



MVDS

Count: **76** Active Wavetronix

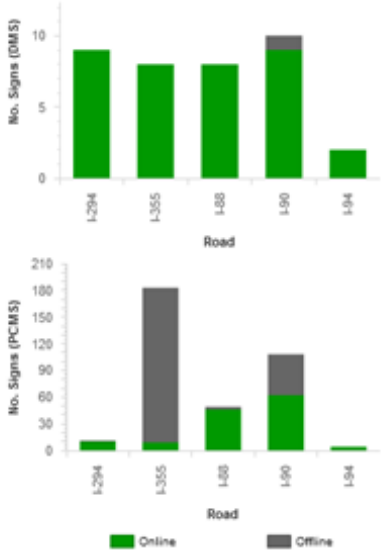
Count: **169** Active RTMS



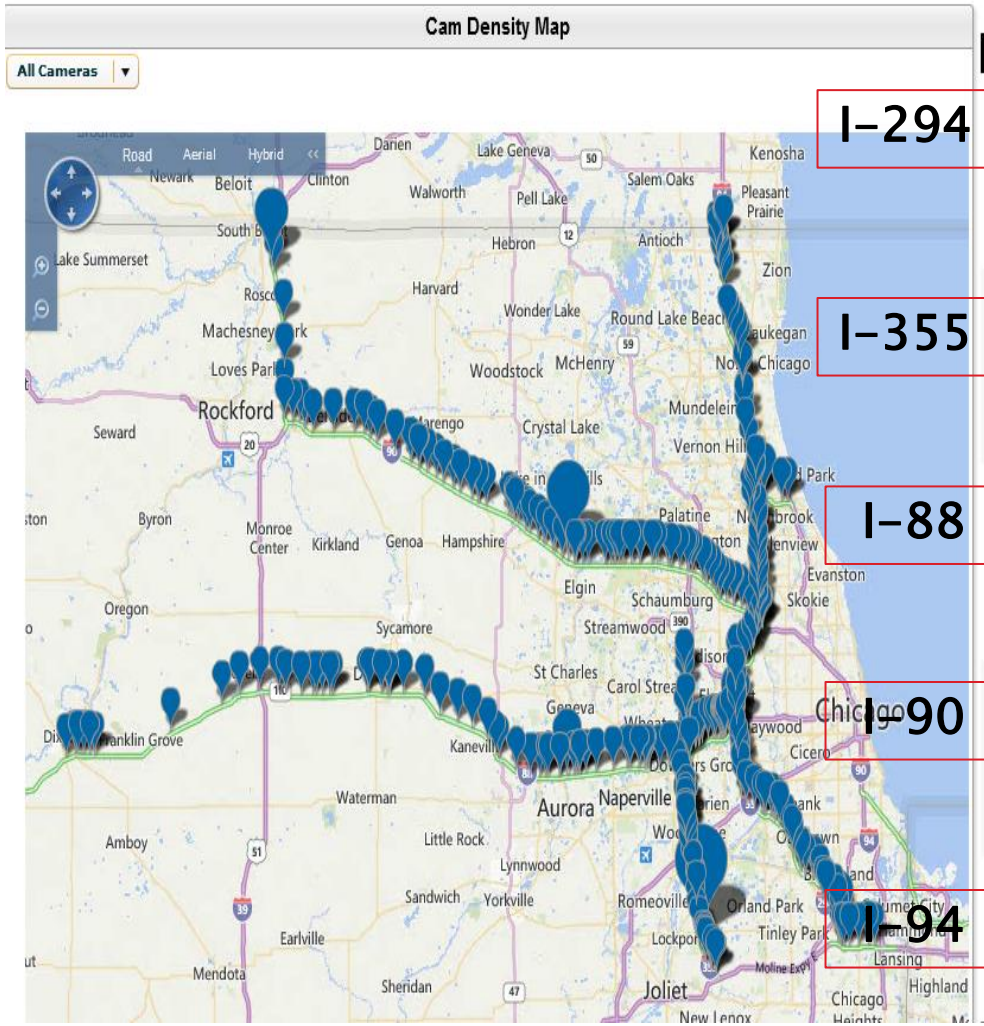
CMS

Count: **39** Active DMS

Count: **301** Active PCMS



CCTV Inventory



	Usage	Deployment	Encoder
	Road: 133 Audit: 44 Security: 56	Fiber: 211 Cellular: 2 Wireless: 20	C40: 32 C60: 51 Axis: 137 Samsung: 12 Siqura: 1
I-355	Road: 84 Audit: 21 Security: 33	Fiber: 135 Cellular: 3 Wireless: 0	C40: 55 C60: 24 Axis: 55 Samsung: 4 Siqura: 0
I-88	Road: 100 Audit: 33 Security: 57	Fiber: 197 Cellular: 0 Wireless: 1	C40: 28 C60: 27 Axis: 133 Samsung: 4 Siqura: 1
I-90	Road: 170 Audit: 48 Security: 60	Fiber: 229 Cellular: 49 Wireless: 0	C40: 10 C60: 9 Axis: 144 Samsung: 86 Siqura: 29
I-94	Road: 73 Audit: 15 Security: 18	Fiber: 87 Cellular: 4 Wireless: 15	C40: 26 C60: 11 Axis: 64 Samsung: 4

Road
Audit
Security
Unknown

Fiber
Cellular
Wireless
Other

Optelecom C40
Optelecom C60
Axis
Samsung
Siqura
Other

ITS Asset Management

MVDS | Failure Reports | VOS | Travel Time

Time | Data Feed & Device Alarms | CMS Alarms | CAD Alarms | Cong Alarms | Queue Station Alarms | VDS Alarms | Warning Flasher Alarms | Alarms Overview

Alarm Count vs. Previous Month

		< 30 Min.					> 30 Min.					> 2 Hrs.				
Alarm Category	Alarm Type	Cur Mnth to Date	Prv Mnth	Change	% Change	Indicator	Cur Mnth to Date	Prv Mnth	Change	% Change	Indicator	Cur Mnth to Date	Prv Mnth	Change	% Change	Indi
CAD	CAD Bridge	4	6	-2	-33.3%	▼	2	0	2	∞%	▲	0	0	0		
CMS	DMS Attached Device Error	13	0	13	∞%	▲	7	0	7	∞%	▲	26	13	13	100.0%	
CMS	DMS Climate-Control System Error	0	0	0			0	0				1	1	0	.0%	
CMS	DMS Co	164	85	79	92.9%	▲	120	58	62			231	108	123	113.9%	
										37.5%		4	6	-2	-33.3%	▼
													0	0		
										∞%	▲	69	1	68	6800.0%	▲
										∞%	▲	26	2	24	1200.0%	▲
												1	0	1	∞%	▲
										∞%	▲	56	2	54	2700.0%	▲
												0	0	0		

Alarm Trends –

monthly trends by type and duration

Individual Device Alarm Trends

DMS Attached Device Error – Controller Cannot Talk to Display

DMS Climate/Temperature /Humidity Errors/Alarms –Errors/Alarms associated with cabinet conditions and the supporting/climate control equipment

DMS Communications Error – Polling Error/Cannot Communicate to Controller

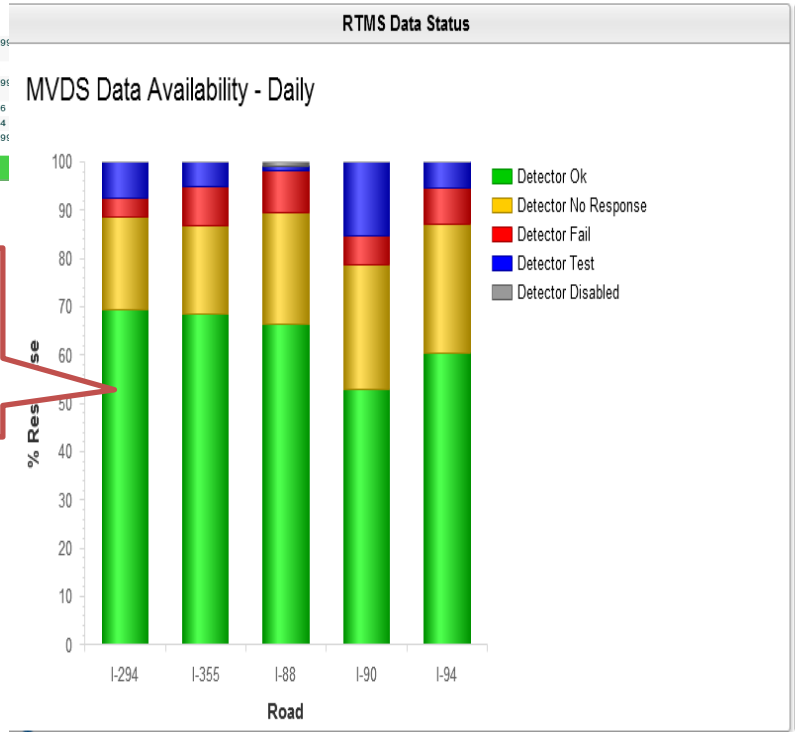
Count flags and durations checks and trends/comparisons for the various errors

ITS Asset Management

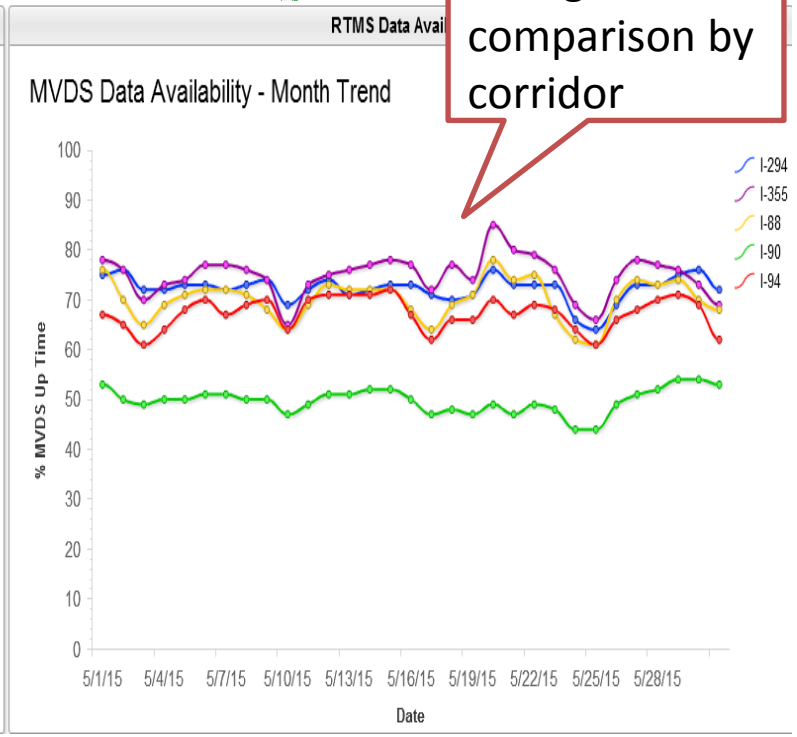
DMS Failure and Failure Reason by Corridor

DMS Summary Table

CMS Name	Route	Milepost	Direction	CMS Manufacturer	CMS Model	Enabled Status	Error Status	Display State
11	I-90	55.6	WB	Daktronics	VFC3000	Enabled	Power Error	Displaying
133	I-294	35.099						
135	I-294	26.3						
15	I-90	67.195						
151	I-88	137.6						
164	I-88	115.4						
166	I-88	73.695						



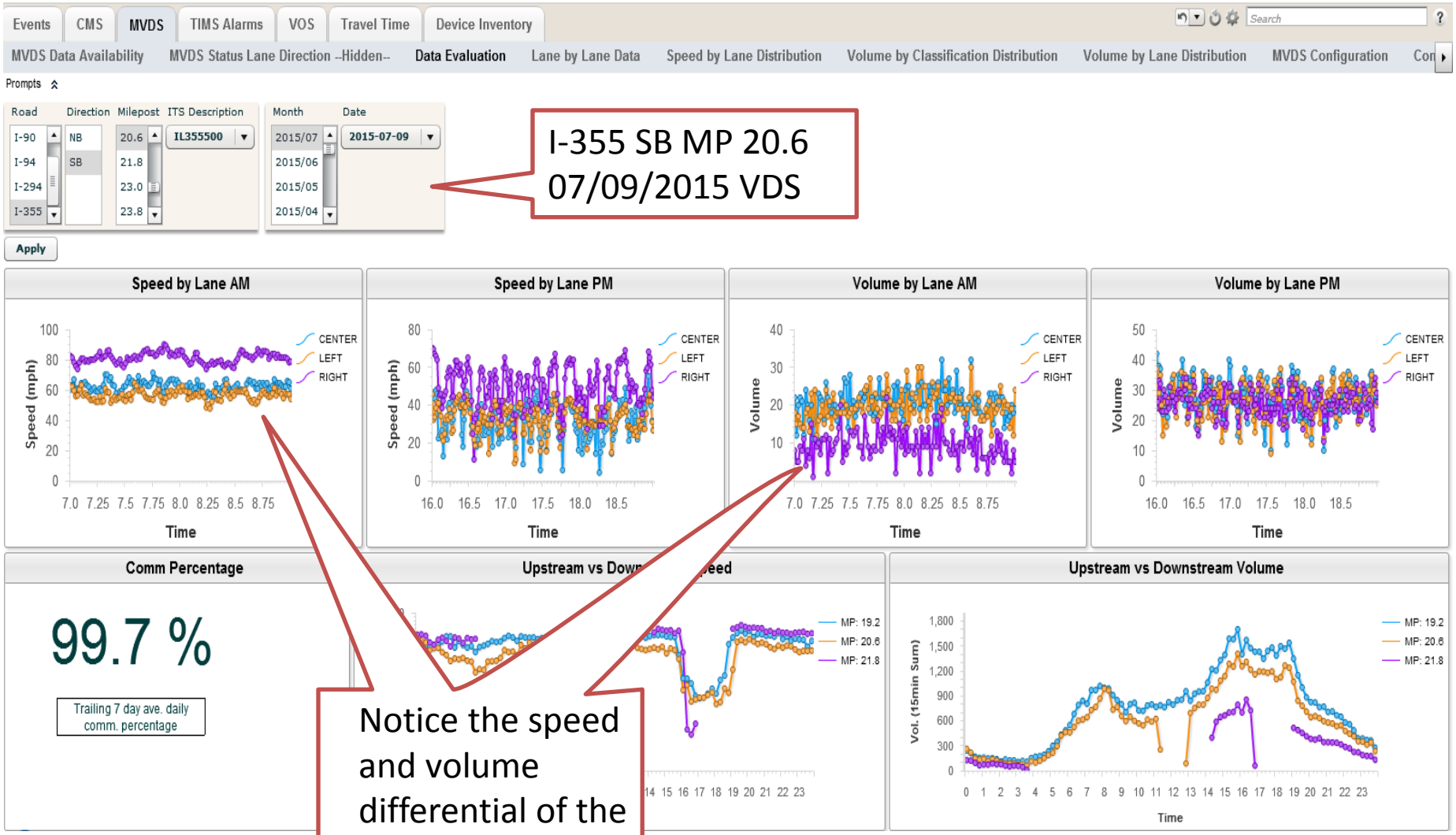
"Drill" down to specific detector



Outage comparison by corridor

VDS Validation Example

VDS Validation Example



I-355 SB MP 20.6
07/09/2015 VDS

Notice the speed and volume differential of the right lane

Return to Chart

Information Use by Incident Mgmt

- Incident response time evaluation
- Number and location of incidents
- Events by type
- Safety issues by location and type of events
- Secondary events analysis

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TIMS Event Core Analytics

Events | CMS | MVDS | TIMS Alarms | VOS | Travel Time | Device Inventory

Event Location | Event Distribution | Event Timeline

Prompts

Road	Direction
I-94	All
I-294	NB
I-355	SB

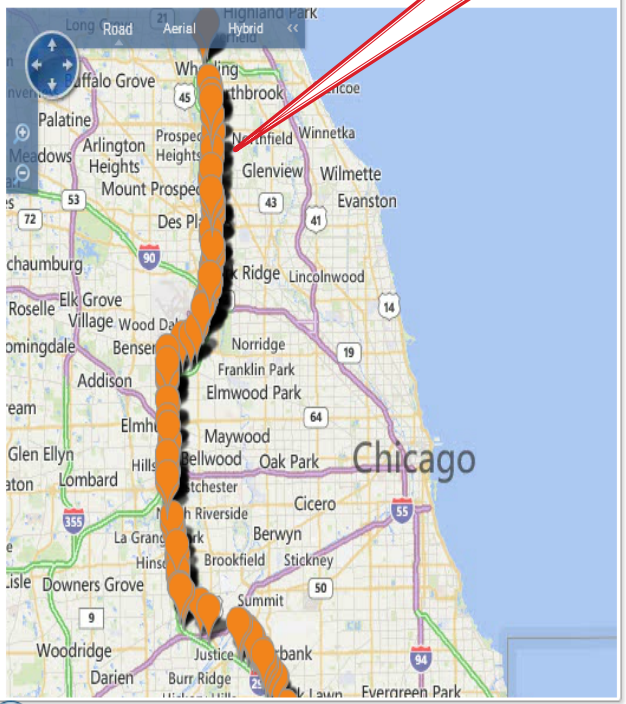
Year Month	Date
2015/07	7/10/15
2015/06	
2015/05	
2015/04	

Apply

Choose event by map

Event Info including lanes blocked

Events Concentration Map

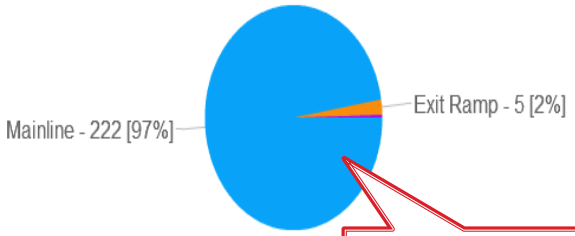


Event Info Table

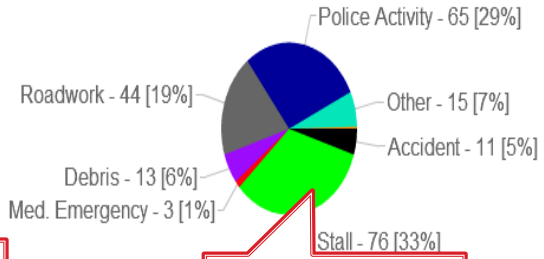
Lane Blocking

Event ID	Road	Dir.	MP	Event Type	Impact	Lane Type	Date/Time	Lane B	RP Actv	To VOS
1427594	I-294	SB	34.3	Roadwork	Low	Mainline	7/10/15 2:02 PM			To VOS
1427590	I-294	NB	33.0	Roadwork	Low	Mainline	7/10/15 2:02 PM			To VOS
1427591	I-294	NB	33.0	Roadwork	Low	Mainline	7/10/15 2:02 PM			To VOS
1427530	I-294	SB	36.5	Roadwork	Low	Mainline	7/10/15 2:00 PM			To VOS
1427540	I-294	NB	52.8	Roadwork	Low	Mainline	7/10/15 2:01 PM			To VOS
1427522	I-294	SB	11.1	Roadwork	Low	Mainline	7/10/15 2:00 PM			To VOS
1427533	I-294	SB	25.2	Roadwork	Low	Mainline	7/10/15 2:00 PM			To VOS

Event Lane Location



Event Type

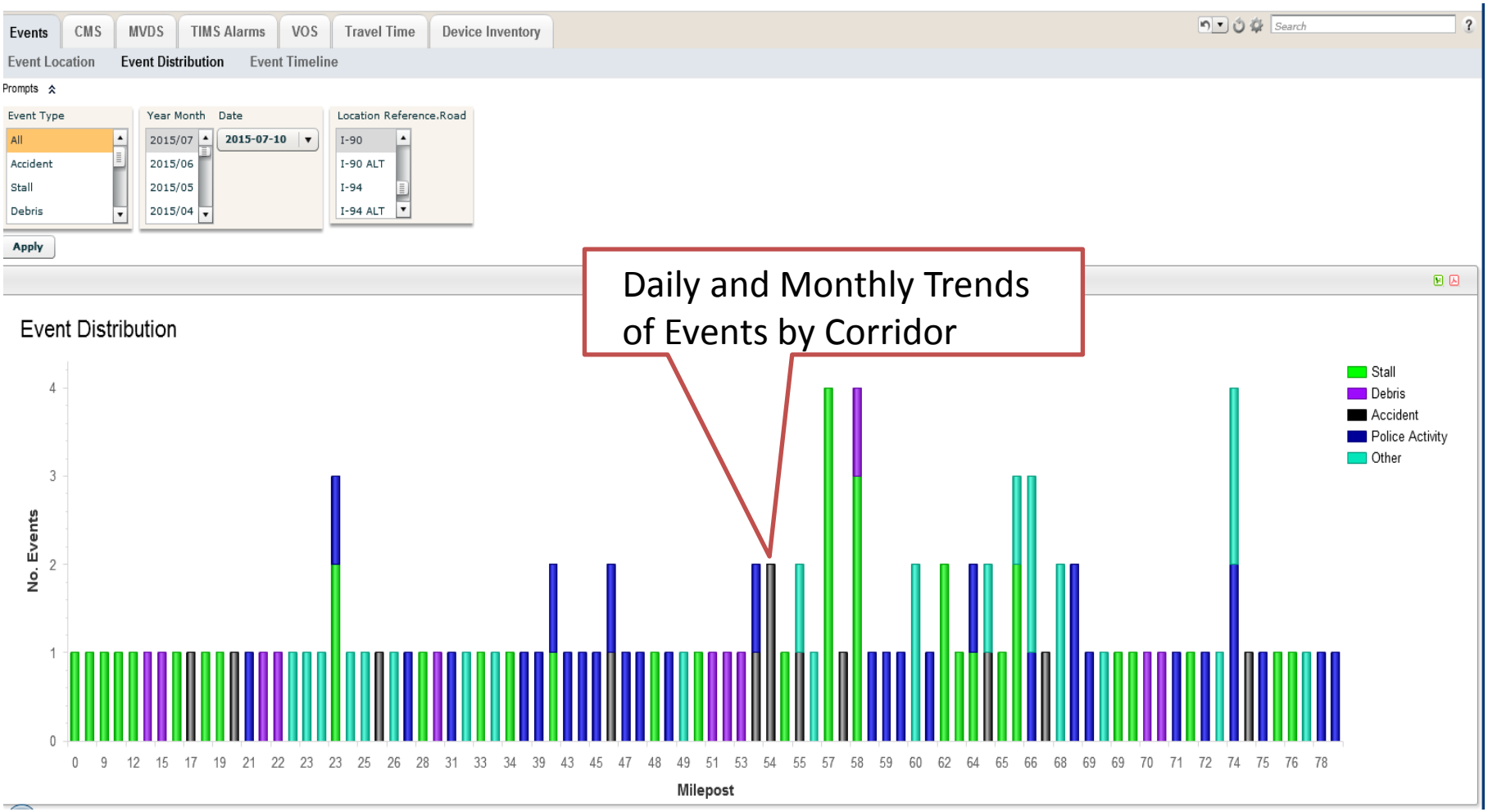


Events by Lane Type

Events by Type

Speed Heat Map Associated to Event

Identify “Hot Spots” of Events



Event Evaluation Example

Event Info Table

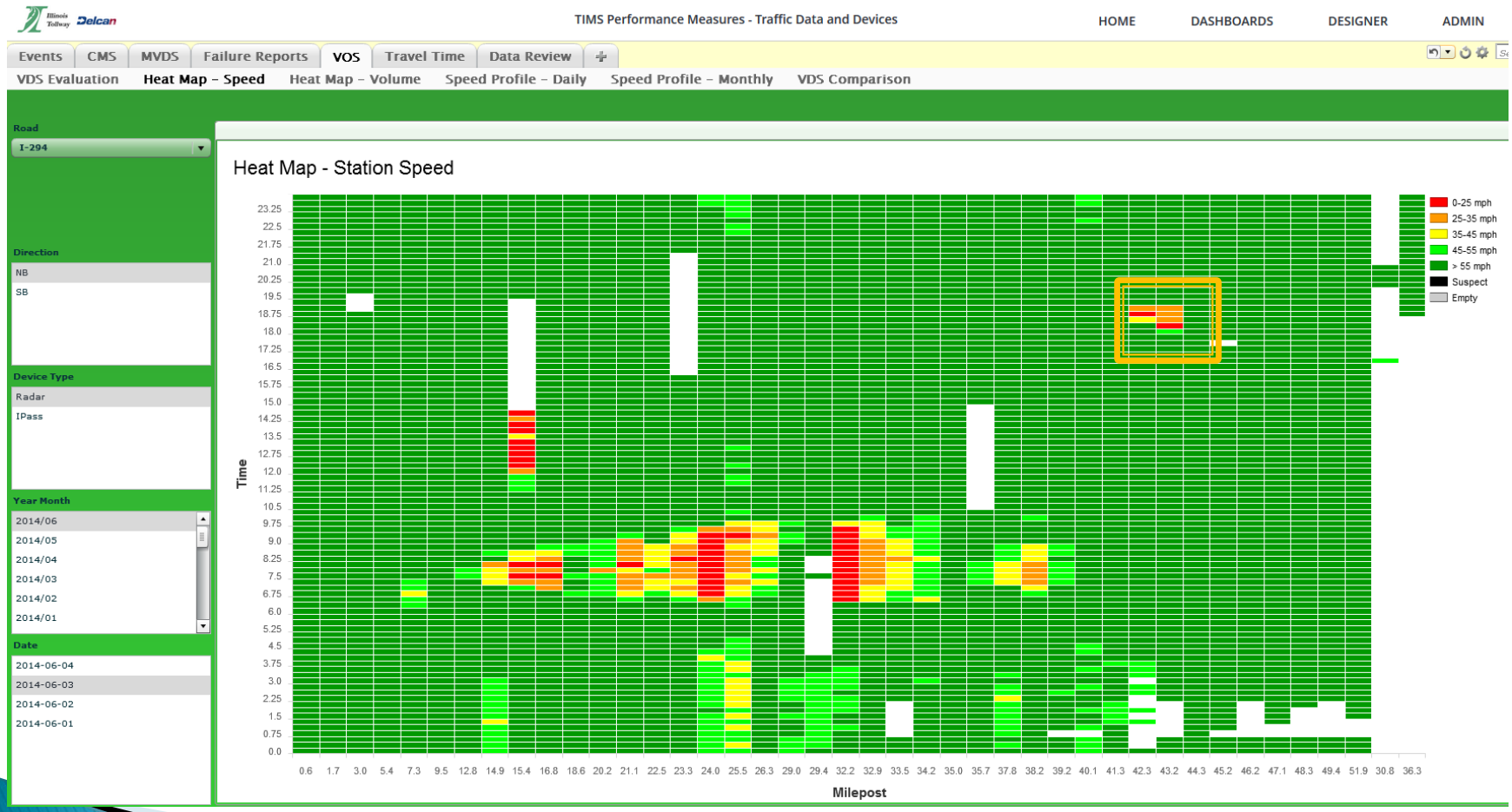
Lane Blocking

Event ID	Road	Dir.	MP	Event Type	Impact	Lane Type	Date/Time	Lane Blk'	RP Actv	To VOS
1185938	I-294	NB	43.8	Accident	Low	Mainline	6/3/14 5:53 PM			To VOS
1185[illegible]6	I-294	SB	40.8	Accident	Low	Mainline	6/3/14 7:53 AM			To VOS
1185506	I-294	SB	40.5	Accident	Low	Mainline	6/3/14 7:53 AM			To VOS

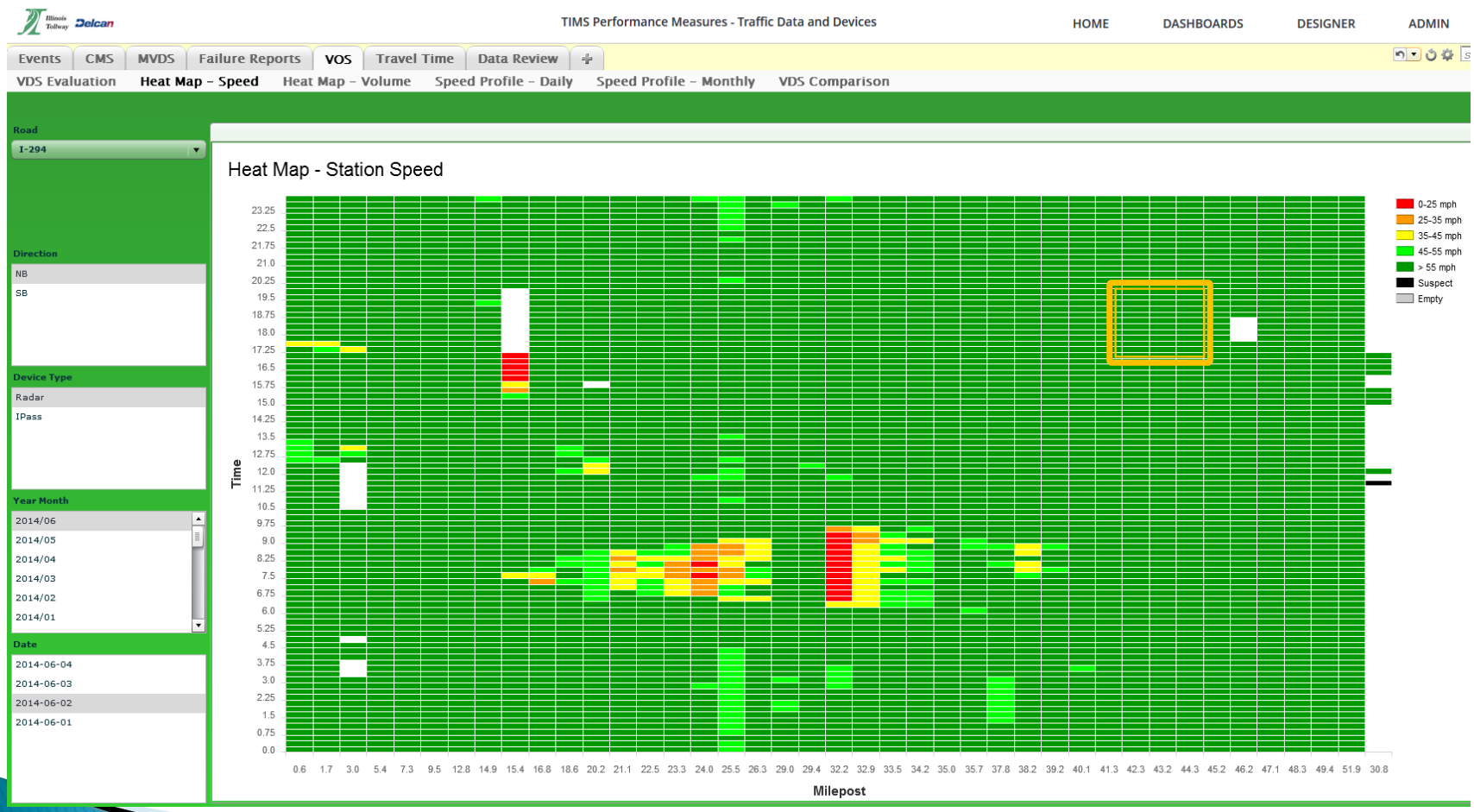
Isolate by Event ID: 1185983 –Goal to evaluate the event's impact on speed

Filter for lane-blocking incidents on I-294 on 6/3/14

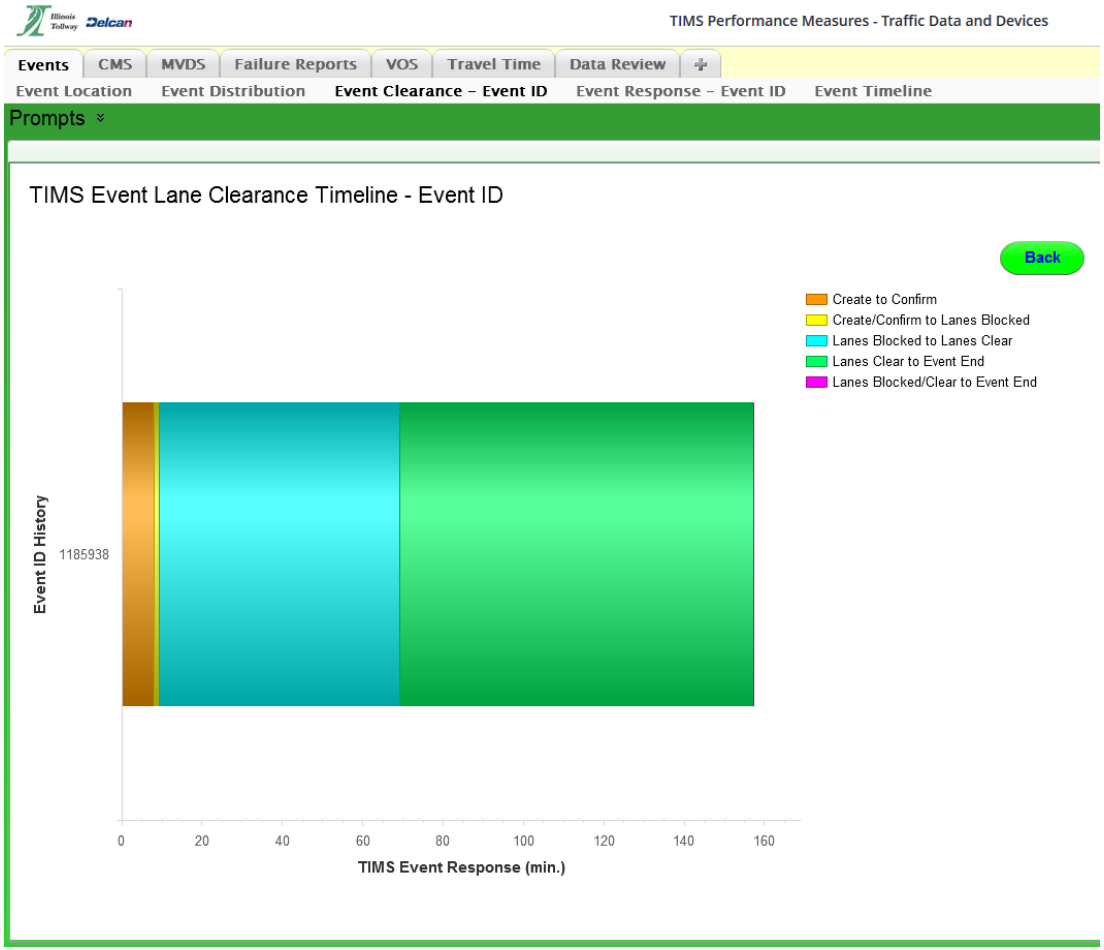
Event Evaluation Example



Event Evaluation Example



Event Evaluation Example



Return to Chart

Information Used by Planning

- Volume/Speed Profiles
- Lane Use Characteristics
- Vehicle Classification

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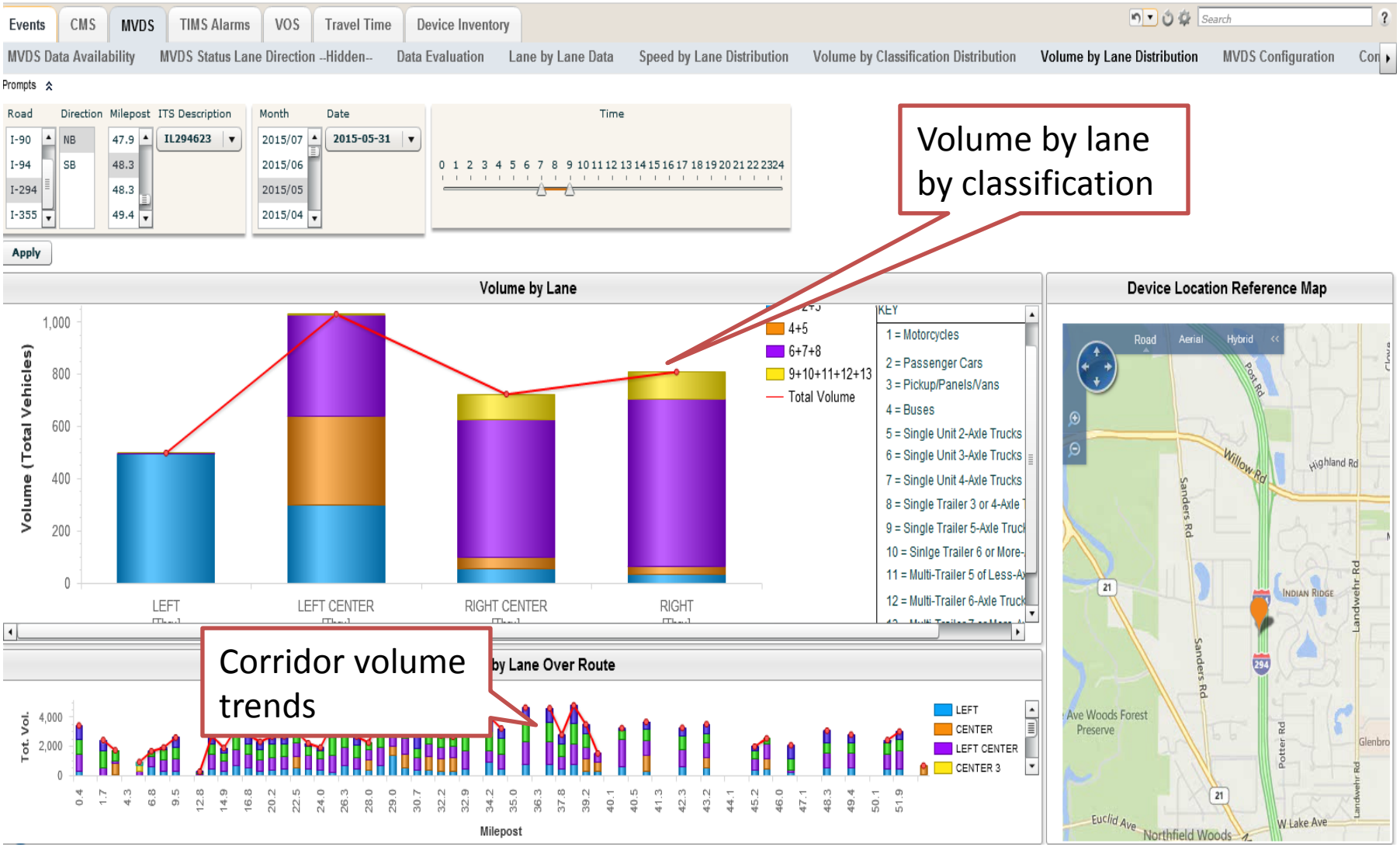
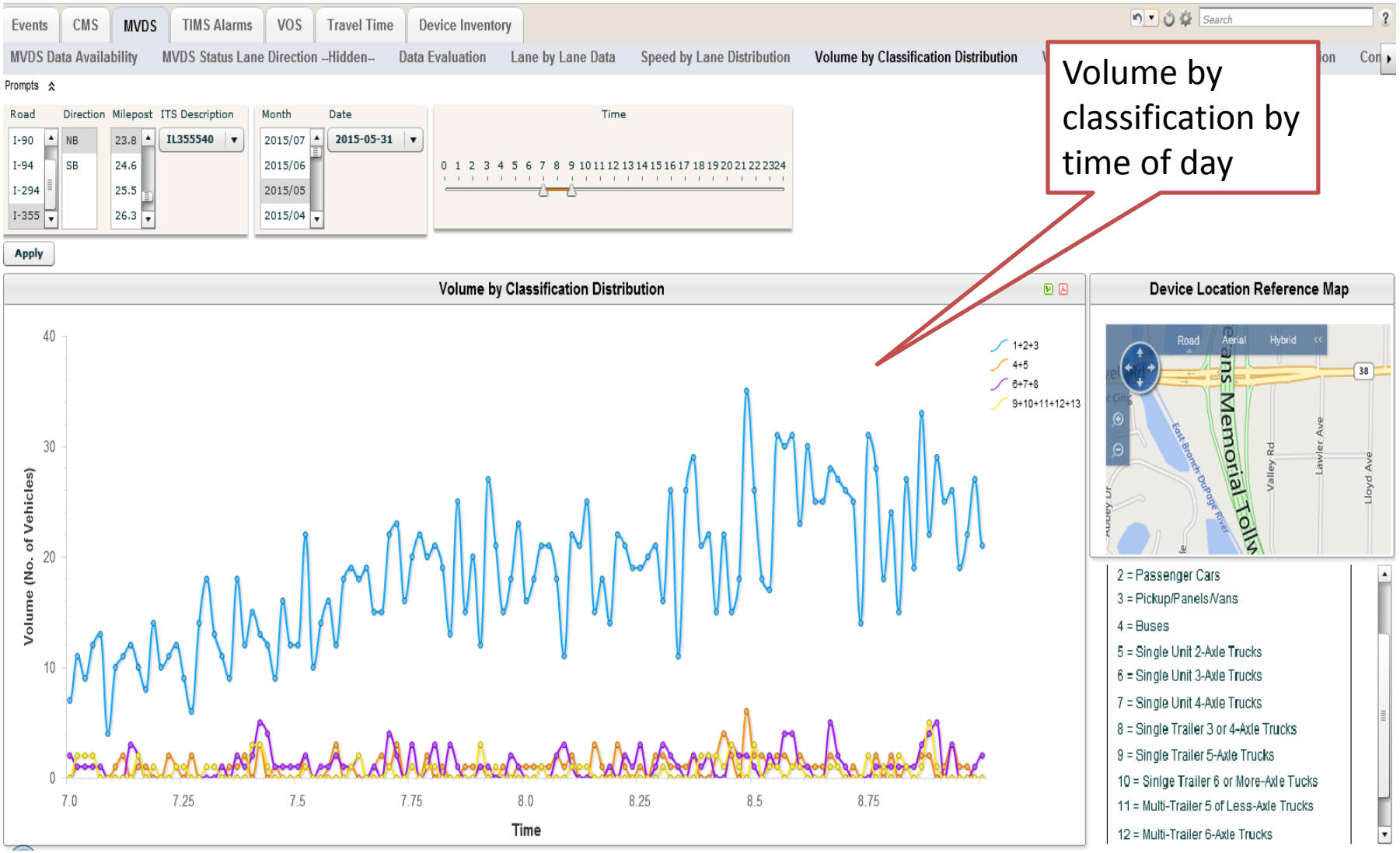
Volume Lane Use Characteristics



Vehicle Classification



Volume by classification by time of day

Future Performance Information

- Weather integration
- AVL integration
- Lane performance/capacity analysis/system operational reliability
- Integration with ITS maintenance/repair tool
- Estimated travel time data archived
- Birst can be tied with other Tollway databases with relevant data (e.g., CAD, GIS, etc.)

Illinois Tollway

Contact:

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