GUIDANCE FOR IMPLEMENTATION OF TIM PERFORMANCE MEASUREMENT

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Overview of Presentation

- Project background
- Research approach
- Research products
- Overview of guidance
- Demonstration of online TIM PM tool

Project Background

- Information came out of NCHRP 07-20 (completed in November 2014)
- TRB NCHRP 07-20 research team
  - Project panel
  - Applied Engineering Management Corporation (AEM)
  - Texas A&M Transportation Institute (TTI)
- Objectives
  - Develop concise guidance on the implementation of TIM performance measurement that is applicable to a broad spectrum of transportation and incident responding agencies.
  - Develop a model database (including schema) for the data elements and performance measures suitable for eventual aggregation of performance measures at a state and national level.

Research Approach

- Conduct a review of existing literature on TIM and TIM performance measurement.
- Conduct telephone interviews with TIM agencies/practitioners to identify best practices in TIM performance measurement.
- Compile information into guidance document.

Research Products

- Written guidance document
  - TRB formatted version downloadable or for purchase from TRB's website (available early 2015)
  - Version submitted to TRB in November 2014 (currently available via download from TIM PM website – see below)
- Online guidance – TIM PM tool
  - Accessible via the TIM Network website:
    - timnetwork.org - click "Performance Measures" tab on menu bar
  - More user friendly
  - Allows for questions and comments to create a dialogue regarding TIM performance measurement

GUIDANCE FOR IMPLEMENTATION OF TRAFFIC INCIDENT MANAGEMENT PERFORMANCE MEASUREMENT

Overview of Guidance

- General guidance on TIM performance measurement
- Model TIM performance measurement database

General Guidance on TIM Performance Measurement – Content Overview

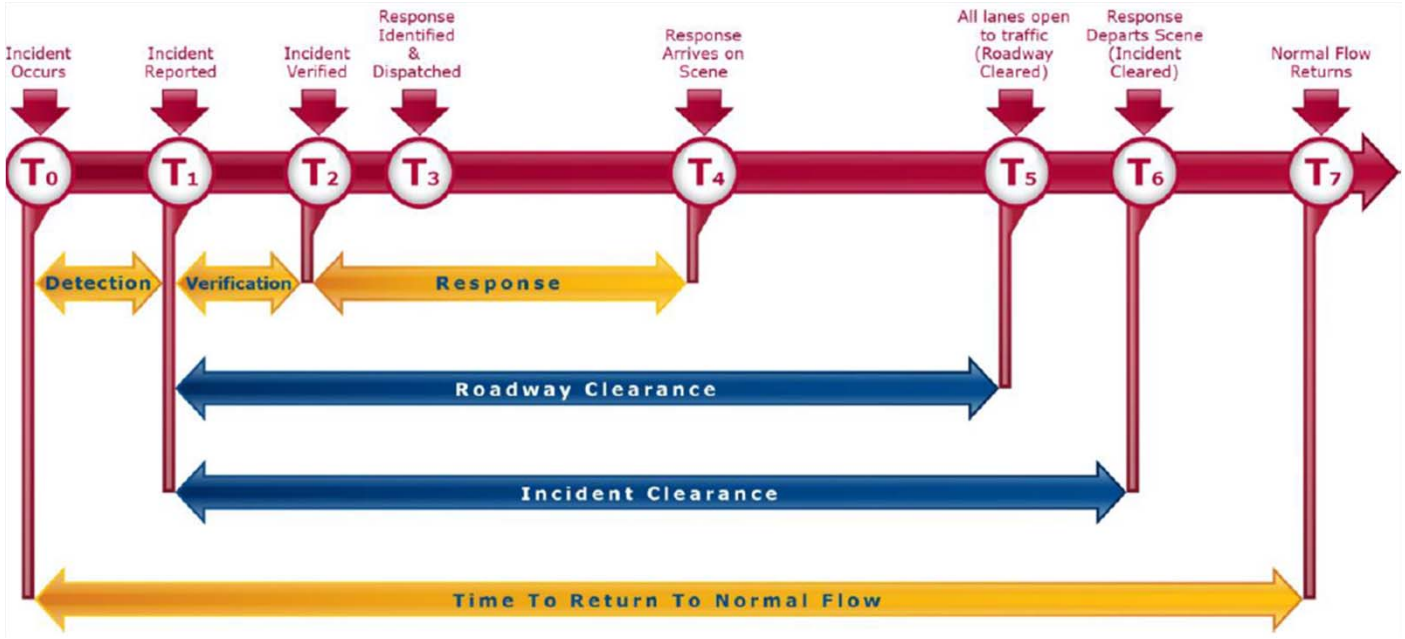
- TIM performance measures
- Sources of TIM performance data
- Challenges with TIM data
- Data mining, reporting, and visualization
- Summary of interviews with 8 agencies
- Key points for success

TIM Performance Measures

- TIM performance measures and definitions
- How to calculate the performance measures
- Putting TIM performance into context (analysis by factors such as incident severity, etc.)
- Current practices in the use of TIM performance measures

Incident Timeline

Guidance presents and explains the incident timeline and the associated time-based TIM performance measures.



TIM PM Definitions and Calculations

Guidance provides definitions and calculations for the time-based TIM performance measures.

Measure	Calculation	Definition
Detection Time	$T_1 - T_0$	Time between the incident occurring and the incident being reported. Detection time is not typically reported due the fact that the actual time the incident occurred is often unknown.
Verification Time	$T_2 - T_1$	Time between incident being reported and the incident being verified. TMCs can typically assist with verification through use of their CCTV cameras
Response Time	$T_4 - T_2$	Time between the incident being verified and the first responder arriving on scene. Law enforcement may not always be the first party to arrive on scene.
Roadway Clearance Time (RCT)	$T_5 - T_1$	Time between the first recordable awareness of the incident by a responsible agency and the first confirmation that all lanes are available for traffic flow.
Incident Clearance Time (ICT)	$T_6 - T_1$	Time between the first recordable awareness of the incident by a responsible agency and the time at which the last responder has left the scene.
Time to Return to Normal Flow	$T_7 - T_0$	Time between the incident occurring and the traffic has returned to normal flow after all clearance activities are complete.

3 National TIM Performance Measures and Current Practices

Guidance provides definitions and current practices regarding the 3 national TIM performance measures.

Roadway Clearance Time

- Nearly 90% of areas collecting this metric do so consistent with the FHWA definition.
- Read additional detail

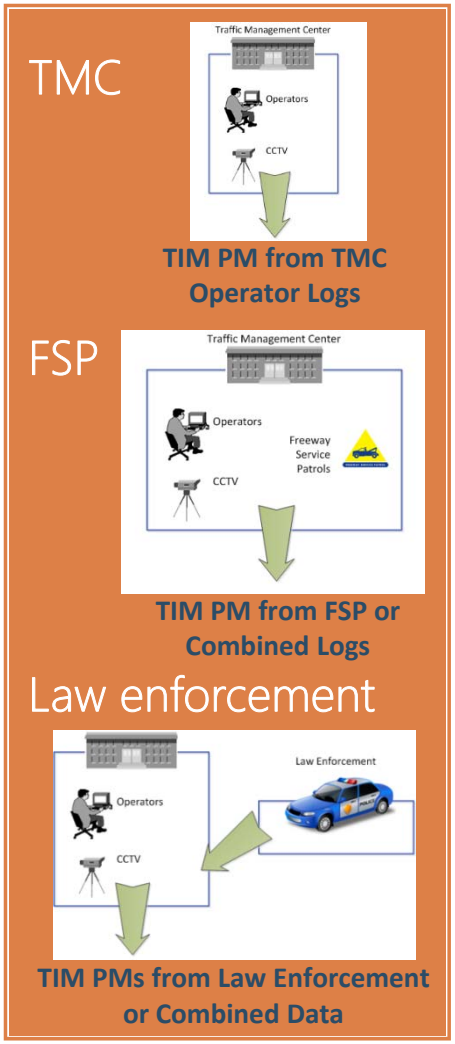
Incident Clearance Time

- Nearly 75% of areas collecting this metric do so consistent with the FHWA definition.
- Read additional detail

Secondary Incidents

- FHWA estimates that approximately 20 percent of all incidents are secondary.
- Read additional detail

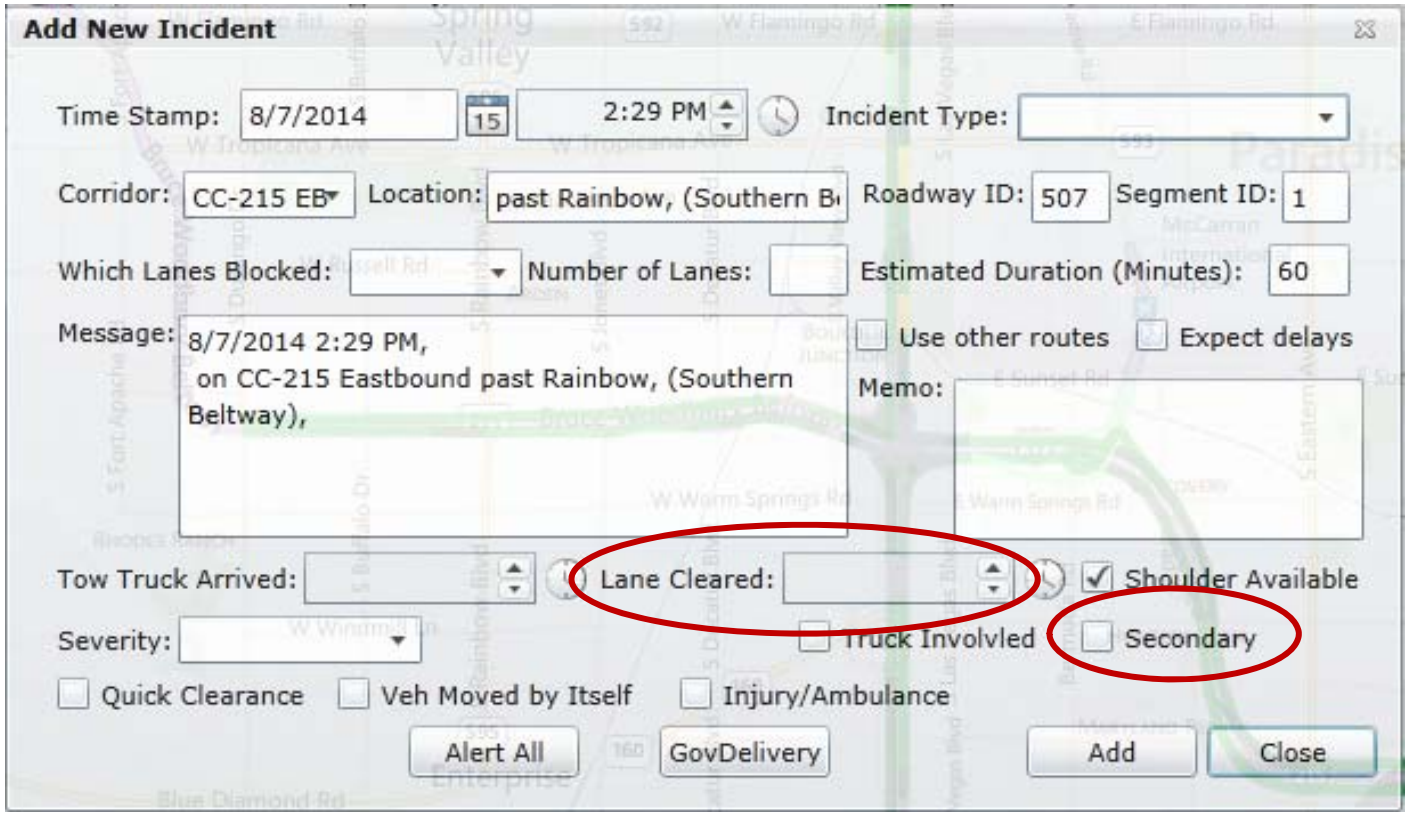
Data Sources for TIM PMs



- Guidance discussions challenges with TIM data
  - Inconsistent definitions
  - Data sharing, exchange, and integration
  - Data availability and quality
- Guidance presents example practices:
  - Illinois Division of Highways Emergency Traffic Patrol Assist Report
  - Freeway and Arterial System of Transportation (FAST) incident input screen
  - Florida Highway Patrol electronic crash form
  - Use of Traffic and Criminal Software (TraCS) in Arizona
  - Virginia DOT TOC integration with Virginia State Police

FAST Incident Input Screen

Collecting data for 2 of the national TIM performance measures.



Florida Highway Patrol Electronic Crash Form

Collecting data for all 3 national TIM performance measures.

Vehicles | CMV | Hit & Run | Motorists | Non-Motorists | Witnesses | Other Persons | Injured | Fatalities | Violations | Businesses | Drugs/Medication/Alcohol Driver(s) NonMotorist(s) | Crash Severity

General | Vehicles | Persons | Businesses | Narratives | Diagrams | Non-Vehicle Property Damage

Crash Identifiers & Roadway | Crash Information | Violations | Pictures | Attachments | Approval

Form Type | County: DUVAL | CAD Lookup | City: JACKSONVILLE | Crash in City Limits | Agency Case No | Agency CAD No

Crash Date/Time | Reported to Agency Date/Time | Dispatched Date/Time | On Scene Date/Time | Roadway Blocked by Crash | Roadway Cleared Date/Time

Cleared Scene Date/Time | Report Date/Time: 02/16/2012 03:07 PM | Investigation Complete Date/Time | Reason Investigation not Complete

Source of Information: LAW ENFORCEMENT AGENCY | Law Enforcement Source ORI | Crash Sequence Order: SECONDARY

Latitude: N 30 17.8374 | GPS | Edit | Roadway Description for Location of Occurrence

Longitude: W 81 46.1422 | Map | Clear | Intersecting Roadway Description for Location of Occurrence | and if applicable | Distance to Crash Location | Direction

Enter MM first if Intersecting Description is Mile Marker

Functional Class Type: TYPE | Functional Class Detail

Type of Shoulder

Flag for FDOT

Data Mining, Reporting, and Visualization Example Practices

- Florida DOT District 4
  - Weekly Incident Duration Report
  - Real-time display of TIM PMs
- Virginia DOT
  - Dashboard
  - Hampton Roads Quarterly Report
- FAST – archived CCTV incident snap shots
- University of Maryland Center for Advanced Transportation Technology (UMD CATT)
  - Incident timeline
  - Impact of incident – heat map

FDOT D4 Weekly Incident Duration Report

Performance measures summary, including RCT and ICT for current week, previous week, and 52-week average.

Average open roads duration.

Weekly Incident Duration

Performance Measures Report

Includes All Responders

District 4

Reporting from Sep 8, 2013 to Sep 14, 2013

Created on: September 16, 2013 9:57 am

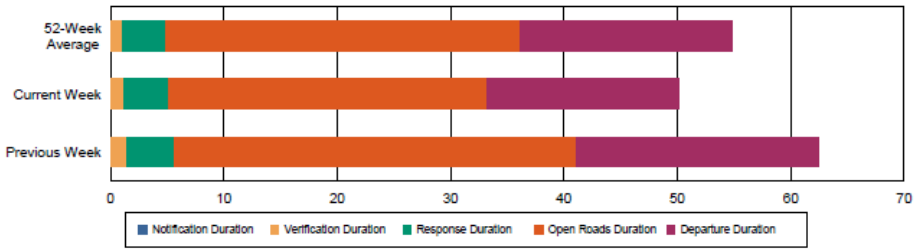
Report Template version 2.2

Performance Measures Summary

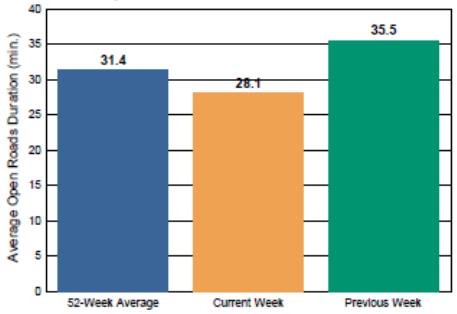
	52-Week Average	Current Week	Previous Week
Events included in Performance Measures	86	114	89
A. Notification Duration (min.)*	0.0	0.0	0.0
B. Verification Duration (min.)	1.1	1.2	1.4
C. Response Duration (min.)	3.8	4.0	4.2
D. Open Roads Duration (min.)	31.4	28.1	35.5
E. Departure Duration (min.)	18.6	17.0	21.4
Roadway Clearance Duration (min.)	**36.2**	**33.2**	**41.1**
Incident Clearance Duration (min.)	**54.8**	**50.2**	**62.5**

*FHP Data is not available for Notification Duration

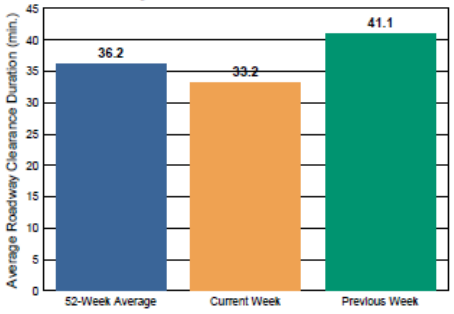
Incident Duration Summary



Open Roads Duration / Week



Roadway Clearance Duration / Week



FDOT D4 Real-Time Display of TIM PMs

Current district wide average RCT.

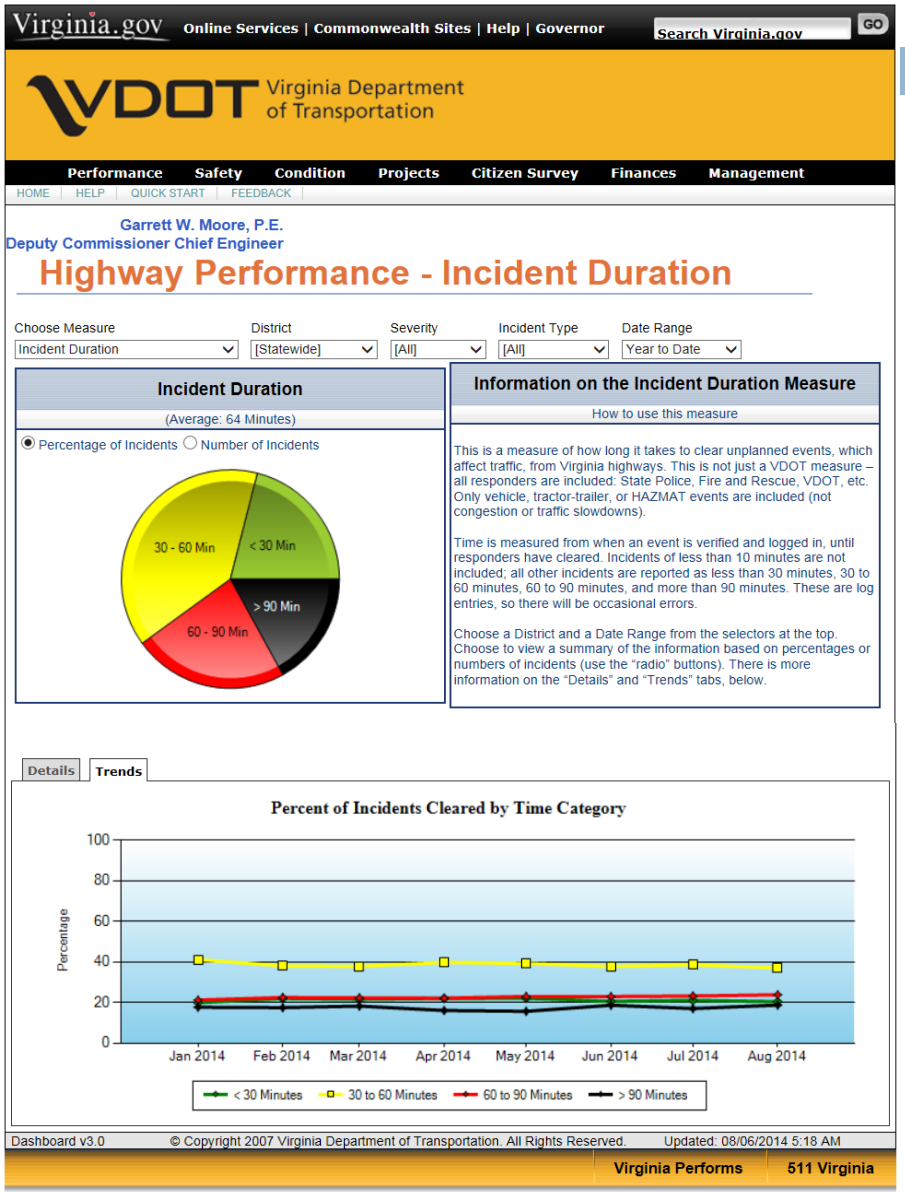
Compare current RCT to RCT at the same time the previous year.

Track status in each county (number of current minor, intermediate, and major incidents; average RCT for each type of incident).

VDOT Dashboard

Percentage/ number of incidents by incident duration.

Searchable by district, incident severity, incident type, and date.

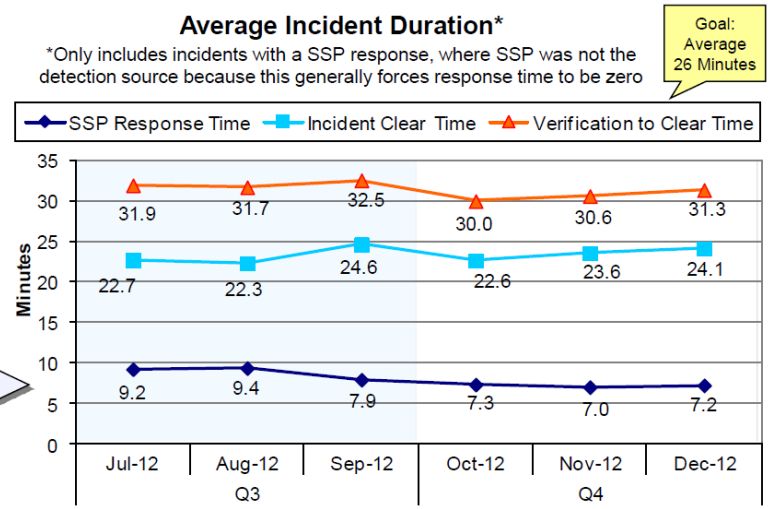


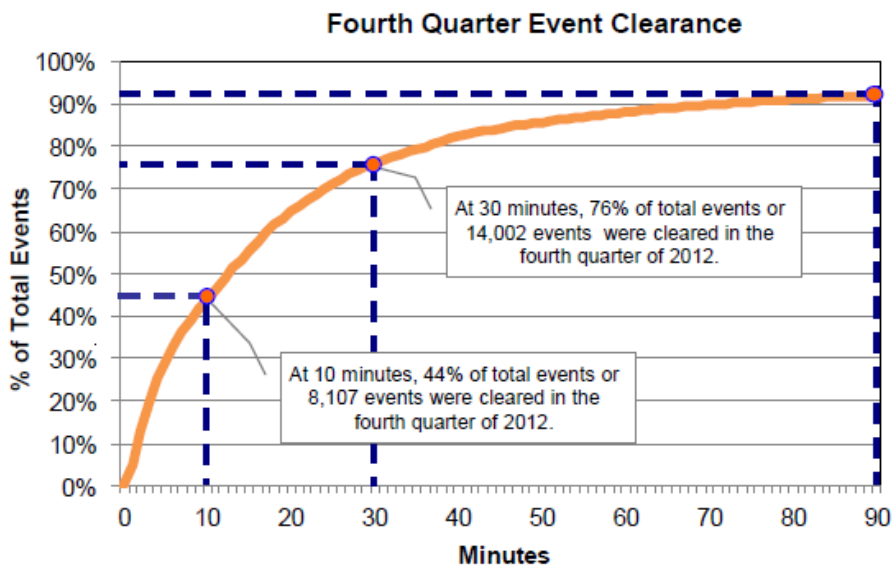
VDOT Hampton Roads Quarterly Report

Average SSP response time, clearance time, and verification to clear. →

Cumulative distribution curve showing percentage of incidents cleared within different times. →

This line graph shows the average SSP Response time - duration from the time an incident is verified to when a SSP truck arrives on scene; the average Incident Clear Time - duration from SSP arrival until the incident is cleared or the SSP is relieved by an outside agency; and the total amount of time from initial verification to clearance for Q3 and Q4 2012.
In Q4 the average SSP response time decreased by over a minute and incident clear time remained constant, causing the average incident duration to decrease from 32 minutes in Q3 to 31 minutes in Q4.





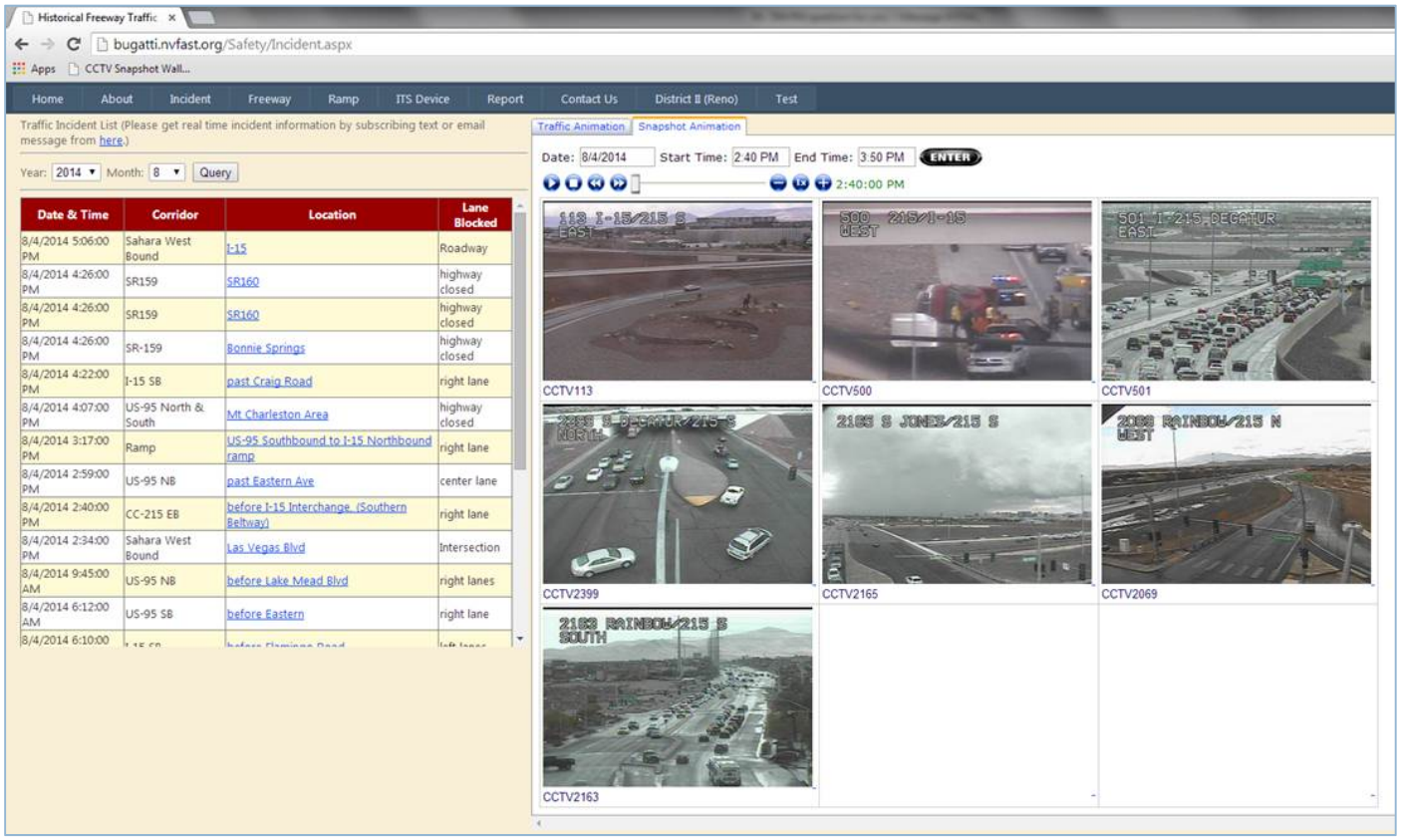
Of the 18,424 events logged by the Hampton Roads Transportation Operations Center in the fourth quarter of 2012, 92% (16,905 events) were cleared within 90 minutes of verification.

Of the approximately 1,500 events that lasted more than 90 minutes, the top event types were:
Roadwork - 41%
Choke Point - 29%
Accidents - 8%

FAST Archived CCTV Incident Snap Shots

Review snap shots to obtain details about incidents.

Helps generate 30-60-90 calculations (of roadway clearance times) for Nevada DOT.



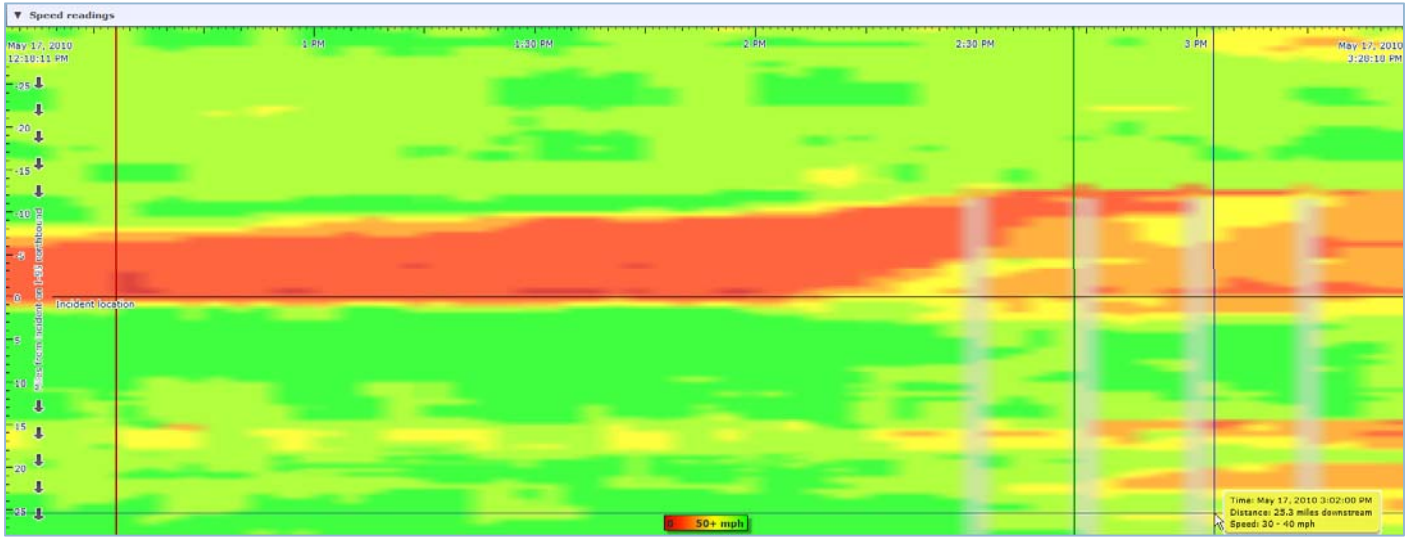
Date & Time	Corridor	Location	Lane Blocked
8/4/2014 5:06:00 PM	Sahara West Bound	I-15	Roadway
8/4/2014 4:26:00 PM	SR159	SR160	highway closed
8/4/2014 4:26:00 PM	SR159	SR160	highway closed
8/4/2014 4:26:00 PM	SR-159	Bonnie Springs	highway closed
8/4/2014 4:22:00 PM	I-15 SB	past Craig Road	right lane
8/4/2014 4:07:00 PM	US-95 North & South	Mt Charleston Area	highway closed
8/4/2014 3:17:00 PM	Ramp	US-95 Southbound to I-15 Northbound ramp	right lane
8/4/2014 2:59:00 PM	US-95 NB	past Eastern Ave	center lane
8/4/2014 2:40:00 PM	CC-215 EB	before I-15 Interchange (Southern Beltway)	right lane
8/4/2014 2:34:00 PM	Sahara West Bound	Las Vegas Blvd	Intersection
8/4/2014 9:45:00 AM	US-95 NB	before Lake Mead Blvd	right lanes
8/4/2014 6:12:00 AM	US-95 SB	before Eastern	right lane
8/4/2014 6:10:00			

UMD CATT Lab Incident Timeline

Combined timeline showing TMC communications, notifications and responders, lane status, and overhead sign messages.

UMD CATT Impact of Incident – Heat Map

Impact of incident on speeds upstream of incident and over time.

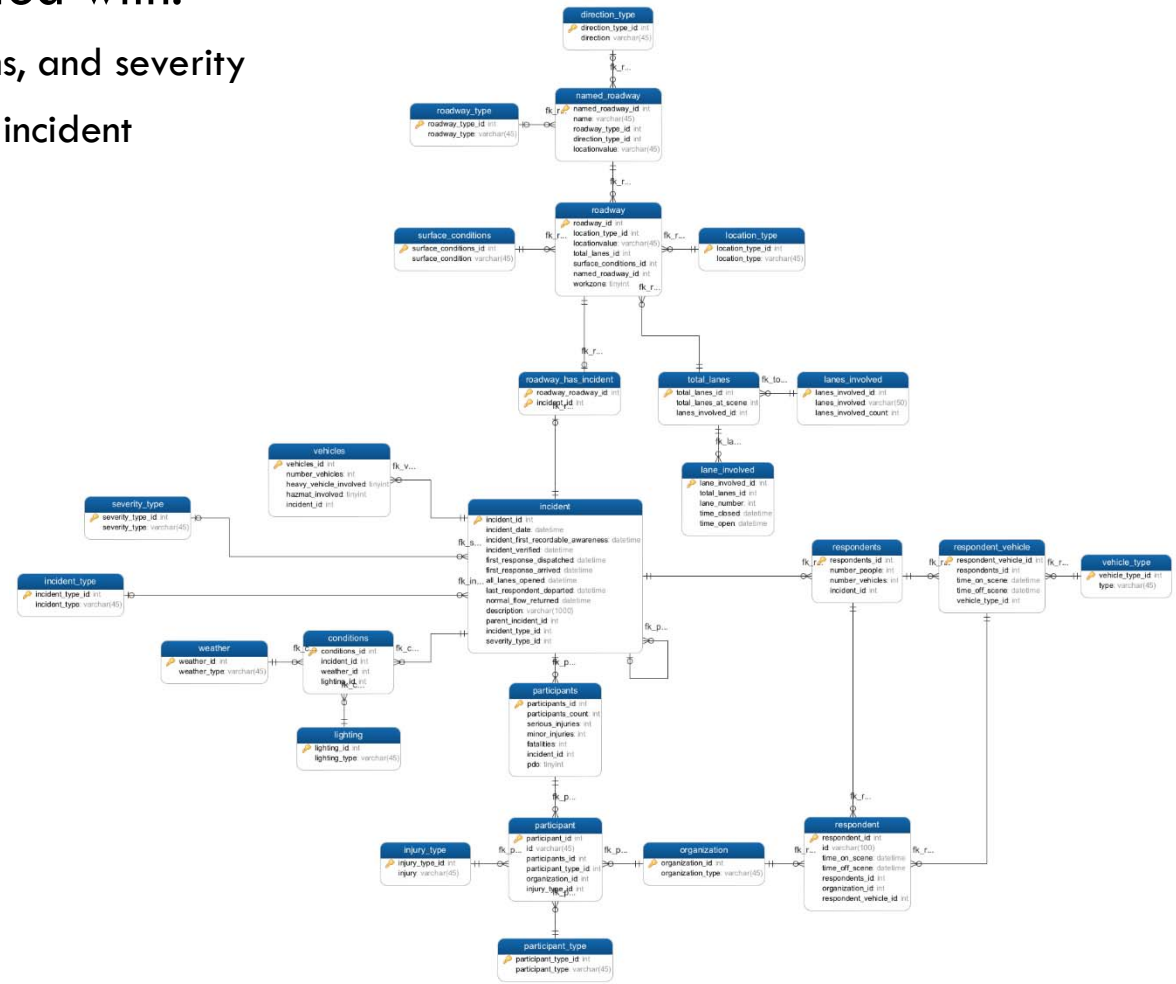


Model TIM Performance Measurement Database – Content Overview

- Database terminology
- Data elements
- Database schema
- Data dictionary
- Database scripts for creating database and populating look-up tables
- Populating the database with data
- Querying the database
- Analysis of performance using the various data elements in the database
- Example applications of the model database

Data Elements and Database Schema

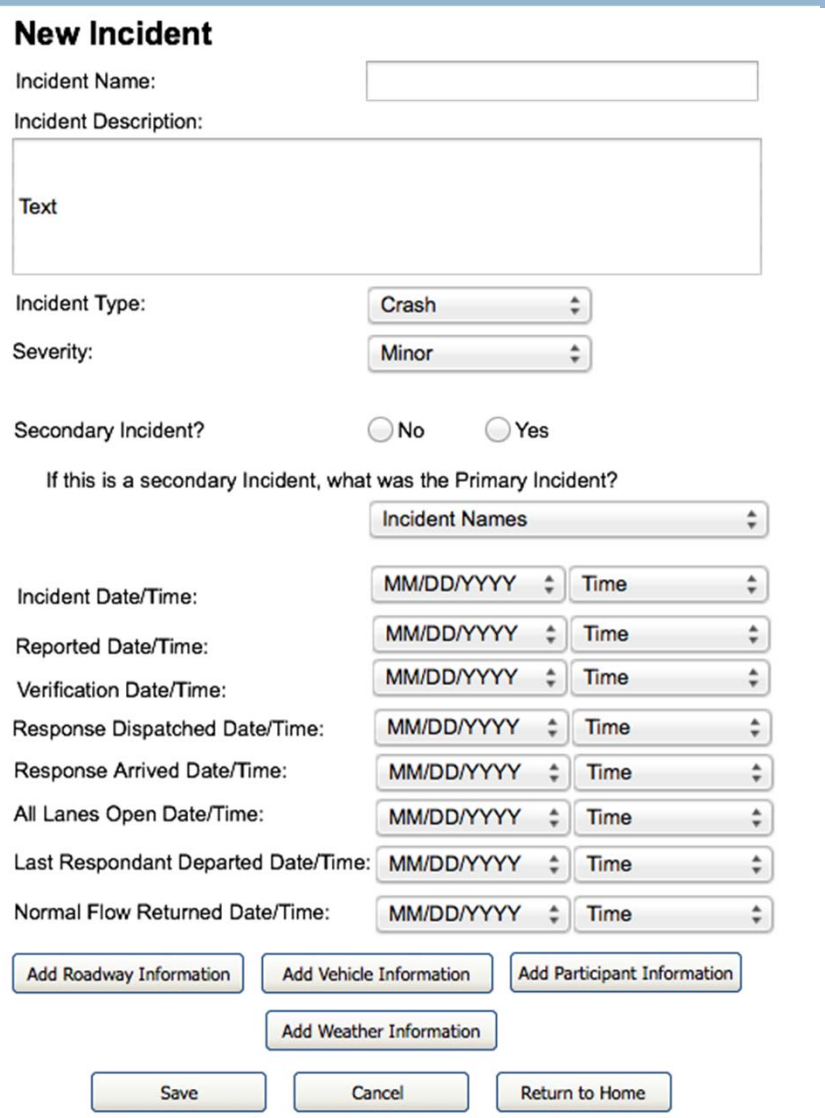
- Data elements associated with:
  - Incident timeline, conditions, and severity
  - Roadway and location of incident
  - Lanes involved
  - Vehicles involved
  - Participants involved
  - Emergency responders involved
- Database scripts
  - Create database
  - Populate look-up tables
  - Database queries



Populating the Database

Guidance includes a simple example incident data entry screen for use with the model TIM PM database.

Guidance also includes a discussion on importing existing datasets into the database.



Querying the Database - SQL

- Guidance provides scripts to query the database:

  This simple script returns the total number of incidents in the database:

```
select count(*)
from Incident;
```

  This script returns the number of primary incidents in the database:

```
select count(*)
from Incidents
where parent_incident_id is null;
```

  The following database script asks the database to provide the % of secondary incidents in the database (as a percentage of all incidents in the database):

```
select 100*(select count(*)
from incident i
where i.parent_incident_id is not null) /
(select count(*)
from incident i);
```

- Guidance also provides more complex scripts associated with calculating the TIM PMs

Analysis of Performance Using the Database

Performance Measures:

- ICT
- RCT
- Secondary Incidents

- Overall
- by incident severity
  - minor, intermediate, major
- by injury severity
  - non-injury, injury, fatality
- by roadway characteristics
  - type, name, direction
- by lanes involved
  - shoulder only, 1 lane, multi-lane
- by time of incident
  - peak periods, days of week, months of year

Example Applications of the Model Database

- Four example organizational objectives:
  - Improve TIM performance for freeway incidents.
  - Identify improved roadway clearance strategies for lane-blocking freeway incidents.
  - Reduce incident clearance times through implementation of a freeway service patrol program.
  - Reduce secondary incidents throughout the region.
- Objectives of examples:
  - Selection of performance measures and targets
  - Application of the model database
  - Development of database queries and scripts
  - Demonstration of data mining and analysis
  - Visualization of performance measures and interpretation of results

Demonstration of Online Tool

timnetwork.org

For Further Information

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