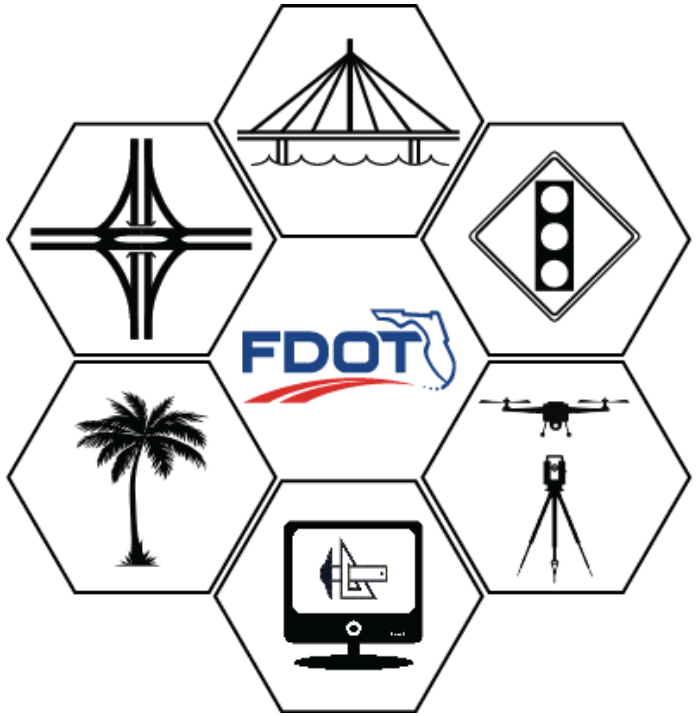


FDOT TRANSPORTATION SYMPOSIUM 2019

Safety Data and Applications

Joe Santos and Alan El-Urfali

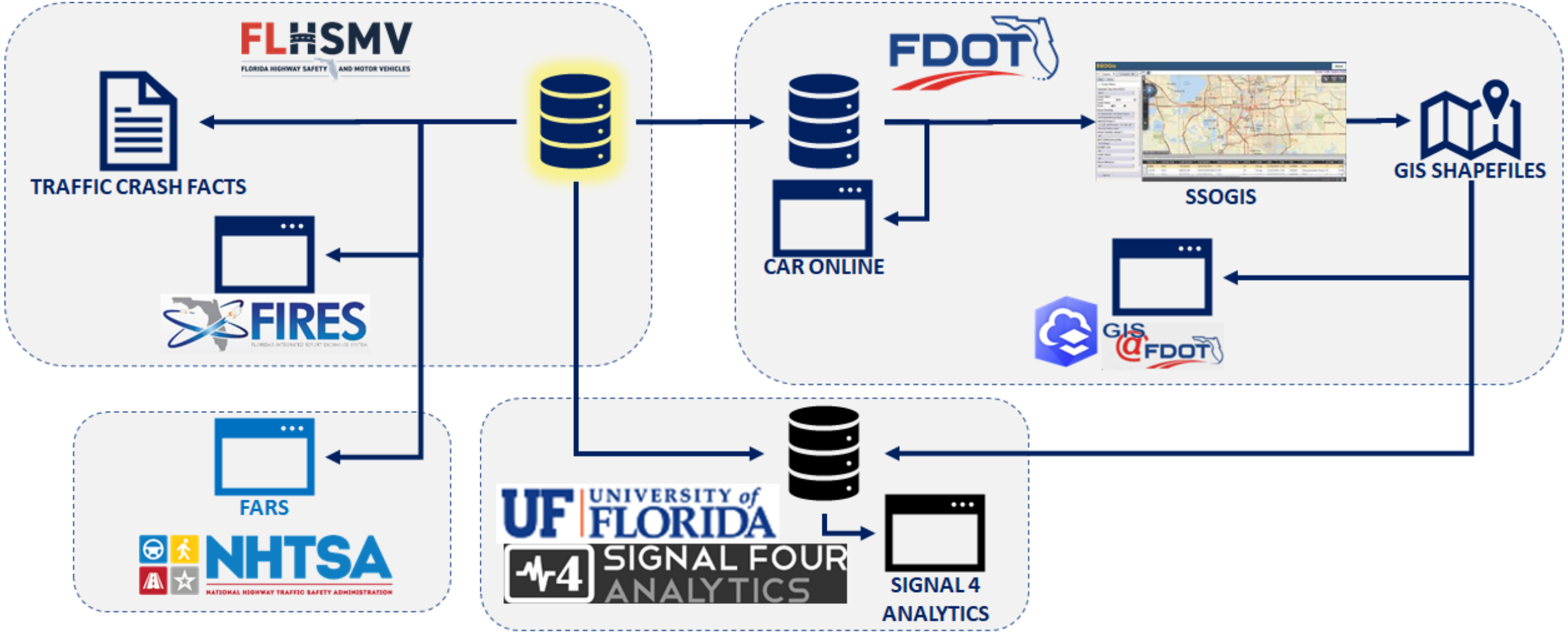
Safety Data and Applications
Overview

- Crash data systems
  - Systems diagram…connections
  - “Restricted” and “Open Access” Systems
- Safety Applications
  - Highway Safety Manual
  - Manual on Uniform Traffic Studies (MUTS)
- Other resources
- Q and A

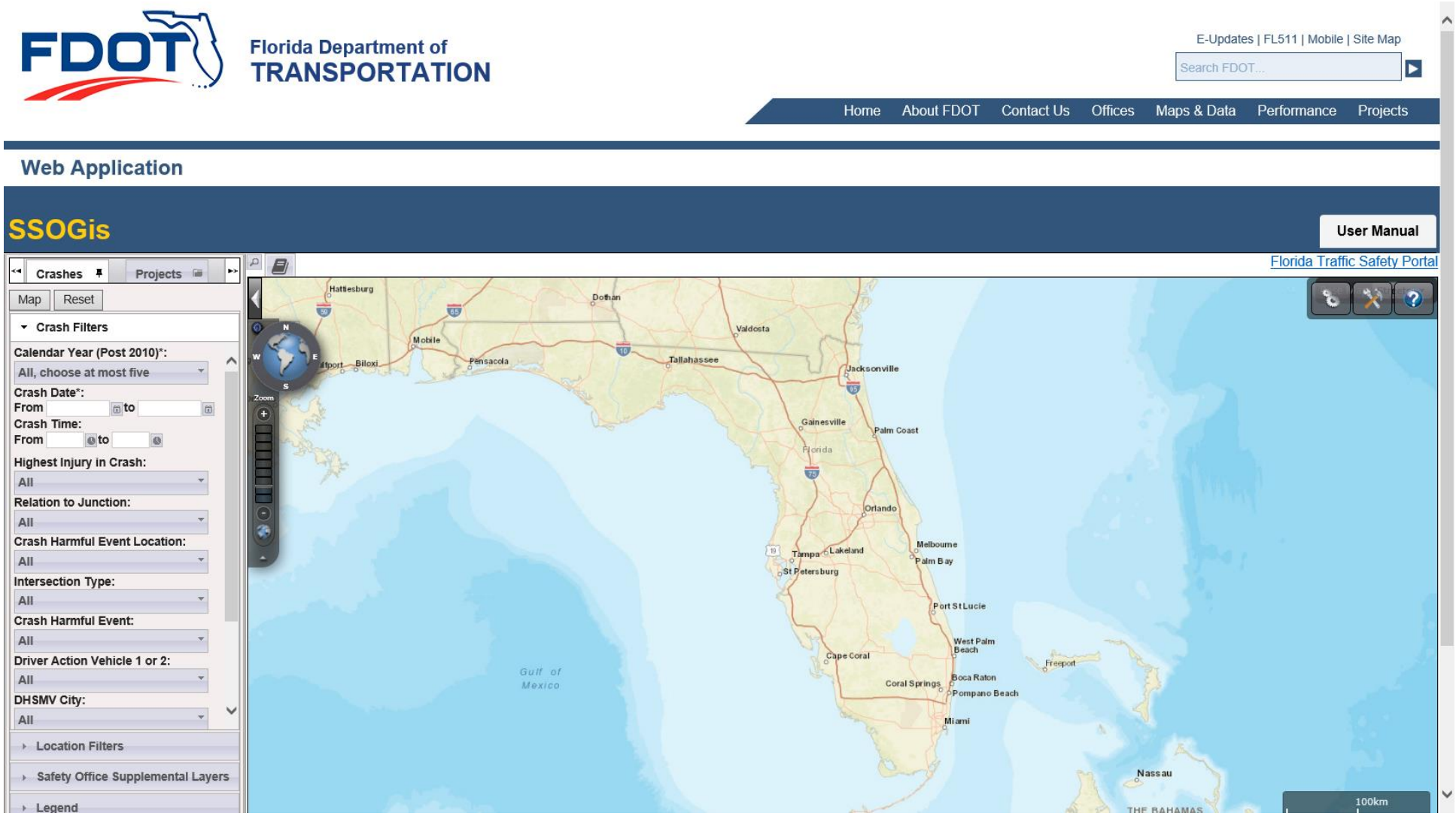
Crash Data Systems

- FLHSMV (Florida Department of Highway Safety and Motor Vehicles)
  - FIRES (Florida's Integrated Report Management System) - open & restricted access
  - Traffic Crash Facts – open access
- FDOT (Florida Department of Transportation)
  - CAR (Crash Analysis Reporting) – restricted access
  - Shapefiles – open & restricted access
  - SSOGis – open access
  - GIS@FDOT – ESRI ArcGIS Online, open & restricted access
- University of Florida
  - Signal 4 Analytics – restricted access
- NHTSA (National Highway Traffic Safety Administration)
  - FARS (Fatality Analysis Reporting System)

Crash Data Systems Diagram

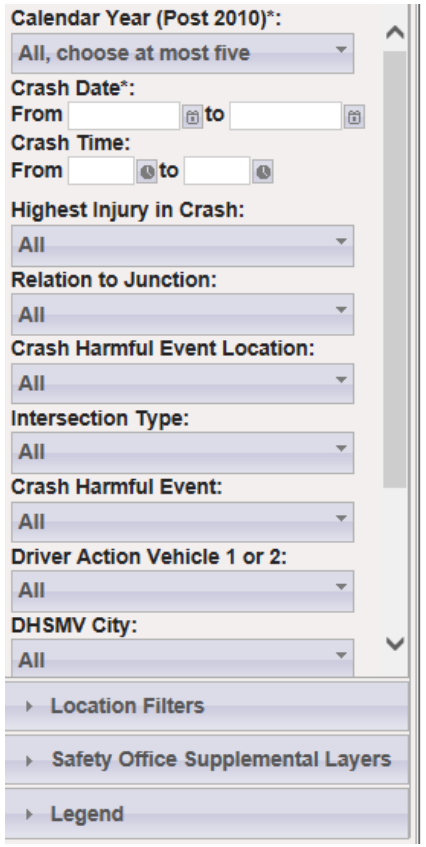


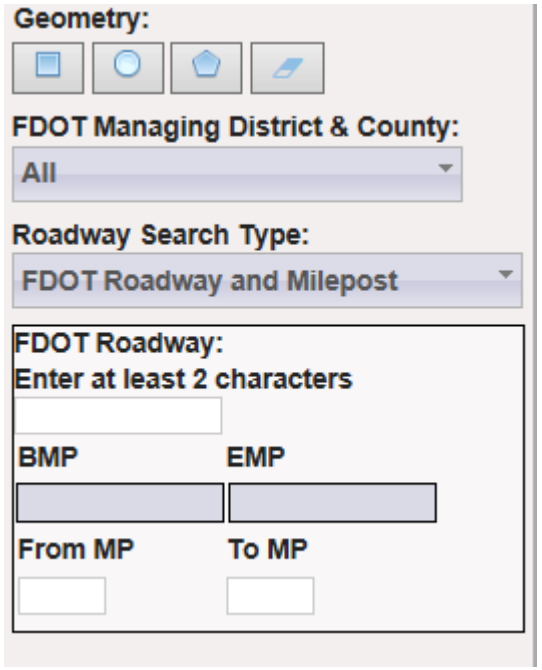
Public Tools
FDOT SSOGIS

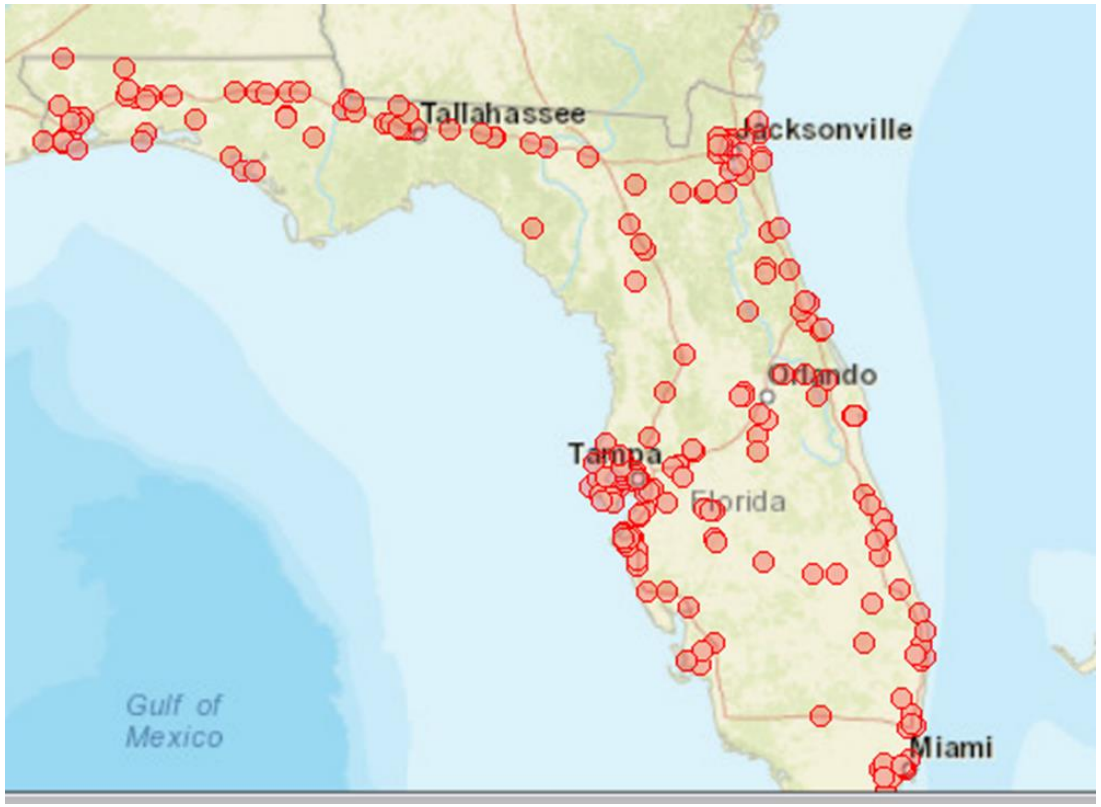


FDOT TRANSPORTATION SYMPOSIUM

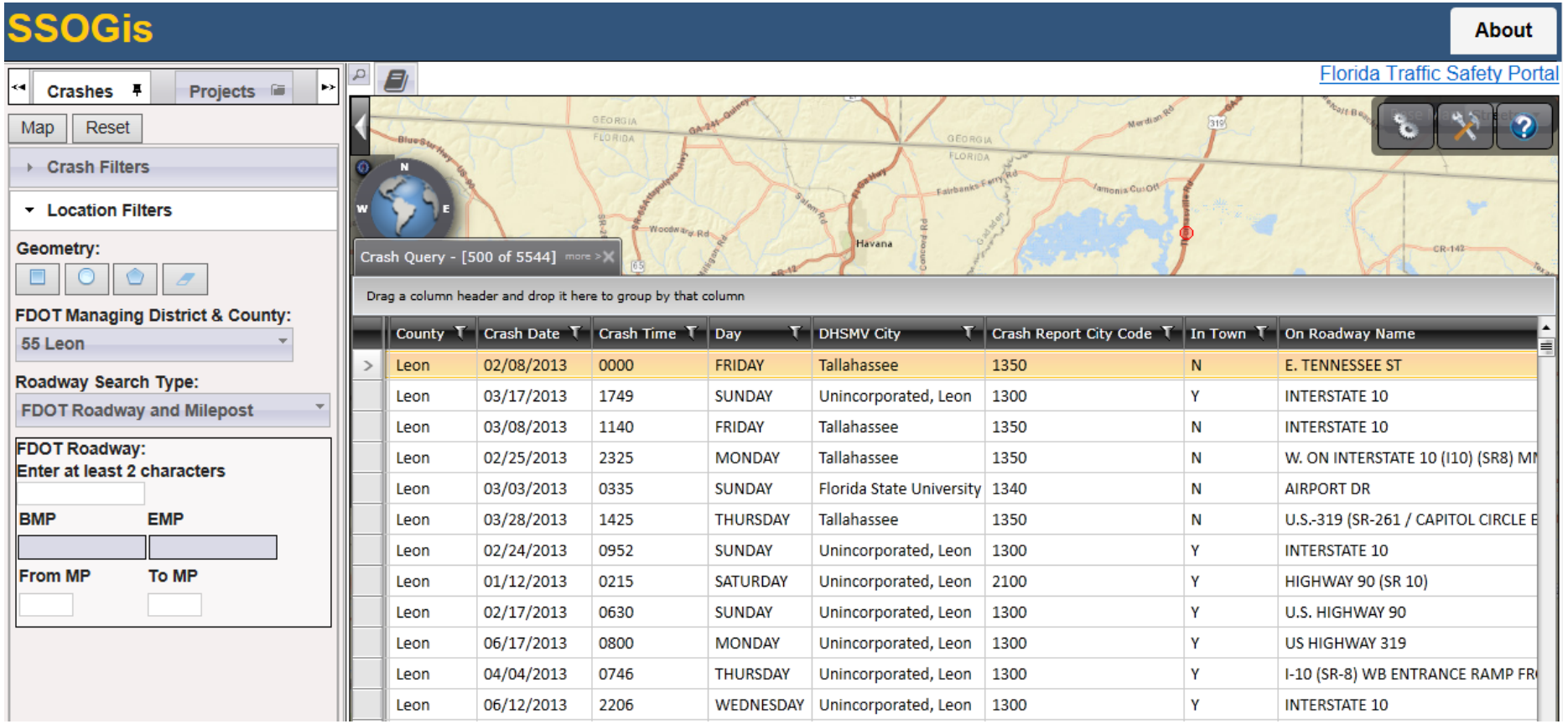
Public Tools
FDOT SSOGIS





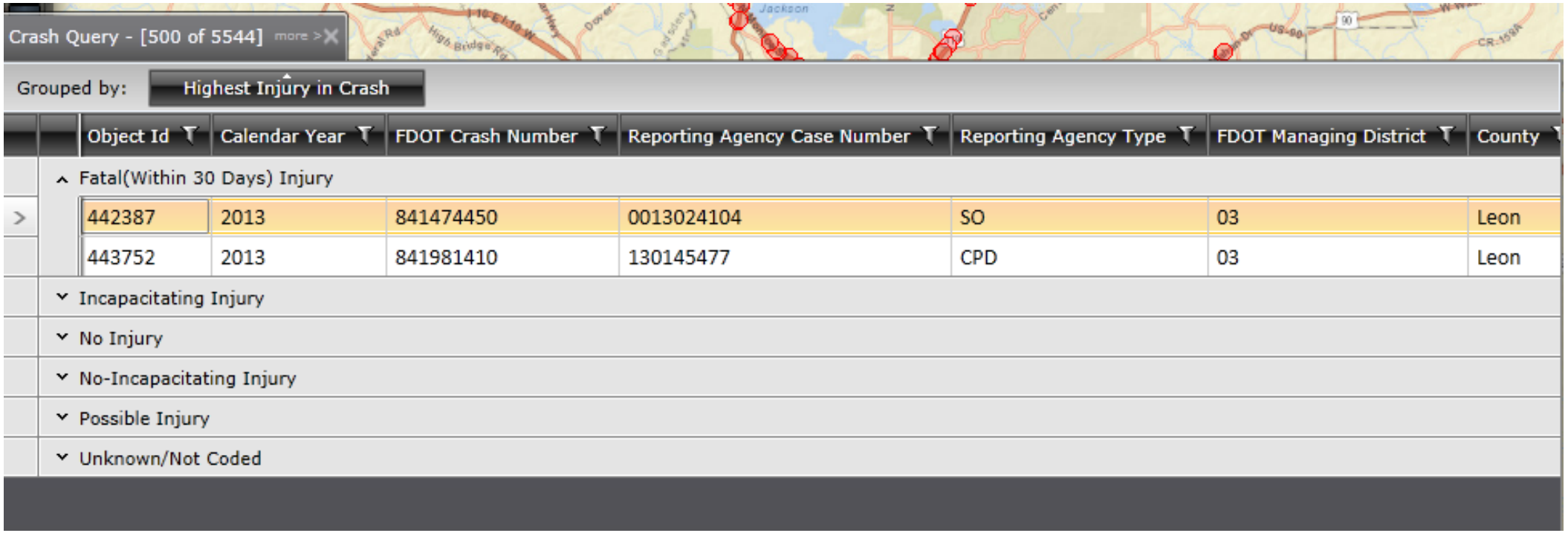


Public Tools
FDOT SSOGIS (Table)



County	Crash Date	Crash Time	Day	DHSMV City	Crash Report City Code	In Town	On Roadway Name
Leon	02/08/2013	0000	FRIDAY	Tallahassee	1350	N	E. TENNESSEE ST
Leon	03/17/2013	1749	SUNDAY	Unincorporated, Leon	1300	Y	INTERSTATE 10
Leon	03/08/2013	1140	FRIDAY	Tallahassee	1350	N	INTERSTATE 10
Leon	02/25/2013	2325	MONDAY	Tallahassee	1350	N	W. ON INTERSTATE 10 (I10) (SR8) MI
Leon	03/03/2013	0335	SUNDAY	Florida State University	1340	N	AIRPORT DR
Leon	03/28/2013	1425	THURSDAY	Tallahassee	1350	N	U.S.-319 (SR-261 / CAPITOL CIRCLE E
Leon	02/24/2013	0952	SUNDAY	Unincorporated, Leon	1300	Y	INTERSTATE 10
Leon	01/12/2013	0215	SATURDAY	Unincorporated, Leon	2100	Y	HIGHWAY 90 (SR 10)
Leon	02/17/2013	0630	SUNDAY	Unincorporated, Leon	1300	Y	U.S. HIGHWAY 90
Leon	06/17/2013	0800	MONDAY	Unincorporated, Leon	1300	Y	US HIGHWAY 319
Leon	04/04/2013	0746	THURSDAY	Unincorporated, Leon	1300	Y	I-10 (SR-8) WB ENTRANCE RAMP FR
Leon	06/12/2013	2206	WEDNESDAY	Unincorporated, Leon	1300	Y	INTERSTATE 10

Public Tools
FDOT SSOGIS (Table Groupings)

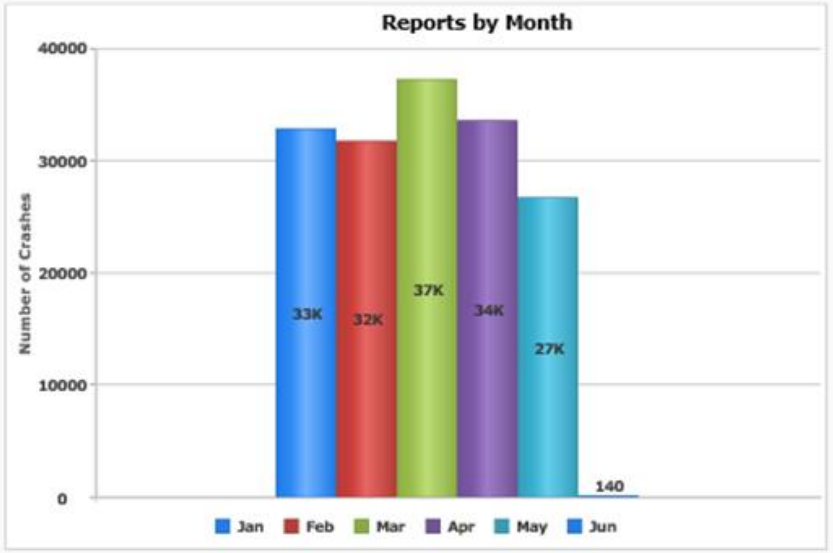


Public Tools
FLHSMV FIRES

Quick Stats

Year: 2017 ◉ Statewide ○ County ○ Agency

Crash Summary	
Total Crashes:	162,212
Injury Crashes:	68,440
Total Injuries:	104,200
Crashes with Traffic Fatalities:	1,130
Total Traffic Fatalities	1,204
Commercial Vehicle Crashes:	17,283
Commercial Vehicles:	18,603
Property Damage Crashes:	92,642
*Pedestrian Crashes:	3,769
*Pedestrian Fatalities:	235
**Bicycle Crashes:	2,988
**Bicycle Fatalities:	44



As of Date: 6/4/2017

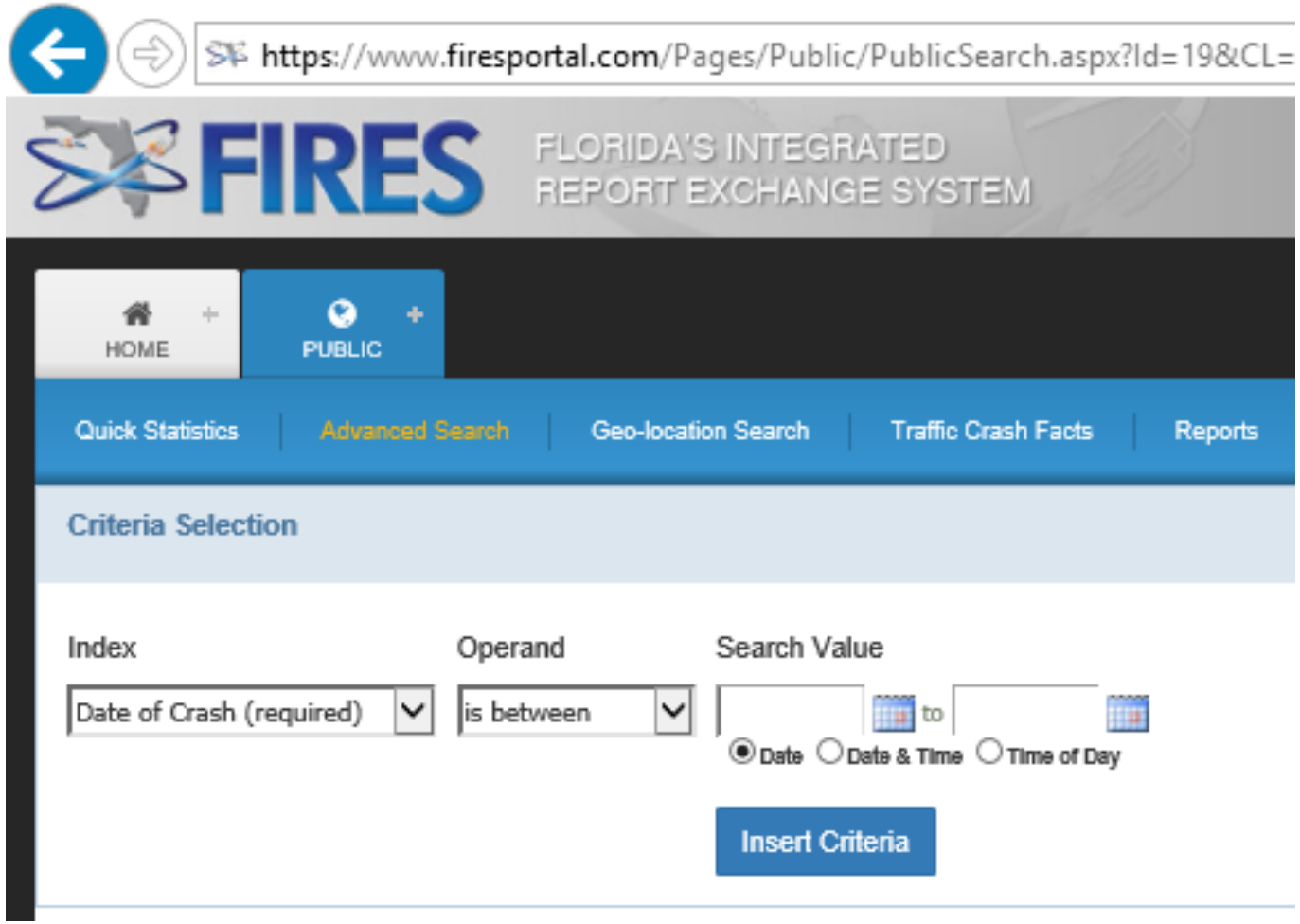
Select Chart: Reports by Month

*Types of Crashes Included

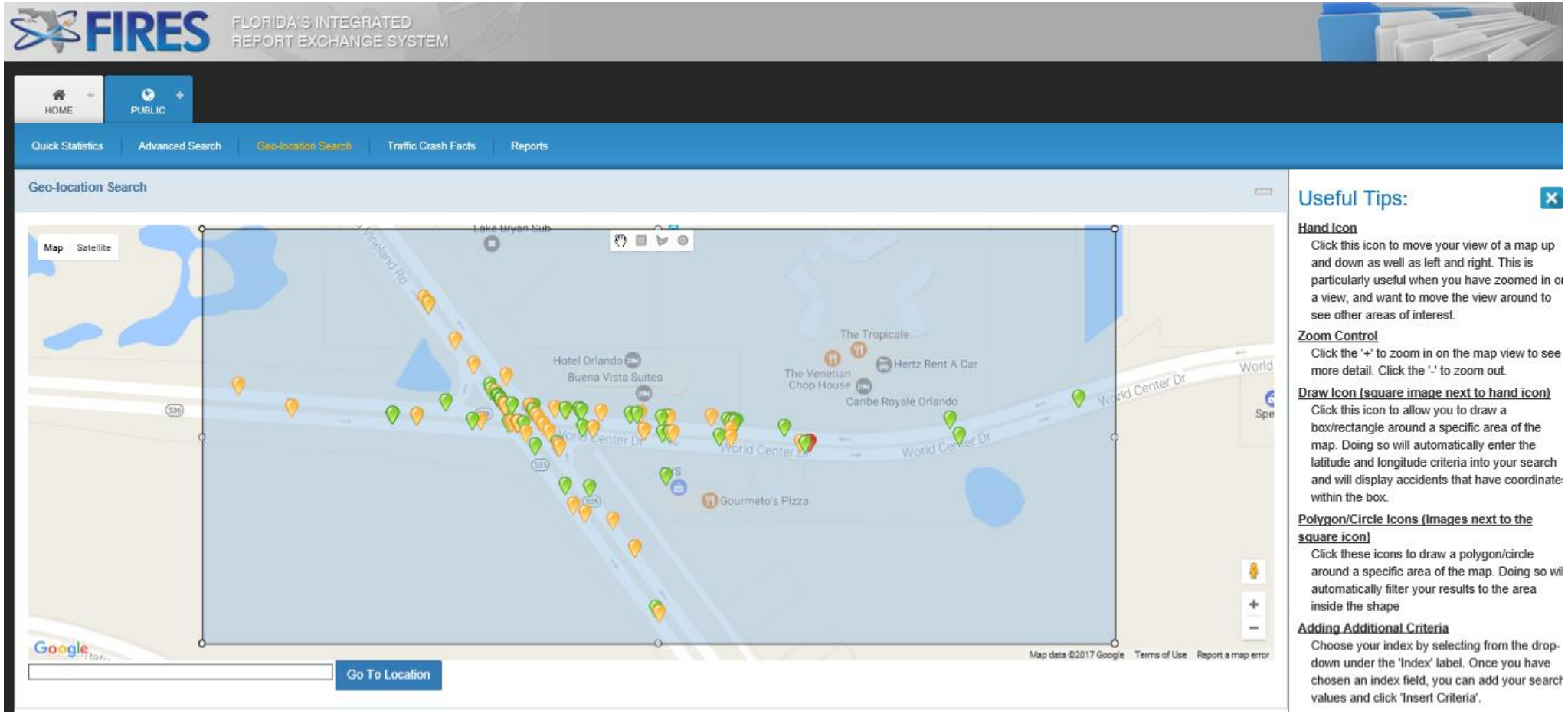
*Pedestrians are reported as Non-Motorist Description of 01-Pedestrian & 02-Other Pedestrian

**Bicyclists are reported as Non-Motorist Description of 03-Bicylist & 04-Other Cyclist

Public Tools
FLHSMV FIRES (Advanced Search)

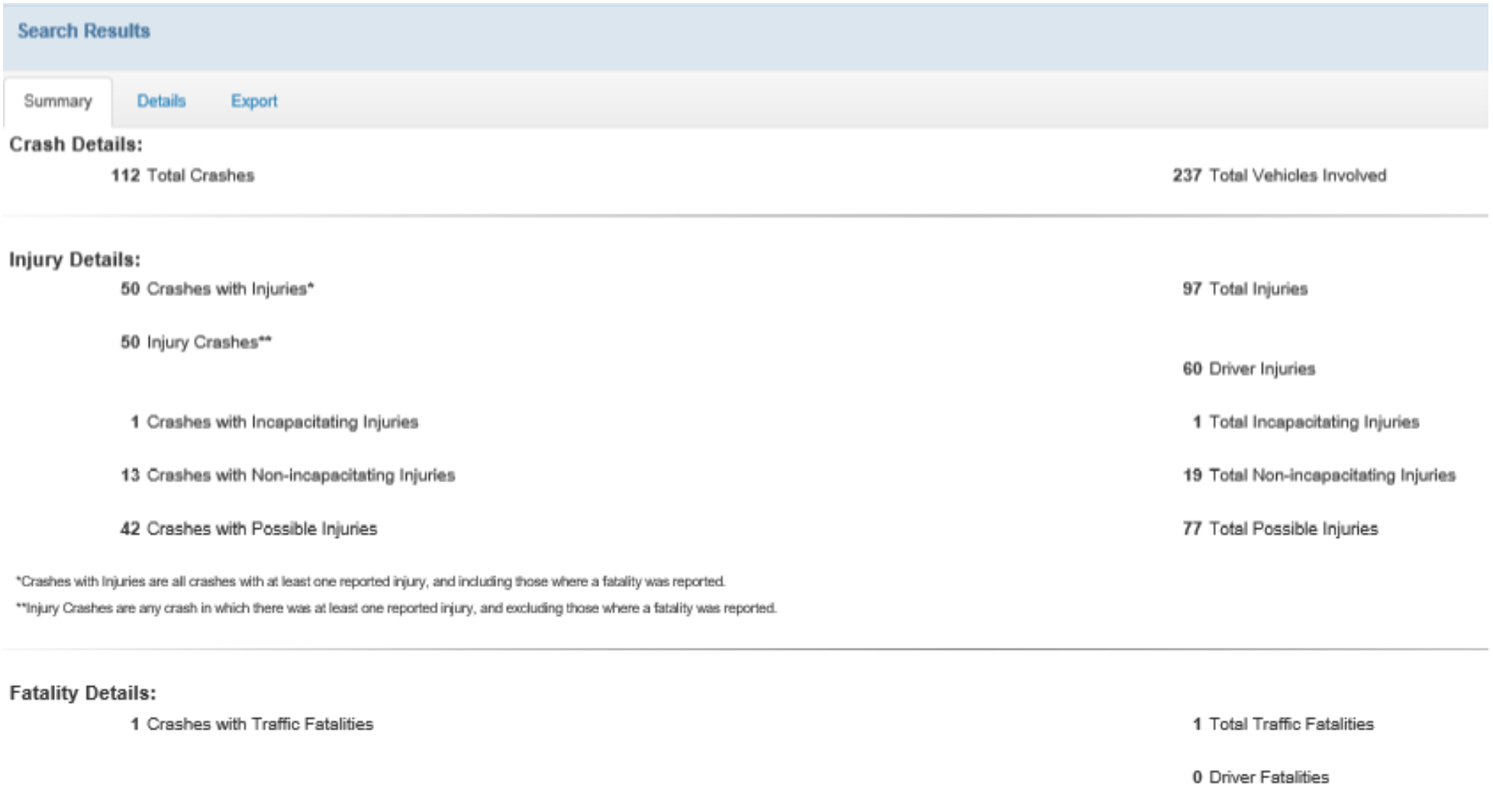


Public Tools
FLHSMV FIRES (Geo Location Search)



FDOT TRANSPORTATION SYMPOSIUM

Public Tools
FLHSMV FIRES (Geo Location Search)



Search Results

Summary | Details | Export

Crash Details:

112 Total Crashes	**237** Total Vehicles Involved

Injury Details:

50 Crashes with Injuries*	**97** Total Injuries
50 Injury Crashes**	**60** Driver Injuries
1 Crashes with Incapacitating Injuries	**1** Total Incapacitating Injuries
13 Crashes with Non-incapacitating Injuries	**19** Total Non-incapacitating Injuries
42 Crashes with Possible Injuries	**77** Total Possible Injuries

*Crashes with Injuries are all crashes with at least one reported injury, and including those where a fatality was reported.

**Injury Crashes are any crash in which there was at least one reported injury, and excluding those where a fatality was reported.

Fatality Details:

1 Crashes with Traffic Fatalities	**1** Total Traffic Fatalities
	0 Driver Fatalities

FDOT TRANSPORTATION SYMPOSIUM

Public Tools
GIS @ FDOT / ArcGIS Online

Public Tools
GIS @ FDOT / ArcGIS Online

- Web apps, maps, layers, files, data collection tools.
- Searchable content.
- FDOT offices.
  - Construction.
  - Emergency Management.
  - Maintenance.
  - Operations.
  - Planning.
  - State Materials Office.
  - State Safety Office.
  - Survey and Mapping Office.
  - Transportation Data Analytics.
  - Others.
- FDOT content.
  - Crash data.
  - Data collection tools.
  - Damage assessment data.
  - Maintenance data.
  - State asset maintenance data.
  - State roadway data.
- Non-FDOT content.
  - ESRI Living Atlas (public content).
  - Census demographic data.
  - Content from ArcGIS Online account holders.

Public Tools
GIS @ FDOT / ArcGIS Online

Florida NonMotorist Fatal or Serious Injury

Overview | Data | Visualization | Usage | Settings

Edit Thumbnail

Add to Favorites

Fatal and serious injuries of non-motorists on Florida public roads. Edit

Feature Layer (hosted) by Rupert.Giroux@dot.state.fl.us_fdot

Created: Dec 11, 2018 Updated: May 30, 2019 View Count: 165

Authoritative

Open in Map Viewer

Open in Scene Viewer

Open in ArcGIS Desktop

Publish

Create View Layer

Export Data

Update Data

Share

Metadata

Description

Edit

This dataset contains locations for fatal and serious injuries of non-motorists (bicyclists or pedestrians) on public roads in Florida from 2007 through 2016. A non-motorist is categorized by the reporting agency using Non-Motorist Codes 1, 2, 3, and 4 for pedestrian, other pedestrian, bicyclist, and other bicyclist respectively. Non-Motorist Codes 5, 6, and 7 denote occupants of motor vehicles not in transport (e.g. parked), occupants of non-motor vehicle devices, and unknown non-motorist types respectively.

This dataset is based on "Long Form" crash data reported by law enforcement to the Florida Department of Highway Safety and Motor Vehicles (FLHSMV). Geographic coordinates were processed and provided by the Florida Department of Transportation (FDOT).

FIRES Portal

FLHSMV is the official custodian of traffic crash data for the State of Florida. You may access and query crash records through their FIRES (Florida's Integrated Report Exchange System) portal [https://www.firesportal.com/].

SSOGis

The FDOT State Safety Office (SSO) maintains a web-based map called SSOGis [https://fdotewp1.dot.state.fl.us/ssogis]. You may

Item Information

Learn more

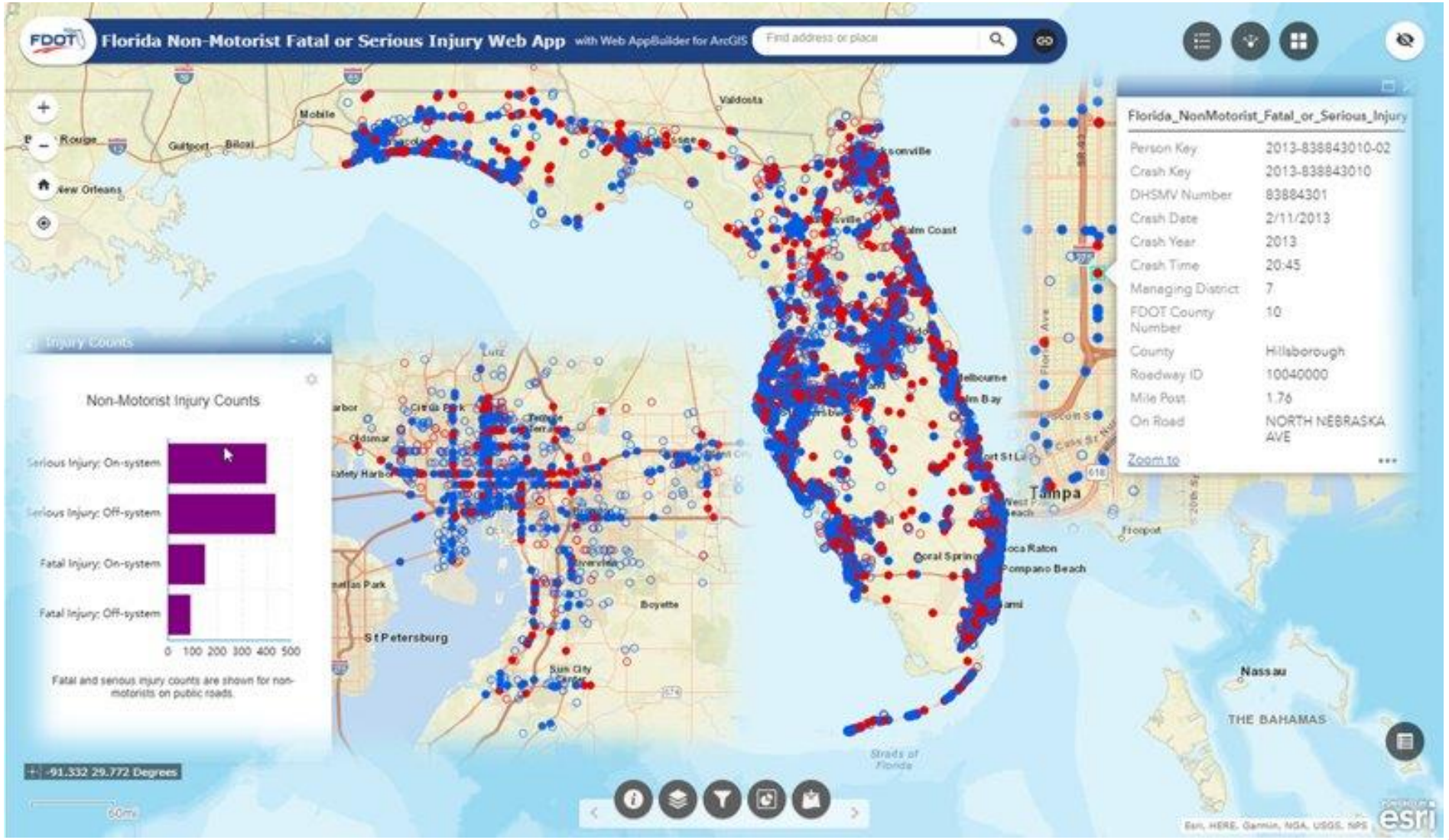
Low High

Details

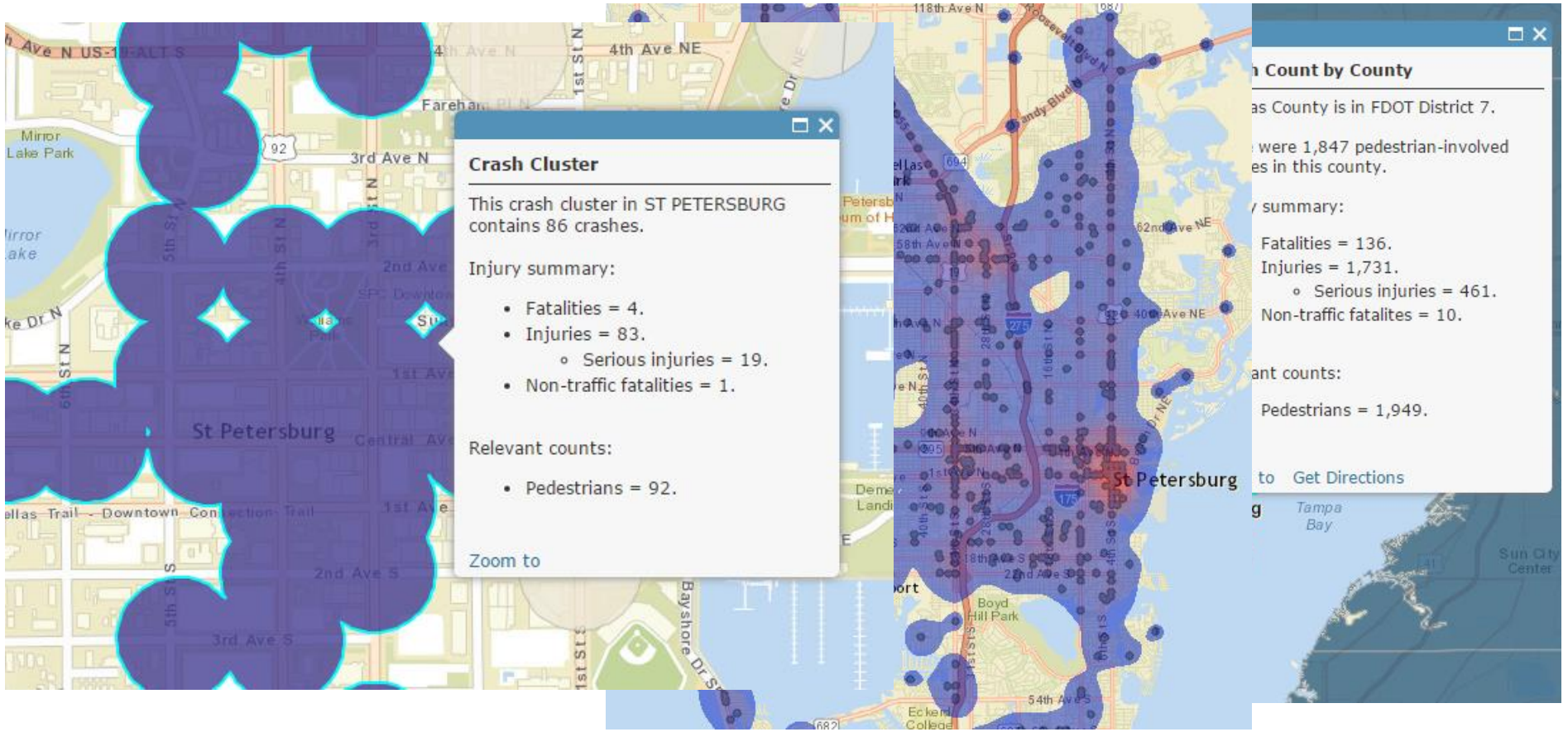
Source: Feature Service
Created from: Florida NonMotorist Fatal or Serious Injury, Shapefile

FDOT TRANSPORTATION SYMPOSIUM

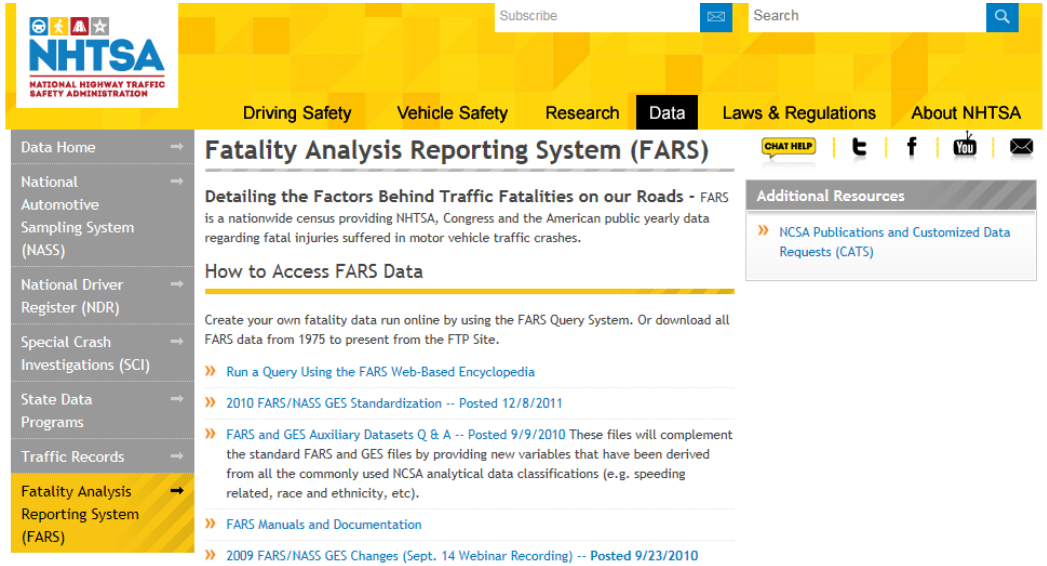
Public Tools
GIS @ FDOT / ArcGIS Online

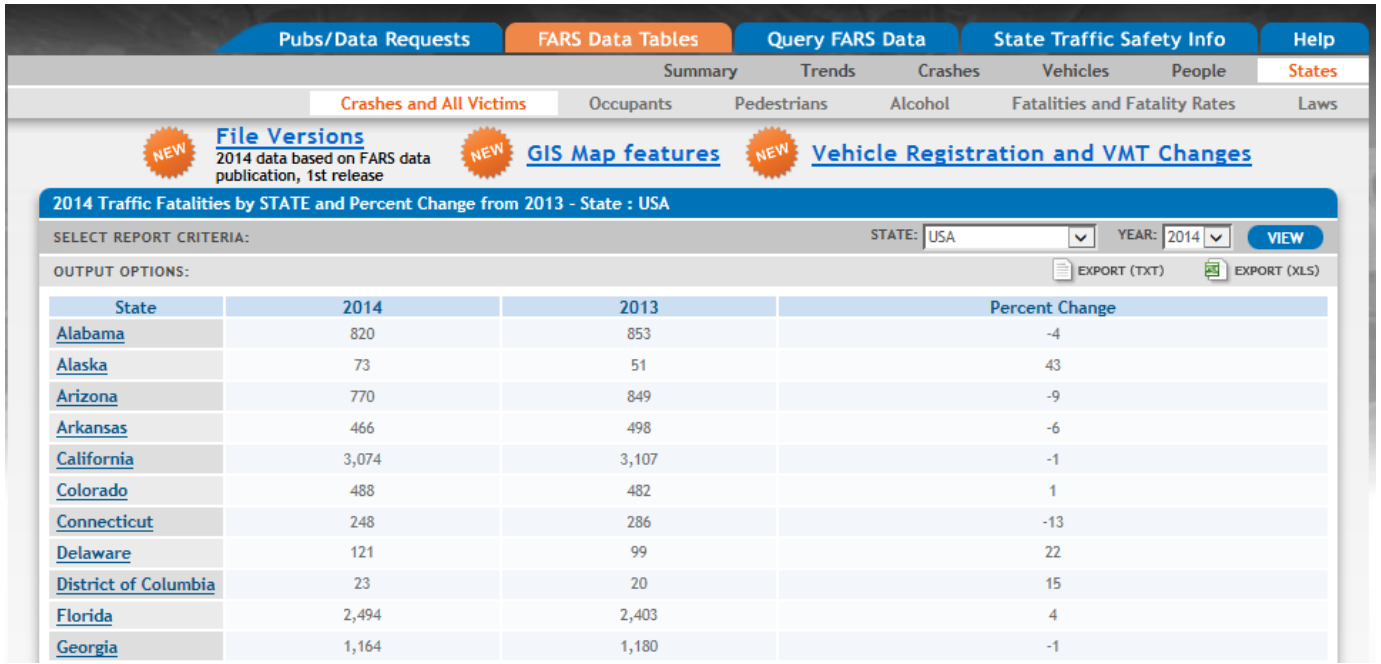


Public Tools
GIS @ FDOT / ArcGIS Online



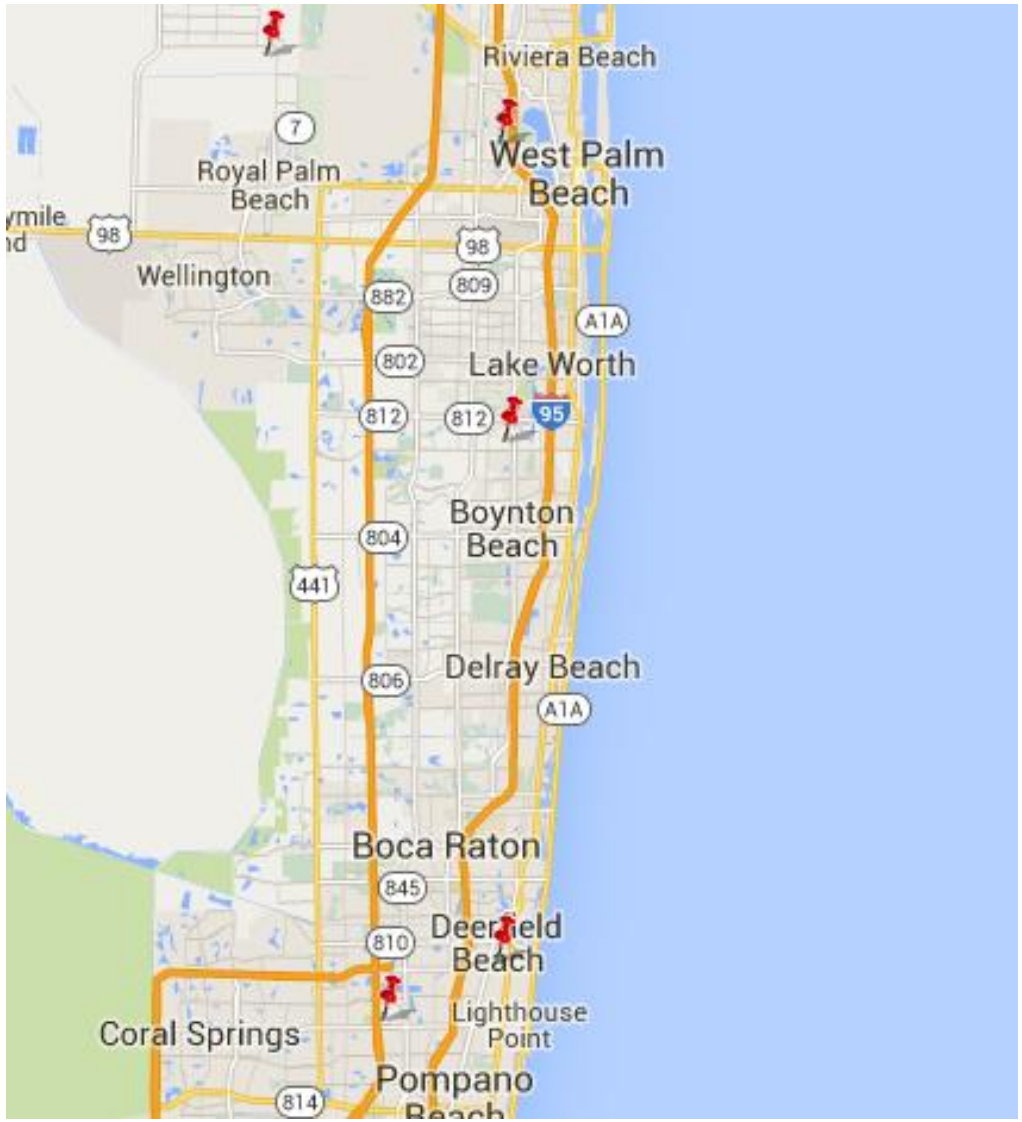
Public Tools
Fatality Analysis Reporting System (FARS)





State	2014	2013	Percent Change
Alabama	820	853	-4
Alaska	73	51	43
Arizona	770	849	-9
Arkansas	466	498	-6
California	3,074	3,107	-1
Colorado	488	482	1
Connecticut	248	286	-13
Delaware	121	99	22
District of Columbia	23	20	15
Florida	2,494	2,403	4
Georgia	1,164	1,180	-1

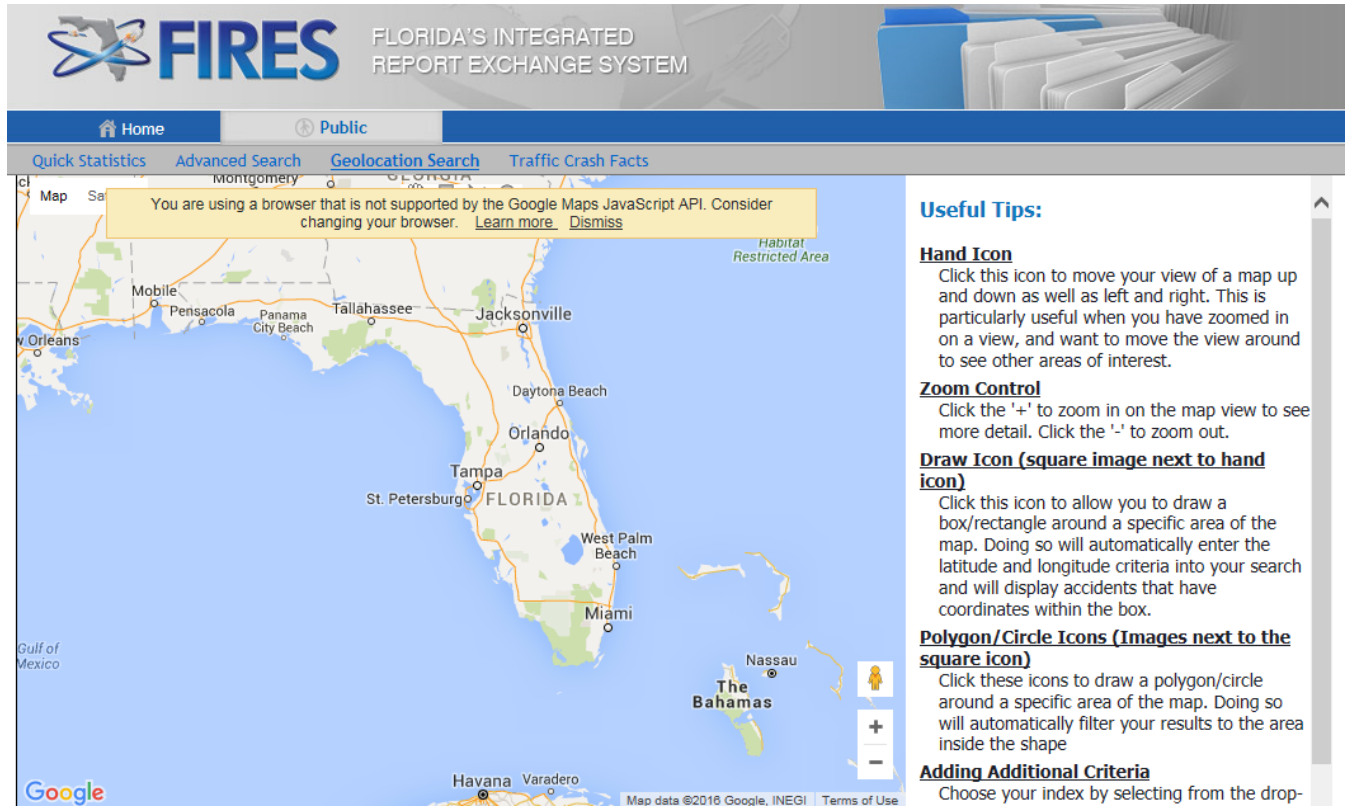
Public Tools
FARS Fatality Map



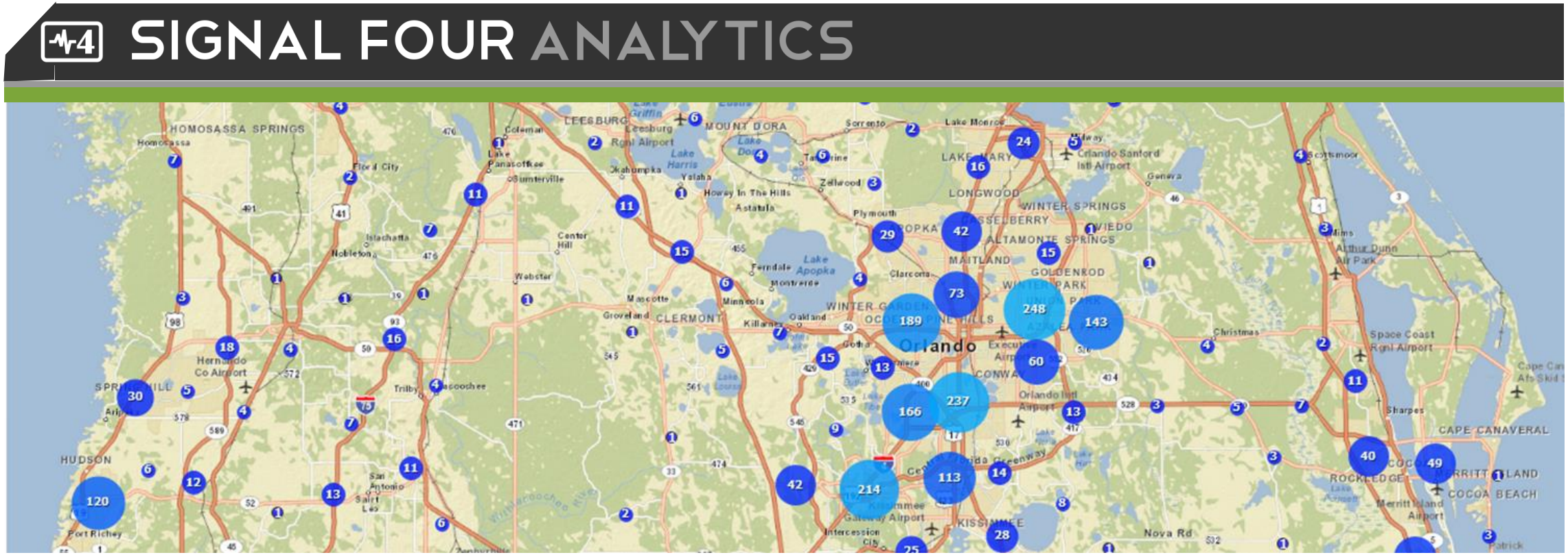
FIRES Portal (Public / Restricted Query + Map)

- Agency
- City
- County of Crash
- Crash in Work Zone
- Date of Crash (required)
- Fatalities Count
- First Harmful Event
- First Harmful Event Location
- First Harmful Event Relation to Junction
- First Harmful Event within Interchange
- Geolocated Latitude
- Geolocated Longitude
- Hit and Run
- Injured Count
- Injuries
- Intersection
- Intersection Name
- Latitude
- Law Enforcement in Work Zone
- Light Condition
- Location
- Longitude
- Manner of Collision/Impact
- Number of Vehicles
- Property Damage
- Road System Identifier
- Roadway
- Roadway Name
- Roadway Surface Condition
- School Bus Related

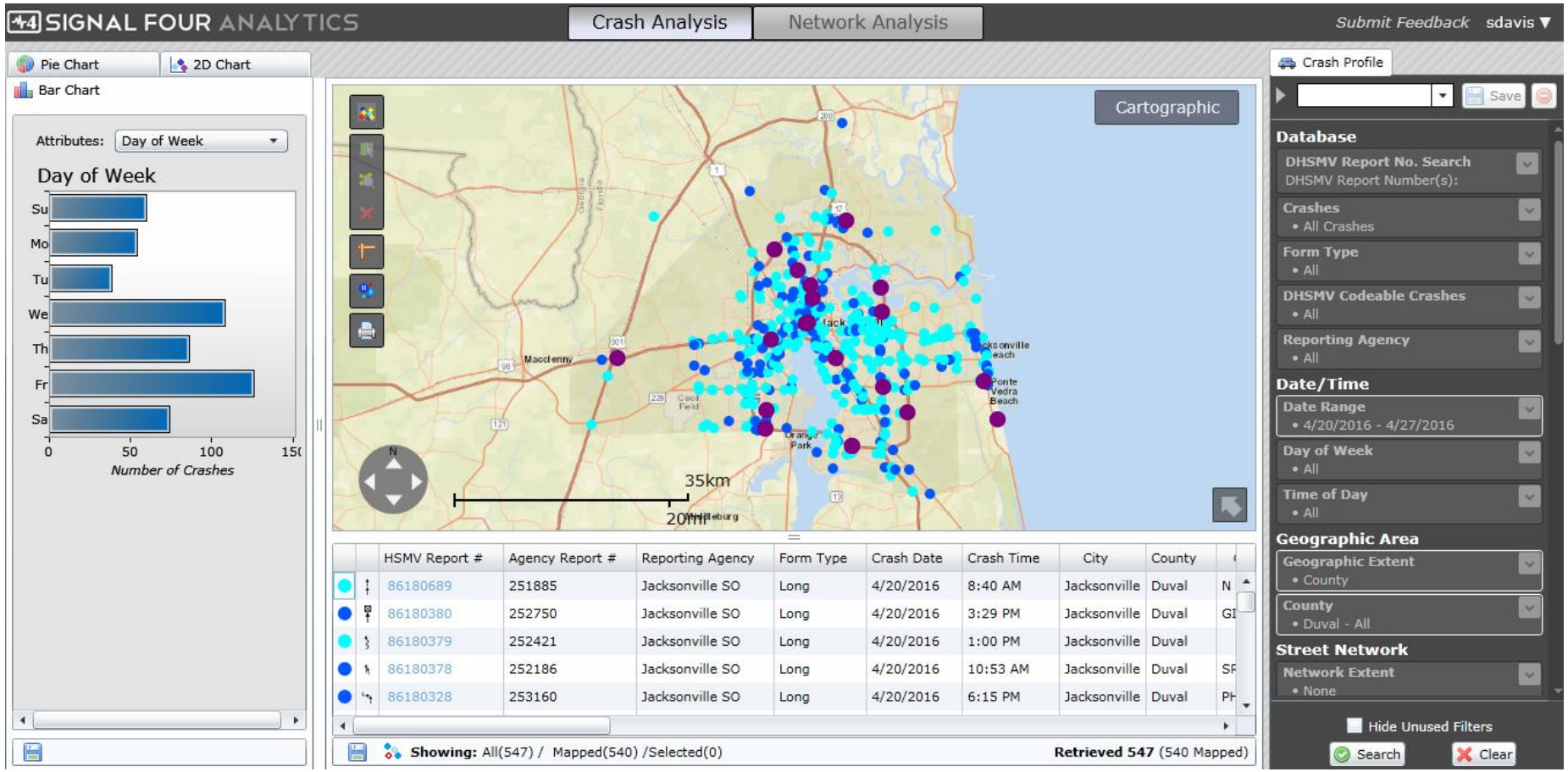
- Traffic Control
- Type of Work Zone
- Weather Condition
- Work Zone Related
- Workers in Work Zone



Restricted Tools
Signal 4 Analytics (S4A)

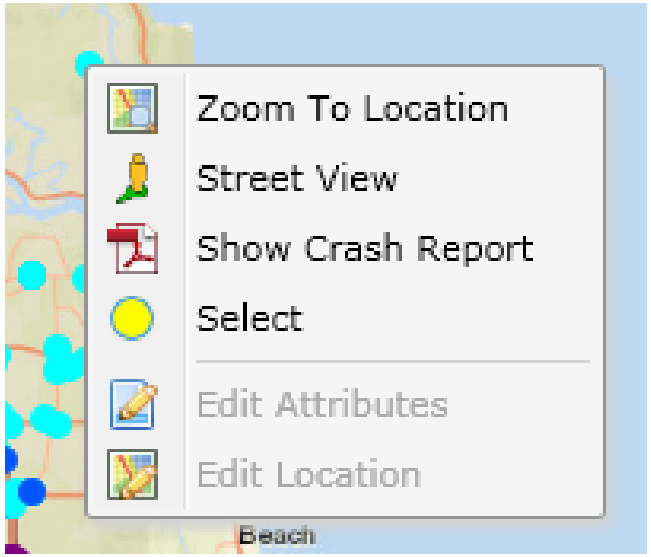

SIGNAL FOUR ANALYTICS
HOMOSASSA SPRINGS
LEESBURG
MOUNT DORA
LAKE MARY
LONGWOOD
WINTER SPRINGS
ALTAMONTE SPRINGS
MAITLAND
GOLDENROD
WINTER PARK
CLERMONT
Orlando
KISSIMMEE
CAPE CANAVERAL
COCOA BEACH
ROCKLEDGE
HUDSON
Nova Rd
Orlando Sanford Intl Airport
Orlando Intl Airport
Space Coast Regional Airport
Hernando Co Airport
Merritt Island Airport
Lake Apopka
Lake Harris
Lake Dora
Lake Monroe
Lake Panasoffkee
Center Hill
Webster
Mascotte
Groveland
Minneola
Oakland
Ferndale
Clarcona
Zellwood
Plymouth
Sorrento
Tavares
Yalaha
Okahumpka
Howey In The Hills
Astatula
Coleman
Leesburg Regional Airport
Florida Citrus
Inverness
Istachatta
Nobleton
Trilby
Lacoochee
San Antonio
Saint Leo
Port Richey
Gateway Airport
Intercession City
Geneva
Mims
Arthur Dunn Air Park
Christmas
Sharpes
Scottsmoor
Cape Canaveral Air Force Skid Strip
Patrick
Ocoee
Gotha
Killarney
Winter Garden
Apopka
Zellwood
Tavares
Eustis
Lady Lake
The Villages
Wildwood
Bushnell
Dade City
Zephyrhills
Wesley Chapel
New Port Richey
Tarpon Springs
Palm Harbor
Clearwater
Largo
Seminole
Pinellas Park
St. Petersburg
Gulfport
Tampa
Temple Terrace
Plant City
Lakeland
Winter Haven
Haines City
Davenport
Kissimmee
St. Cloud
Poinciana
Auburndale
Lake Wales
Bartow
Fort Meade
Mulberry
Lakeland Linder Regional Airport
Tampa Executive Airport
Peter O. Knight Airport
Tampa International Airport
MacDill Air Force Base
Plant City Airport
Lakeland Linder Airport
Winter Haven Gilbert Airport
Haines City Municipal Airport
Kissimmee Gateway Airport
Orlando Executive Airport
Orlando Apopka Airport
Ocala International Airport
Ocala
Silver Springs
Belleview
Dunnellon
Crystal River
Homosassa
Floral City
Brooksville
Weeki Wachee
Spring Hill
Hudson
Port Richey
Hernando
Citrus Springs
Beverly Hills
Lecanto
Inverness
Withlacoochee River
Crystal River Airport
Citrus County Airport
Withlacoochee State Trail
Suncoast Parkway
Veterans Expressway
Florida Turnpike
Interstate 4
Interstate 75
Interstate 95
Interstate 275
Interstate 375
Interstate 4 Ultimate
Selmon Expressway
Courtney Campbell Causeway
Howard Frankland Bridge
Gandy Bridge
Sunshine Skyway Bridge
Tampa Bay
Gulf of Mexico
Atlantic Ocean
Indian River
Banana River
Merritt Island
Cape Canaveral
Cape Canaveral Space Force Station
Kennedy Space Center
Titusville
Cocoa
Rockledge
Melbourne
Palm Bay
Melbourne International Airport
Patrick Space Force Base
Valkaria Airport
Sebastian Inlet
Vero Beach
Fellsmere
Sebastian
Indian River County
Brevard County
Volusia County
Seminole County
Orange County
Osceola County
Lake County
Sumter County
Pasco County
Hernando County
Citrus County
Hillsborough County
Pinellas County
Polk County
Manatee County
Sarasota County
Charlotte County
Lee County
Collier County
Hendry County
Glades County
Okeechobee County
Martin County
St. Lucie County
Indian River County
Brevard County
Volusia County
Flagler County
Putnam County
Alachua County
Marion County
Levy County
Gilchrist County
Dixie County
Taylor County
Lafayette County
Suwannee County
Columbia County
Hamilton County
Madison County
Jefferson County
Leon County
Wakulla County
Franklin County
Gadsden County
Liberty County
Calhoun County
Gulf County
Bay County
Walton County
Okaloosa County
Santa Rosa County
Escambia County
Pensacola
Pensacola International Airport
Navarre
Fort Walton Beach
Destin
Eglin Air Force Base
Crestview
Milton
Jay
Century
Cantonment
Gulf Breeze
Pensacola Bay
Perdido Key
Florida-Alabama State Line
Apalachicola
Carrabelle
Port St. Joe
Panama City
Panama City Beach
Tyndall Air Force Base
Mexico Beach
Wewahitchka
Blountstown
Marianna
Chipley
Bonifay
Graceville
Chattahoochee
Quincy
Tallahassee
Tallahassee International Airport
Florida State University
Florida A&M University
Monticello
Madison
Perry
Steinhatchee
Cross City
Old Town
Chiefland
Williston
Cedar Key
Trenton
Bronson
Fanning Springs
Branford
Live Oak
Lake City
Lake City Gateway Airport
Jasper
White Springs
Jennings
Suwannee River
Ichetucknee Springs State Park
Fort White
Alachua
Gainesville
Gainesville Regional Airport
Newberry
Archer
Micanopy
Hawthorne
Interstate 10
Interstate 110
Interstate 295
Interstate 595
Interstate 75
Interstate 95
Interstate 4
Florida Turnpike
Veterans Expressway
Suncoast Parkway

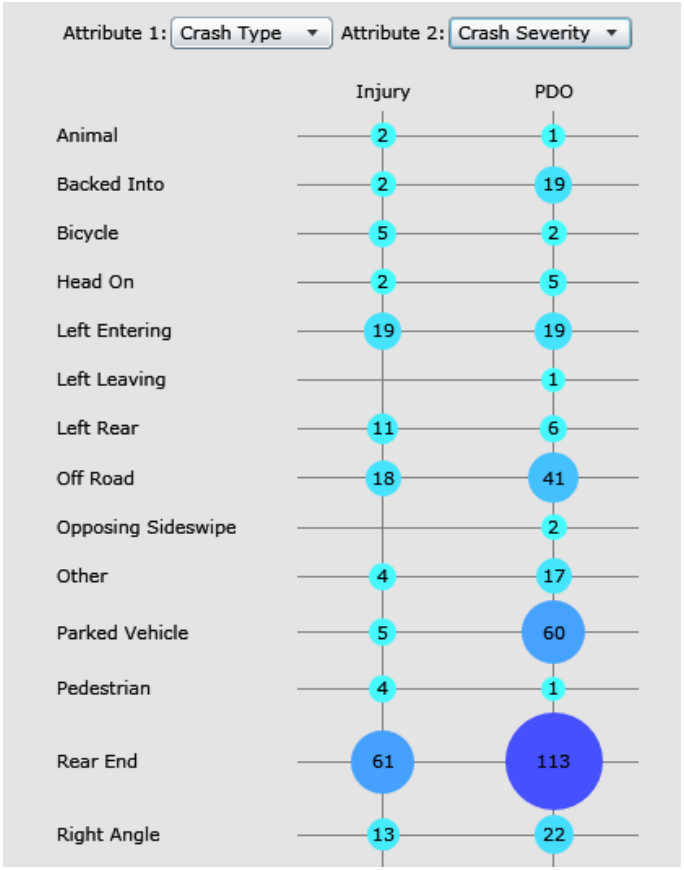
Restricted Tools
Signal 4 Analytics (S4A)

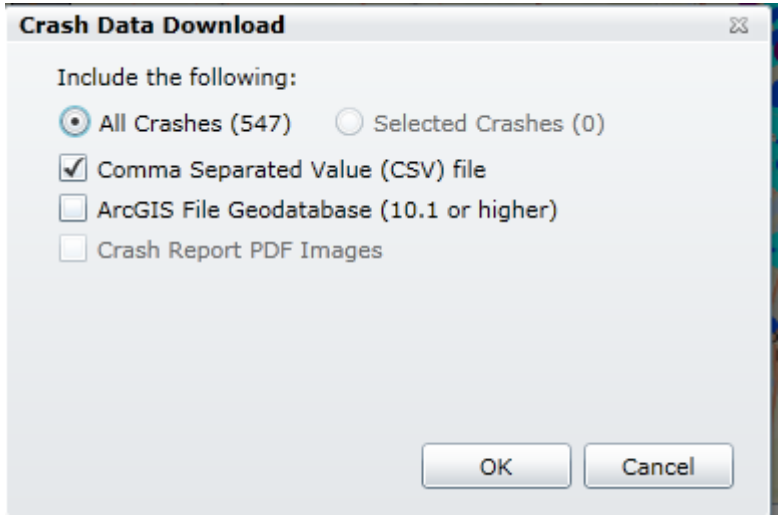


FDOT TRANSPORTATION SYMPOSIUM

Restricted Tools
Signal 4 Analytics (S4A)

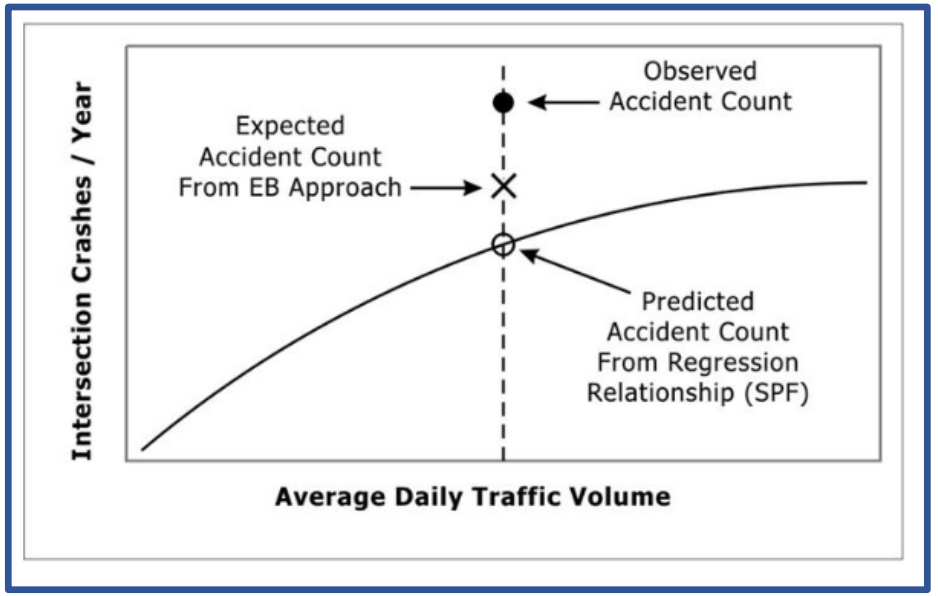






Traffic Safety Studies with Highway Safety Manual

- Traffic Safety Studies
  - Reactive safety studies
    - Based on historical crash accumulation of a specific crash type at a given location
  - Predictive safety studies
    - Predict a given location's potential crash frequency using Highway Safety Manual (HSM) models
    - Can be conducted on existing or planned facilities
- HSM Part C Procedure
  - Predicted average crash frequency
    - Computed from safety performance function (SPF)
  - Expected average crash frequency
    - Computed from combination of SPF and historical crash data



HSM Part C Crash Predictive Model

$$N_{predicted} = N_{spf}(CMF_1 * CMF_2 * \ldots * CMF_x)C_x$$

where:

$N_{predicted}$ = predicted crash frequency

N_{spf} = predicted average crash frequency for base conditions

CMF_x = crash modification factor for a given geometric or traffic control feature

C_x = local calibration factor.

FDOT TRANSPORTATION SYMPOSIUM

Table 5-1. Facility Types and Site Types Included in the HSM Predictive Method (Source: Highway Safety Manual, 2010, Table 3-2)

HSM Chapter	Undivided Roadway Segments	Divided Roadway Segments	Intersections			
			Stop Control on Minor Legs		Signalized	
			3-Leg	4-Leg	3-Leg	4-Leg
10. Rural Two-Lane highways	✓		✓	✓		✓
11. Rural Multi-Lane Highways[1]	✓	✓	✓	✓		✓
12. Urban and Suburban Aterials[2]	✓	✓	✓	✓	✓	✓

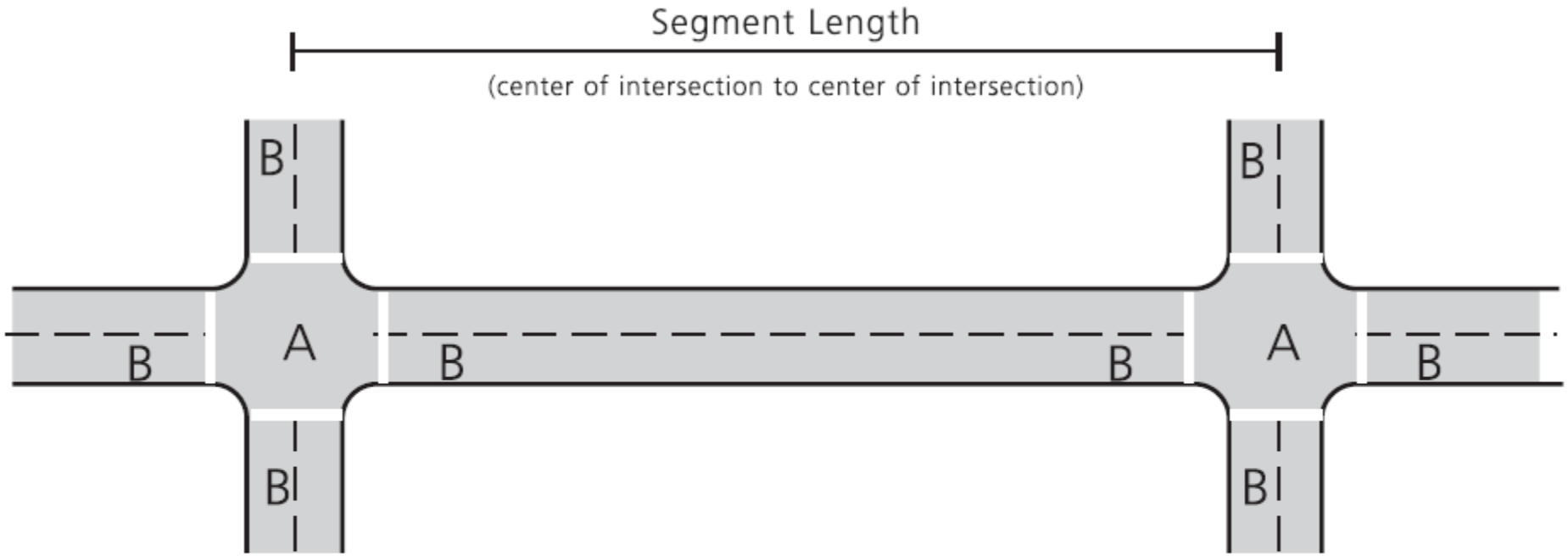
1. Methodology available for four lane divided and undivided. No methodology is currently available for six lane rural highways.
2. Methodology available for two lane undivided, three lane with center two way left turn lane, four lane divided and undivided, and five lane with center two way left turn lane. The methodology for six lane arterials is under development.

Data Collection for HSM Predictive Method

- Traffic volume and geometric data collection
  - Data for roadway segments
  - Data for intersections
- Historical crash data collection and collision diagram development
- Local conditions data collection and condition diagram development

Table 3 Site Characteristics and Traffic-Volume Variables Used in HSM Safety Predictions

Variables	Chapter 10 Rural Two-Lane, Two-Way Roads	Chapter 11 Rural Multilane Highways	Chapter 12 Urban and Suburban Arterials
Roadway Segments			
Area type (rural/suburban/urban)	✓	✓	✓
Annual average daily traffic volume	✓	✓	✓
Length of roadway segment	✓	✓	✓
Number of through lanes	✓	✓	✓
Lane width	✓	✓	
Shoulder width	✓	✓	
Shoulder type	✓	✓	
Presence of median (divided/undivided)		✓	✓
Median width		✓	
Presence of concrete median barrier		✓	
Presence of passing lane	✓		
Presence of short four-lane section	✓		
Presence of two-way left-turn lane	✓		✓
Driveway density	✓		
Number of major commercial driveways			✓
Number of minor commercial driveways			✓
Number of major residential driveways			✓
Number of minor residential driveways			✓
Number of major industrial/institutional driveways			✓
Number of minor industrial/institutional driveways			✓
Number of other driveways	✓		
Horizontal curve length	✓		
Horizontal curve radius	✓		
Horizontal curve superelevation	✓		
Presence of spiral transition	✓		
Grade	✓		
Roadside hazard rating	✓		
Roadside slope		✓	
Roadside fixed-object density			✓
Roadside fixed-object offset			✓
Percent of length with on-street parking			✓
Type of on-street parking			✓
Presence of lighting			✓
Intersections			
Area type (rural/suburban/urban)	✓	✓	✓
Major-road average daily traffic volume	✓	✓	✓
Minor-road average daily traffic volume	✓	✓	✓
Number of intersection legs	✓	✓	✓
Type of intersection traffic control	✓	✓	✓
Left-turn signal phasing (if signalized)			✓
Presence of right turn on red (if signalized)			✓
Presence of red-light cameras			✓
Presence of median on major road		✓	
Presence of major-road left-turn lane(s)	✓	✓	✓
Presence of major-road right-turn lane(s)	✓	✓	✓
Presence of minor-road left-turn lane(s)		✓	
Presence of minor-road right-turn lane(s)		✓	
Intersection skew angle	✓	✓	
Intersection sight distance	✓	✓	
Terrain (flat vs. level or rolling)		✓	
Presence of lighting		✓	✓



A All crashes that occur within this region are classified as intersection crashes.

B Crashes in this region may be segment or intersection related, depending on the characteristics of the crash.

Figure A-1. Definition of Roadway Segments and Intersections

FDOT TRANSPORTATION SYMPOSIUM

Traffic Volume and Geometry Data for Roadway Segments

- HSM Chapter 10 - Rural two-lane roadways
  - Data required to compute base crash prediction
    - Roadway Annual Average Daily Traffic (AADT)
    - Homogeneous roadway segment length
  - Data required to computer crash modification factors (CMF)
    - Lane width
    - Should width and type
    - Horizontal curvature and super-elevation
    - Grade level
    - Driveway density
    - Center rumble strips
    - Passing lane and two-way left-turn lane
    - Roadside design
    - Presence of lighting and automated speed enforcement

Traffic Volume and Geometry Data for Intersections

- HSM Chapter 10 - Rural two-lane roads
  - Data required to compute base crash prediction
    - Intersection configuration
    - Major and minor road AADT
  - Data required to compute CMF
    - Intersection skew angle
    - Number of approaches with left-turn lanes
    - Number of approaches with right-turn lanes
    - Intersection lighting

Data Collection Forms in Manual on Uniform Traffic Studies (MUTS)

Figure 5-1. Rural Two-Lane Roadway Segment Data Collection (Form No. 750-020-05a)

State of Florida Department of Transportation — Form 750-020-05-a, TRAFFIC ENGINEERING, February 2015

DATA COLLECTION RURAL TWO-LANE ROADS - SEGMENTS

General Analysis Information		Site Information	
Segment Number	1	Roadway Name	SR 50
Segment Limits	CR 757 TO C 478 A	Location	Sumter County
Analysis Year	2014	Project Number	11730.36

Notes

1) A roadway must have homogeneous characteristics in order to be analyzed as a single segment. If any characteristics change, including any of the data inputs in this spreadsheet, then the roadway must be analyzed as separate segments and this spreadsheet should be copied and filled out for each analysis ssegment independently.
2) Values in this spreadsheet may be copied and pasted directly into NCHRP 17-38 spreadsheets which are available from FDOT Safety Office upon request. Note that only values and not formulas should be copied.

Field Data Collection

Length of segment, L (mi)		0.3
AADT (veh/day)	$AADT_{MAX}$ = 17,800 (veh/day)	7,100
Lane width (ft)		12
Shoulder width (ft)		Right Shld: 4 / Left Shld: 4
Shoulder type		Right Shld: Paved / Left Shld: Paved
Length of horizontal curve (mi)		0.3
Radius of curvature (ft)		1,400
Spiral transition curve (present/not present)		Not Present
Superelevation variance (ft/ft)		0
Grade (%)		0
Driveway density (driveways/mile)		7
Centerline rumble strips (present/not present)		Not Present
Passing lanes [present (1 lane) /present (2 lane) / not present)]		Not Present
Two-way left-turn lane (present/not present)		Not Present
Roadside hazard rating (1-7 scale) - See HSM Chapter 13, Page 13-59		5
Segment lighting (present/not present)		Not Present
Auto speed enforcement (present/not present)		Not Present
Calibration Factor, Cr		1.00

Source: NCHRP 17-38 HSM Spreadsheets

Figure 5-5. Rural Two-Lane Roadway Intersection Data Collection (Form No. 750-020-05e)

State of Florida Department of Transportation — Form 750-020-05-e, TRAFFIC ENGINEERING, February 2015

DATA COLLECTION RURAL TWO-LANE ROADWAYS - INTERSECTIONS

General Analysis Information		Site Information	
Intersection Number	1	Roadway Name	SR 50
Intersection Name	SR 472 and SR 50	Location	Sumter County
Analysis Year	2014	Project Number	11730.36

Notes

1) Values in this spreadsheet may be copied and pasted directly into NCHRP 17-38 spreadsheets which are available from FDOT Safety Office upon request. Note that only values, and not formulas should be copied.
2) 3ST= 3 leg stop control, 4ST = 4 leg stop control, 4SG = 4 leg signalized

Field Data Collection

Intersection type (3ST, 4ST, 4SG)		4SG
$AADT_{major}$ (veh/day)	$AADT_{MAX}$ = 25,200 (v/day)	7,500
$AADT_{minor}$ (veh/day)	$AADT_{MAX}$ = 12,500 (v/day)	1,000
Intersection skew angle (degrees) [If 4ST, does skew differ for minor legs?]		Skew for Leg 1 (All): 0 / Skew for Leg 2 (4ST only): 0
Number of signalized or uncontrolled approaches with a left-turn lane (0, 1, 2, 3, 4)		0
Number of signalized or uncontrolled approaches with a right-turn lane (0, 1, 2, 3, 4)		0
Intersection lighting (present/not present)		Not Present
Calibration Factor, C		1.50

Source: NCHRP 17-38 HSM Spreadsheets

FDOT TRANSPORTATION SYMPOSIUM

Traffic Volume and Geometry Data for Roadway Segments

- HSM Chapter 11 - Rural multi-lane roads
  - Data required to compute base crash prediction
    - Roadway design - divided or undivided
    - Roadway AADT
    - Homogeneous roadway segment length
  - Data required to compute CMF
    - Lane width
    - Shoulder width and type (undivided roads)
    - Right shoulder width (divided roads)
    - Side-slope range (undivided roads)
    - Median with (divided roads)
    - Presence of light and automated speed enforcement

Traffic Volume and Geometry Data for Intersections

- HSM Chapter 11- Rural multi-lane roadways
  - Data required to compute base crash prediction
    - Intersection configuration
    - Major and minor road AADT
  - Data required to compute CMF
    - Intersection skew angle
    - Number of non-stop approaches with left-turn lanes
    - Number of non-stop approached with right-turn lanes
    - Intersection lighting

Data Collection Forms in Manual on Uniform Traffic Studies (MUTS)

Figure 5-2. Rural Multi-Lane Roadway Segment Data Collection (Form No. 750-020-05b)

State of Florida Department of Transportation — TRAFFIC ENGINEERING — February 2015

DATA COLLECTION RURAL MULTI-LANE ROADWAYS

General Analysis Information		Site Information	
Segment Number	1	Roadway Name	SR 50
Segment Limits	CR 757 TO C 478 A	Location	Sumter County
Analysis Year	2014	Project Number	11730.36

Notes

1) A roadway must have homogeneous characteristics in order to be analyzed as a single segment. If any characteristics change, including any of the data inputs in this spreadsheet, then the roadway must be analyzed as separate segments and this spreadsheet should be copied and filled out for each analysis ssegment independently.
2) Values in this spreadsheet may be copied and pasted directly into NCHRP 17-38 spreadsheets which are available from FDOT Safety Office upon request. Note that only values and not formulas should be copied.

Field Data Collection

Roadway type (divided / undivided)		Divided
Length of segment, L (mi)		0.3
AADT (veh/day)	$AADT_{MAX}$ = 89,300 (Divided) 33,200 (Undivided) (veh/day)	7,100
Lane width (ft)		12
Shoulder width (ft) - right shoulder width for divided [if differ for directions of travel, use average width]		4
Shoulder type - right shoulder type for divided		Paved
Median width (ft) - for divided only (if analyzing an undivided segment, place the text "Not Applicable" in the input box)		20
Side Slopes - for undivided only (if analyzing a divided segment, place the text "Not Applicable" in the input box)		1:5
Lighting (present/not present)		Not Present
Auto speed enforcement (present/not present)		Not Present
Calibration Factor, Cr		1.10

Source: NCHRP 17-38 HSM Spreadsheets

Figure 5-6. Rural Multi-Lane Roadway Intersection Data Collection (Form No. 750-020-05f)

State of Florida Department of Transportation — TRAFFIC ENGINEERING — February 2015

DATA COLLECTION RURAL MULTI-LANE ROADWAYS - INTERSECTIONS

General Analysis Information		Site Information	
Intersection Number	1	Roadway Name	SR 50
Intersection Name	SR 472 and SR 50	Location	Sumter County
Analysis Year	2014	Project Number	11730.36

Notes

1) Values in this spreadsheet may be copied and pasted directly into NCHRP 17-38 spreadsheets which are available from FDOT Safety Office upon request. Note that only values, and not formulas should be copied.
2) 3ST= 3 leg stop control, 4ST = 4 leg stop control, 4SG = 4 leg signalized

Field Data Collection

Intersection type (3ST, 4ST, 4SG)		4SG
$AADT_{major}$ (veh/day)	$AADT_{MAX}$ = 43,500 (v/day)	7,500
$AADT_{minor}$ (veh/day)	$AADT_{MAX}$ = 18,500 (v/day)	1,500
Intersection skew angle (degrees)		0
Number of non-STOP-controlled approaches with left-turn lanes (0, 1, 2)		0
Number of non-STOP-controlled approaches with right-turn lanes (0, 1, 2, 3, or 4)		0
Intersection lighting (present/not present)		Not Present
Calibration Factor, C_i		1.50

Source: NCHRP 17-38 HSM Spreadsheets

FDOT TRANSPORTATION SYMPOSIUM

Traffic Volume and Geometry Data for Roadway Segments

- HSM Chapter 12 - Urban and suburban arterials
  - Data required to compute base crash prediction
    - Roadway type
    - Roadway AADT
    - Homogeneous roadway segment length
  - Data required to compute CMF
    - Type of street parking
    - Proportion of curb length with on-street parking
    - Roadside fixed objects density/offset to roadside fixed objects
    - Median width
    - Presence of lighting and automated speed enforcement

Traffic Volume and Geometry Data for Intersections

- HSM Chapter 12 - Urban and Suburban Arterials
  - Data required to compute base crash prediction
    - Intersection configuration
    - Major and minor road AADT
    - All daily pedestrian crossing volumes (signalized intersections)
    - Maximum number of lanes crossed by pedestrians (signalized intersections)
  - Data required to compute CMF
    - Unsignalized intersection
      - ✓ Number of major road approached with left-turn lanes
      - ✓ Number of major road approaches with right-turn lanes
    - Signalized intersection
      - ✓ Number of approaches with left-turn lanes/right-turn lanes/RTOR prohibited
      - ✓ Type of left-turn signal phasing
      - ✓ Presence of lighting and intersection red-light camera

Data Collection Forms in Manual on Uniform Traffic Studies (MUTS)

Figure 5-3. Urban/Suburban Arterial Segment Data Collection (Form No. 750-020-05c)

Form 750-020-05c
TRAFFIC ENGINEERING
February 2015

State of Florida Department of Transportation

DATA COLLECTION URBAN/SUBURBAN ARTERIALS - SEGMENTS

General Analysis Information		Site Information	
Segment Number	1	Roadway Name	SR 423
Segment Limits	Bennet Ave to US 17/92	Location	Winter Park
Analysis Year	2014	Project Number	11730.42

Notes

1) A roadway must have homogeneous characteristics in order to be analyzed as a single segment. If any characteristics change, including any of the data inputs in this spreadsheet, then the roadway must be analyzed as separate segments and this spreadsheet should be copied and filled out for each analysis ssegment independently.
2) Values in this spreadsheet may be copied and pasted directly into NCHRP 17-38 spreadsheets which are available from FDOT Safety Office upon request. Note that only values and not formulas should be copied.
3) 2U = 2 lane undivided, 3T = 3 lane with center left turn lane, 4U = 4 lane undivided, 4D = 4 lane divided, 5T = 5 lane with center left turn lane

Field Data Collection		
Roadway type (2U, 3T, 4U, 4D, 5T)		4D
Length of segment, L (mi)		0.25
AADT (veh/day)	$AADT_{MAX}$ = 66,000 (veh/day)	48,000
Type of on-street parking (none/parallel/angle)		None
Proportion of curb length with on-street parking		0
Median width (ft) - for divided only		20
Lighting (present / not present)		Present
Auto speed enforcement (present / not present)		Not Present
Major commercial driveways (number)		5
Minor commercial driveways (number)		1
Major industrial / institutional driveways (number)		0
Minor industrial / institutional driveways (number)		0
Major residential driveways (number)		0
Minor residential driveways (number)		0
Other driveways (number)		0
Speed Category		Posted Speed Greater than 30 mph
Roadside fixed object density (fixed objects / mi)		30
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]		15
Calibration Factor, Cr		1.62

Source: NCHRP 17-38 HSM Spreadsheets

Figure 5-7. Urban/Suburban Roadway Intersection Data Collection (Form No. 750-020-05g)

Form 750-020-05g
TRAFFIC ENGINEERING
February 2015

State of Florida Department of Transportation

DATA COLLECTION URBAN/SUBURBAN ARTERIALS - INTERSECTIONS

General Analysis Information		Site Information	
Intersection Number	1	Roadway Name	SR 50
Intersection Name	SR 472 and SR 50	Location	Sumter County
Analysis Year	2014	Project Number	11730.36

Notes

1) Values in this spreadsheet may be copied and pasted directly into NCHRP 17-38 spreadsheets which are available from FDOT Safety Office upon request. Note that only values, and not formulas should be copied.
2) 3ST= 3 leg stop control, 3SG= 3 leg signalized, 4ST = 4 leg stop control, 4SG = 4 leg signalized

Field Data Collection		
Intersection type (3ST, 3SG, 4ST, 4SG)		4ST
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 46,800 (veh/day)	25,000
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 5,900 (veh/day)	1,500
Intersection lighting (present/not present)		Present
Calibration factor, C_i		1.00
Data for unsignalized intersections only:		--
Number of major-road approaches with left-turn lanes (0,1,2)		0
Number of major-road approaches with right-turn lanes (0,1,2)		0
Data for signalized intersections only:		--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		2
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		2
Type of left-turn signal phasing for Leg #1		Protected / Permissive
Type of left-turn signal phasing for Leg #2		Protected / Permissive
Type of left-turn signal phasing for Leg #3		Not Applicable
Type of left-turn signal phasing for Leg #4 (if applicable)		Not Applicable
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0
Intersection red light cameras (present/not present)		Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only		10
Maximum number of lanes crossed by a pedestrian ($n_{lanes,c}$)		0
Number of bus stops within 300 m (1,000 ft) of the intersection		0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Present
Number of alcohol sales establishments within 1,000 ft of the intersection		0

Source: NCHRP 17-38 HSM Spreadsheets

FDOT TRANSPORTATION SYMPOSIUM

Historical Crash Data

- Historical Crash Data
  - FDOT Crash Analysis Reporting (CAR) system for historical crash data
    - Permission required for access to FDOT CAR system
  - General format of police reports changed in 2011
    - Different values assigned to harmful events
  - FHP uses single form for long-form and short-form crashes after 2011
    - Short-form may still be used by local agencies
- Empirical Bayesian (EB) Method
  - Calculate expected crashes based on predicted and observed crashes with EB method
  - Equations in the Highway Safety Manual (HSM), Part C, Appendix A

Collision Diagrams

- Not required for HSM Part C crash predictive method
- Benefits for collision diagram
  - Provides a visual representation of crash patterns
  - Helps identify crash clusters by crash type
  - A valuable tool for determining countermeasures
- Software program available for developing collision diagrams
- Spot check automated collision diagrams for crash spatial location

Figure 5-9. Collision Diagram for Segments (Form No. 750-020-05i)

State of Florida Department of Transportation

Form 750-020-05-I
TRAFFIC ENGINEERING
February 2015

COLLISION DIAGRAM - SEGMENT

General Analysis Information		Site Information	
Roadway ID Number	75190000		
Nearby Intersection Name	US 17/92 and Bennet Ave	Location	Winter Park
Analysis Years	2010-2014	Project Number	11730.42

Notes

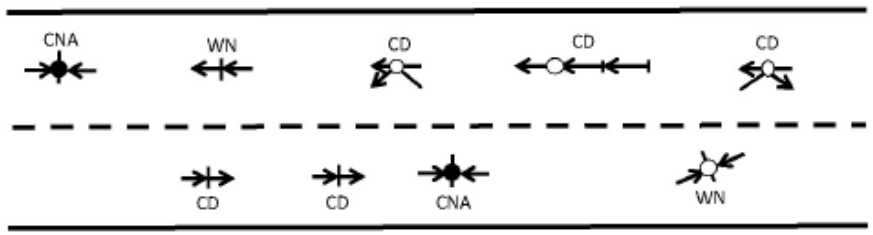
1) Collision diagram symbology illustrated in Figure 5-4 of Chapter 5 of the Highway Safety Manual should be used.

2) The legend may be used to clarify symbology that identifies total number of crashes, injuries, fatalities, pavement conditions, etc.

Field Data Collection

Legend

C Dry Clear	L Dawn/Dusk	Head-On	Sideswipe
W Wet	D Day	Angle	Injury
N Night	A Alcohol/Drug-Related	Rear-End	Fatal



SR 423 (Lee Road) — Street Name

9.6 — Approximate Milepost

Total Intersection Crashes per the Crash Summary	
Total Crashes Graphed on this Page	9
Total Injury Crashes	4
Total Fatal Crashes	2
Total PDO Crashes	3

Source: Adapted from HSM Figure 5-3

Figure 5-10. Collision Diagram for Intersections (Form No. 750-020-05)

State of Florida Department of Transportation

Form 750-020-05
TRAFFIC ENGINEERING
February 2015

COLLISION DIAGRAM - INTERSECTION

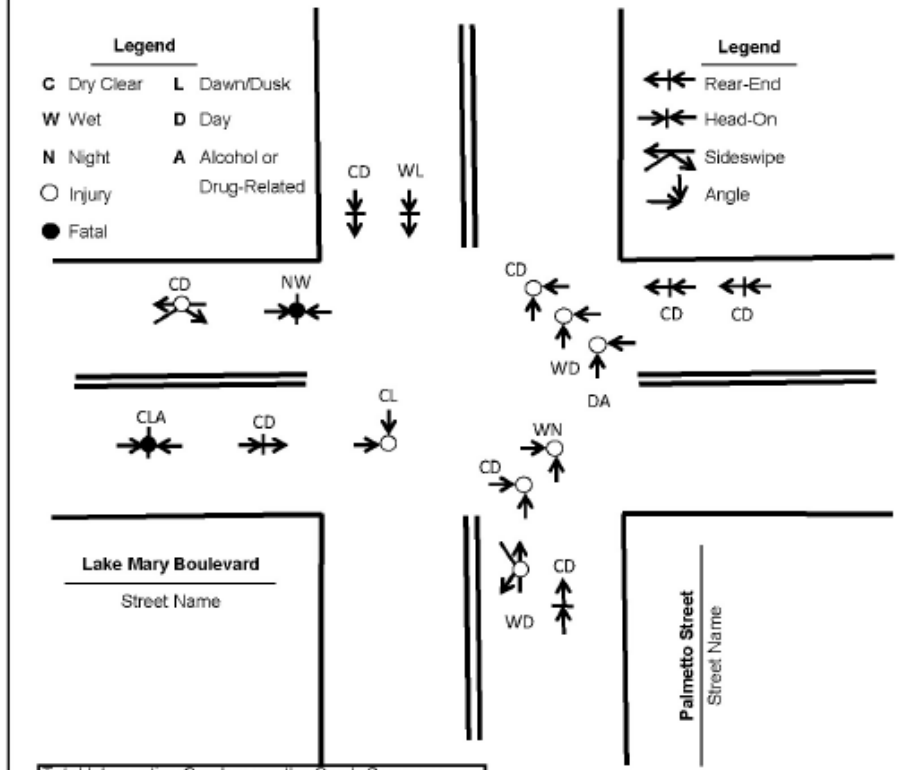
General Analysis Information		Site Information	
Intersection Number	1		
Intersection Name	Palmetto St. and Lake Mary Blvd.	Location	Lake Mary
Analysis Years	2010-2014	Project Number	17644

Notes

1) Collision diagram symbology illustrated in Figure 5-4 of Chapter 5 of the Highway Safety Manual should be used.

2) The legend may be used to clarify symbology that identifies total number of crashes, injuries, fatalities, pavement conditions, etc.

Field Data Collection



Total Intersection Crashes per the Crash Summary	
Total Crashes Graphed on this Page	16
Total Injury Crashes	8
Total Fatal Crashes	2
Total PDO Crashes	6

Source: Adapted from HSM Figure 5-4

FDOT TRANSPORTATION SYMPOSIUM

Collision Summaries

- Total crashes used for HSM crash predictive analysis
- More detailed crash summaries needed for countermeasure selection
  - Crash type and severity
  - Lighting and day/light conditions
  - Date and weather
  - Road surface conditions
  - First harmful event
  - Contributing cause
  - Other categories as needed

Figure 5-11. Collision Summary (Form No. 750-020-06)

Form 750-020-06
TRAFFIC ENGINEERING
February 2015

State of Florida Department of Transportation

COLLISION SUMMARY

Gerneral Information

Section/Roadway ID:	75006	State Road:	426 (Fairbanks Ave)
Intersecting Route:	Clay Street	Study Period:	6/1/12 To: 5/31/14
Milepost:	0.588	Data by:	JIW
County:	Orange	Date:	Tuesday, July 01, 2014

No.	Date	Day	Time	Severity		Property Damage	Crash Type	Day / Night	Wet / Dry	Contributing Cause
				Fatal	Injury					
1	9/13/12	Thu	03:51 PM	0	0	$3,000	Sideswipe	DAY	DRY	Improper Lane Change
2	9/20/12	Thu	07:28 PM	0	2	$10,000	Rear End	NIGHT	DRY	Careless Driving
3	3/7/13	Thu	05:30 PM	0	0	$250	Rear End	DAY	DRY	Careless Driving
4	6/14/13	Fri	12:13 PM	0	1	$0	Rear End	DAY	DRY	Careless Driving
5		Sat	07:52 PM	0	0	$0	Rear End	NIGHT	DRY	Careless Driving
6	9/7/13	Sat	02:19 PM	0	0	$2,000	Left Turn	DAY	DRY	Failed to Yield ROW
7	11/9/13	Sat	12:59 PM	0	2	$11,500	Rear End	DAY	DRY	Careless Driving
8	12/10/13	Tue	05:30 PM	0	0	$750	Sideswipe	DAY	DRY	Improper Lane Change
9	2/1/14	Sat	05:59 PM	0	2	$7,000	Angle	DAY	WET	Failed to Yield ROW
10	2/12/14	Wed	05:50 PM	0	0	$2,000	Rear End	DAY	WET	Careless Driving
11	4/11/14	Fri	10:47 AM	0	0	$1,000	Backed Into	DAY	DRY	Careless Driving
12	5/7/14	Wed	09:40 AM	0	0	$750	Backed Into	DAY	DRY	Careless Driving
13	5/8/14	Thu	05:40 PM	0	1	$5,750	Sideswipe	DAY	DRY	Improper Lane Change
TOTAL				0	8	$ 44,000				

Total No.	Fatal	Injury	PDO	Rear End	Head-on	Angle	Left Turn	Right Turn	Sideswipe	Backed Into	Bicycle / Pedestrian	Other
13	0	5	11	6	0	1	1	0	3	2	0	0
PERCENT	0%	38%	85%	46%	0%	8%	8%	0%	23%	15%	0%	0%

Contrib. Cause	Day	Night	PAVEMENT CONDITIONS			Exceeded Speed	DUI	Careless Driving	Improper Lane Change	Failed to Yield ROW	Disregarded Control Devices	Other
			WET	DRY	Unknown							
TOTAL	11	2	2	11	0	0	0	8	3	2	0	0
PERCENT	85%	15%	15%	85%	0%	0%	0%	62%	23%	15%	0%	0%

Total Vehicles Entering/ADT: Collision Rate: PER M.E.V.

FDOT TRANSPORTATION SYMPOSIUM

Condition Diagram

- Condition diagram to show the intersection and conditions within the surrounding area
- Necessary to capture field conditions
- Items for condition diagram
  - Intersection alignment
  - Buildings
  - Sidewalks
  - Trees
  - Lighting poles
  - Stop signs
  - Other items as needed

Figure 6-2. Condition Diagram (Form No. 750-020-04)

State of Florida Department of Transportation
CONDITION DIAGRAM

Form 750-020-04
TRAFFIC ENGINEERING
February 2015

General Analysis Information

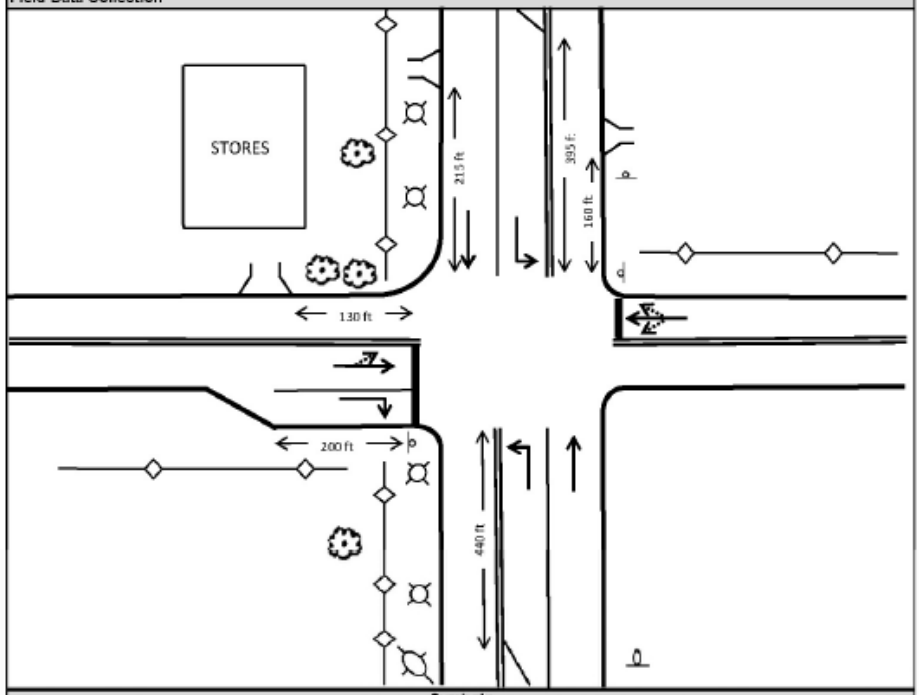
Roadway ID Number	87150000		
Nearby Intersection Name	SW 192nd Street	Location	Miami-Dade County
Analysis Years	2008-2012	Project Number	11879.25

Notes

1) Condition diagrams are intended to capture detailed information that may not be easily communicated in a table format.

2) The legend may be used to clarify symbology used.

Field Data Collection



Symbols

TREES
DRIVEWAY
LIGHT POLE
BUILDING
POWER POLE
SIGN (1 POST)
LANE MOVEMENT
SHARED THRU AND PERMISSIVE TURN LANE

FDOT Design Standards Index No. 002 provides additional Standardized Symbols

FDOT TRANSPORTATION SYMPOSIUM

Links

- FIRES (Florida's Integrated Report Management System)
  - *https://www.firesportal.com/*
- Traffic Crash Facts
  - https://firesportal.com/Pages/Public/DHSMVDocuments.aspx
- CAR (Crash Analysis Reporting)
  - https://fdotwp2.dot.state.fl.us/CrashAnalysisReporting/Account/Login
- Shapefiles
  - https://www3.dot.state.fl.us/unifiedbasemaprepository/
- SSOGis
  - *https://fdotewp1.dot.state.fl.us/ssogis/*
- GIS@FDOT, ArcGIS Online
  - http://fdot.maps.arcgis.com
- Signal 4 Analytics
  - *https://s4.geoplan.ufl.edu/*
- FARS (Fatality Analysis Reporting System)
  - *https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars*

Other Resources

- FDOT State Safety Office
  - http://www.fdot.gov/safety/
- Crash Data Academy Webinars
  - http://www.fdot.gov/safety/11A-SafetyEngineering/crash%20data%20academy/academy.shtm
- FLHSMV general reports and statistics
  - https://www.flhsmv.gov/resources/general-reports/
- FLHSMV crash and citation reports and statistics
  - https://www.flhsmv.gov/resources/crash-citation-reports/

Questions?

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