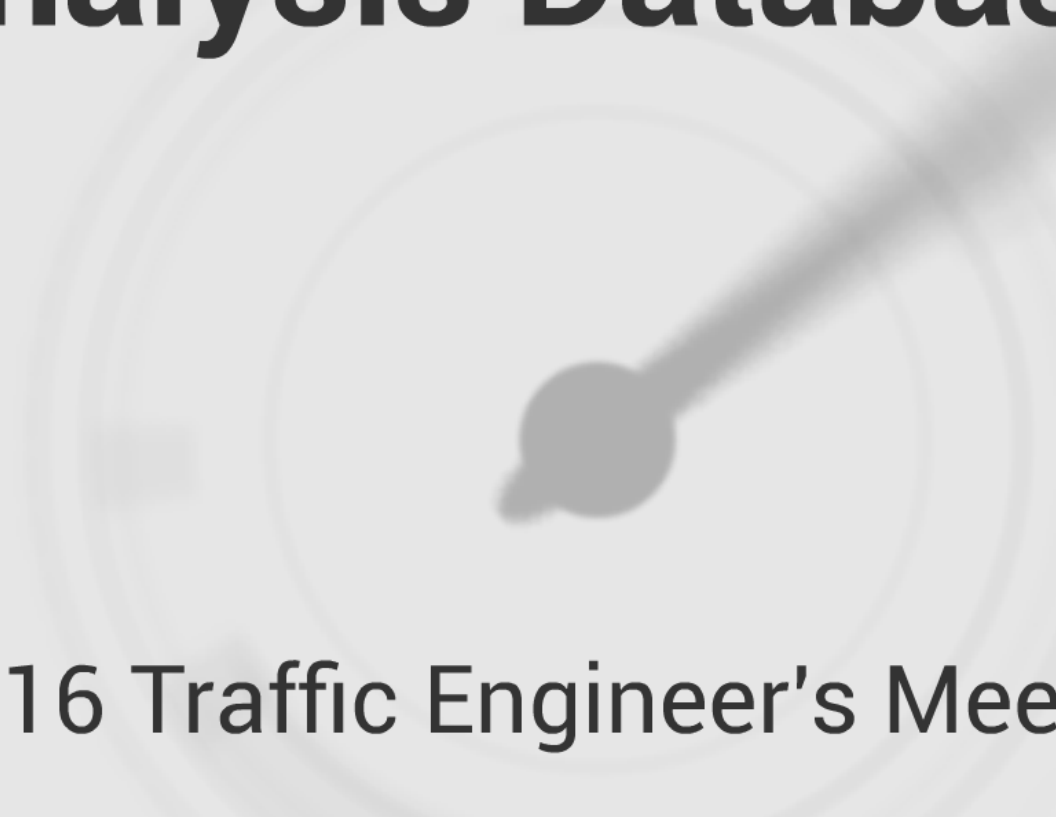


Speed and Queue Analysis Database



2016 Traffic Engineer's Meeting

Thomas Montz, PE, PTOE
Arcadis

**SPEED
LIMIT?**

NO

SPEED
LIMIT
9½

SPEED
BUMP
AHEAD



SPEED
LIMIT
80

NIGHT
65

TRUCK
SPEED
LIMIT
70
NIGHT
65

278

**SPEED
LIMIT**



Speed Study Standards

Policy





MUTCD

- Should be within 5 mph of the 85th percentile speed

EDSM VI.1.1.1


- Speed limit purpose
- Speed zone criteria
- Speed zone length

Speed Study Report

- Roadway characteristics 
- Reason for zoning study
- Current / Suggested speed zone on map
- Speed tabulation form 
- Cumulative frequency curve 
- Crash data tables 

Data Collection

Radar:

- Manually obtain speed sample from 100 vehicles (or 2 hours)
- Avoid being detected by motorist 

Pneumatic:

- Place tubes and counters to obtain data later
- Not reliable near intersections
- Free flow vehicles?



Policy

MUTCD

- Should be within 5 mph of the 85th percentile speed

EDSM VI.1.1.1

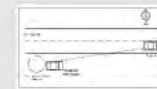
- Speed limit purpose
- Speed zone criteria
- Speed zone length



Data Collection

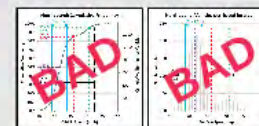
Radar:

- Manually obtain speed sample from 100 vehicles (or 2 hours)
- Avoid being detected by motorist

A table with multiple columns and rows, likely representing a data collection sheet for radar speed measurements. The columns are not clearly labeled but appear to include fields for time, location, and speed.

Pneumatic:

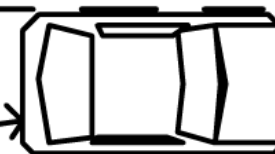
- Place tubes and counters to obtain data later
- Not reliable near intersections
- Free flow vehicles?



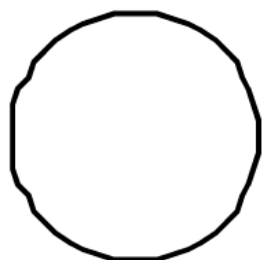


North

Main Street



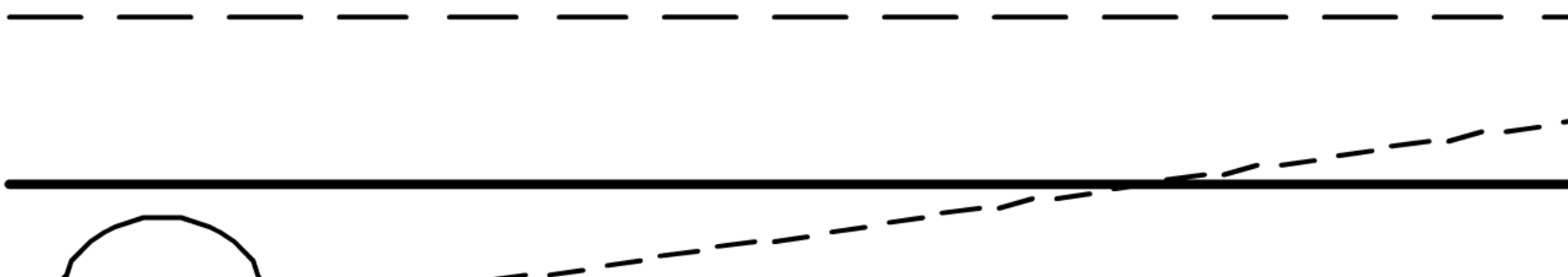
Target Vehicle



Tree used to conceal
observer



**Observer
With Radar**



Date: MM/DD/YY
 Name: John Doe
 Location: 6th Street and Main Street
 Speed Limit: 35 mph

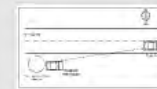
Start Time: 0700
 End Time: 0725
 Down Time: N.A.
 Weather: Clear

Speed	Passenger Vehicles		Buses		Trucks		Total
	Record	No.	Record	No.	Record	No.	
15							
16							
17							
18							
19							
20							
21		2					2
22						1	1
23		1				2	3
24		4					4
25		1					1
26		3					3
27		2				1	3
28		2					2
29	 	5		2			7
30		2				1	3
31		3					3
32	 	5					5
33		3					3
34		3		1		1	5
35	 	6				2	8
36	 	6					6
37	 	6				2	8
38		4					4
39	 	6					6
40		4					4
41	 	5				2	7
42		3					3
43		2					2
44		4					4
45		2					2
46							
47		1					1
48							
49							
50							
Total							100

Data Collection

Radar:

- Manually obtain speed sample from 100 vehicles (or 2 hours)
- Avoid being detected by motorist

A table with multiple rows and columns, likely representing data collection results. The table is mostly blank with some faint text in the header.

Pneumatic:

- Place tubes and counters to obtain data later
- Not reliable near intersections
- Free flow vehicles?

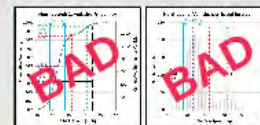




Figure 2.7. Pneumatic Road Tubes

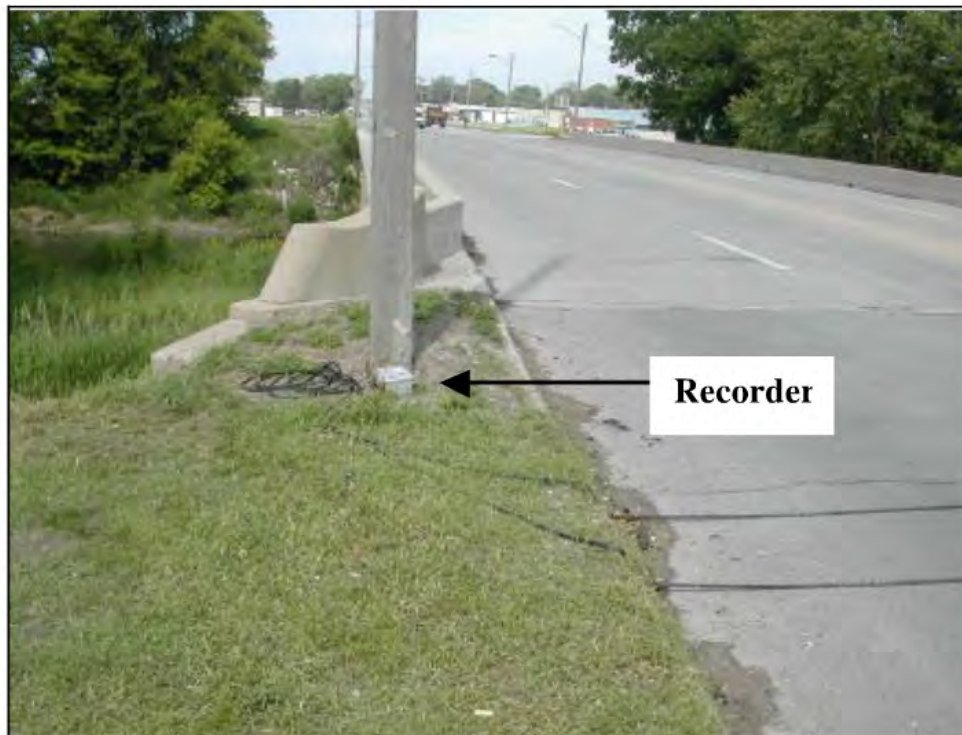
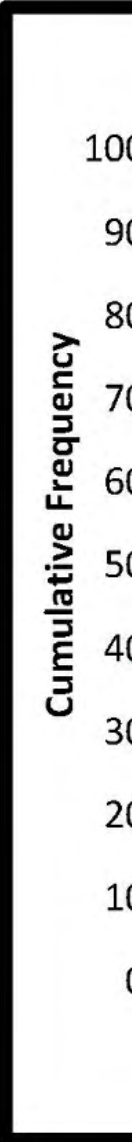


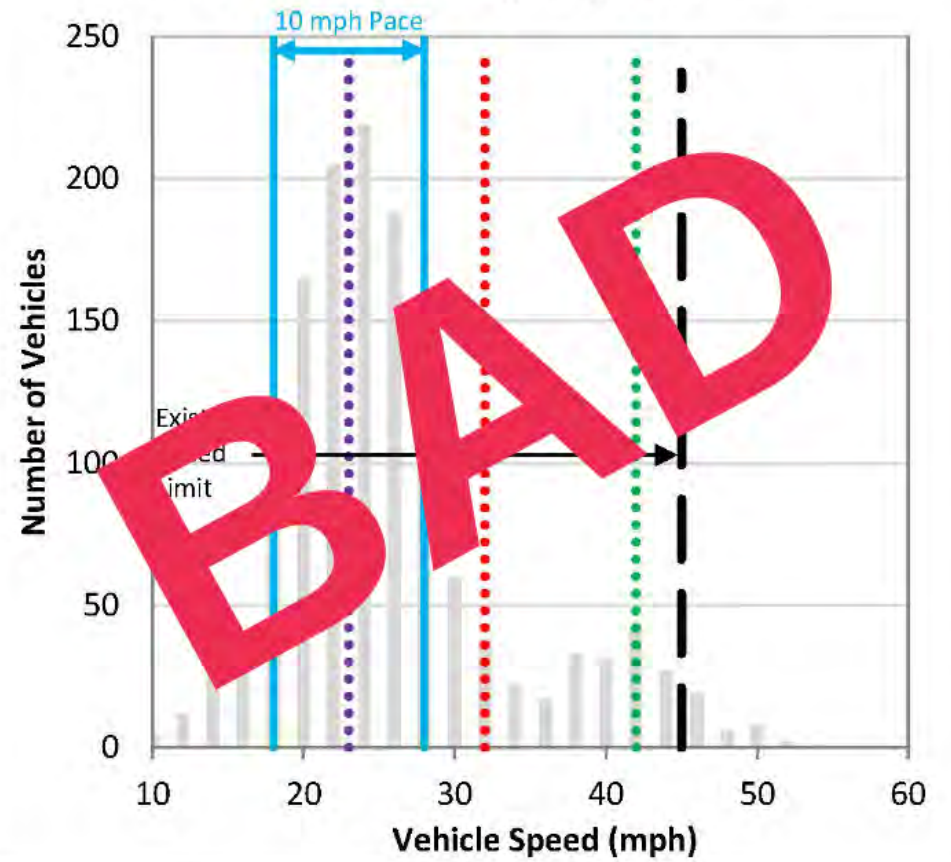
Figure 2.8. Road Tubes and Recorder



Northbound: Cumulative Frequency







Northbound: Vehicles per Speed Interval





Speed Study Report

- Roadway characteristics 
- Reason for zoning study
- Current / Suggested speed zone on map
- Speed tabulation form 
- Cumulative frequency curve 
- Crash data tables 

Speed Study Retainer Contract

- **Covering all Interstates throughout the state**
- **Summarize crash history**
- **Verify geometric attributes & speed limits**
- **Oversee data collection**
- **Analyze data**
- **Develop GIS database to store data**

East Baton Rouge Parish- Site 5

Date: 8/26/2015 Day: Wednesday
 Time: 10:00 AM - 2:00 PM Speed: 60
 Direction: Northbound Location: Mile Point 8.3
 Headway Analyzed: > 5.0 seconds

Date: 8/26/2015 Day: Wednesday
 Time: 10:00 AM - 2:00 PM Speed: 60
 Direction: Southbound Location: Mile Point 8.3
 Headway Analyzed: > 5.0 seconds

Speed (mph)	Automobiles	Buses	Light Trucks	Heavy Trucks	Total	Cumulative Vehicle Total	Cumulative %
20 To 22	0	0	0	0	0	0	0.0%
22 To 24	0	0	0	0	0	0	0.0%
24 To 26	0	0	0	0	0	0	0.0%
26 To 28	0	0	0	0	0	0	0.0%
28 To 30	0	0	0	0	0	0	0.0%
30 To 32	0	0	0	0	0	0	0.0%
32 To 34	0	0	0	0	0	0	0.0%
34 To 36	0	0	0	0	0	0	0.0%
36 To 38	0	0	0	0	0	0	0.0%
38 To 40	0	0	0	0	0	0	0.0%
40 To 42	0	0	0	0	0	0	0.0%
42 To 44	0	0	0	0	0	0	0.0%
44 To 46	0	0	0	0	0	0	0.0%
46 To 48	1	0	0	0	1	1	0.1%
48 To 50	1	0	0	1	2	3	0.3%
50 To 52	5	1	0	1	7	10	1.0%
52 To 54	11	1	1	7	20	30	3.1%
54 To 56	17	3	2	8	31	61	6.3%
56 To 58	45	2	6	8	62	123	12.7%
58 To 60	72	5	5	21	103	226	23.3%
60 To 62	105	0	8	22	136	362	37.3%
62 To 64	105	2	7	20	134	496	51.1%
64 To 66	91	1	5	12	109	605	62.3%
66 To 68	107	0	3	11	121	726	74.8%
68 To 70	61	0	2	2	65	791	81.5%
70 To 72	57	0	0	2	59	850	87.5%
72 To 74	40	0	1	0	41	891	91.8%
74 To 76	24	0	2	0	26	917	94.4%
76 To 78	24	0	1	0	25	942	97.0%
78 To 80	11	1	1	1	14	956	98.5%
80 To 82	5	0	0	0	5	961	99.0%
82 To 84	3	0	0	0	3	964	99.3%
84 To 86	2	0	0	0	2	966	99.5%
86 To 88	2	0	0	0	2	968	99.7%
88 To 90	1	0	0	0	1	969	99.8%
90 To 92	2	0	0	0	2	971	100.0%
92 To 94	0	0	0	0	0	971	100.0%
94 To 96	0	0	0	0	0	971	100.0%
96 To 98	0	0	0	0	0	971	100.0%
98 To 100	0	0	0	0	0	971	100.0%
Total	792	16	45	118	971		

Speed (mph)	Automobiles	Buses	Light Trucks	Heavy Trucks	Total	Cumulative Vehicle Total	Cumulative %
20 To 22	0	0	0	0	0	0	0.0%
22 To 24	0	0	0	0	0	0	0.0%
24 To 26	0	0	0	0	0	0	0.0%
26 To 28	0	0	0	0	0	0	0.0%
28 To 30	0	0	0	0	0	0	0.0%
30 To 32	0	0	0	0	0	0	0.0%
32 To 34	0	0	0	0	0	0	0.0%
34 To 36	0	0	0	0	0	0	0.0%
36 To 38	0	0	0	1	1	1	0.1%
38 To 40	0	0	0	0	0	1	0.1%
40 To 42	0	0	0	0	0	1	0.1%
42 To 44	0	0	0	0	0	1	0.1%
44 To 46	0	0	0	0	0	1	0.1%
46 To 48	5	1	1	1	8	9	1.1%
48 To 50	8	0	2	4	14	23	2.8%
50 To 52	8	0	0	7	15	38	4.8%
52 To 54	30	1	5	14	50	88	10.7%
54 To 56	43	1	8	9	61	149	18.1%
56 To 58	75	1	11	17	104	253	30.7%
58 To 60	81	4	5	17	107	360	43.7%
60 To 62	85	2	10	15	112	472	57.4%
62 To 64	95	1	7	14	117	589	71.8%
64 To 66	85	0	6	6	97	686	83.4%
66 To 68	50	1	2	0	53	739	89.8%
68 To 70	41	0	1	0	42	781	94.9%
70 To 72	18	0	0	1	19	798	97.0%
72 To 74	12	0	0	0	12	810	98.4%
74 To 76	8	0	0	1	9	819	99.5%
76 To 78	1	0	0	0	1	820	99.6%
78 To 80	0	0	0	0	0	820	99.6%
80 To 82	2	0	0	0	2	822	99.9%
82 To 84	1	0	0	0	1	823	100.0%
84 To 86	0	0	0	0	0	823	100.0%
86 To 88	0	0	0	0	0	823	100.0%
88 To 90	0	0	0	0	0	823	100.0%
90 To 92	0	0	0	0	0	823	100.0%
92 To 94	0	0	0	0	0	823	100.0%
94 To 96	0	0	0	0	0	823	100.0%
96 To 98	0	0	0	0	0	823	100.0%
98 To 100	0	0	0	0	0	823	100.0%
Total	646	12	58	107	823		



East Baton Rouge Parish- Site 5
Northbound & Southbound
Speed Study Analysis

I-110 Speed Study
 I-10 to US 61
 Route I-110
 State of Louisiana
 Task Order H.011750.1
 State Contract No. 4400004011

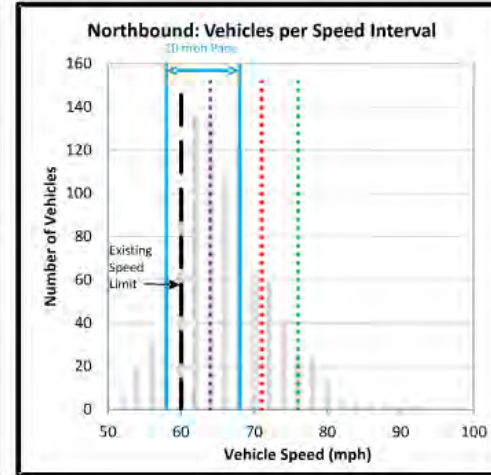
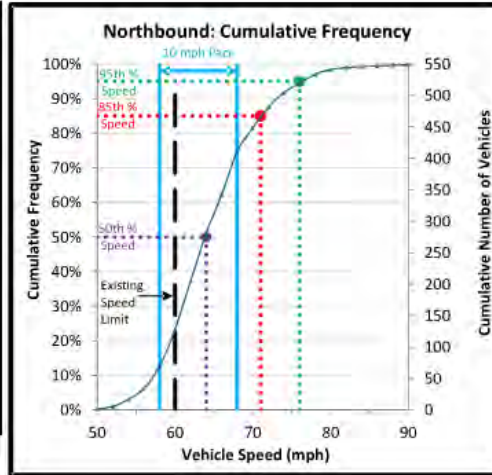


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AC	TM
Drawing File:	
Spot Speed Study Site.xls	
Drawing By:	Date:
AM	Sept. 2015
Project Number	Sheet Number
TM150018.0002	12

East Baton Rouge Parish- Site 5

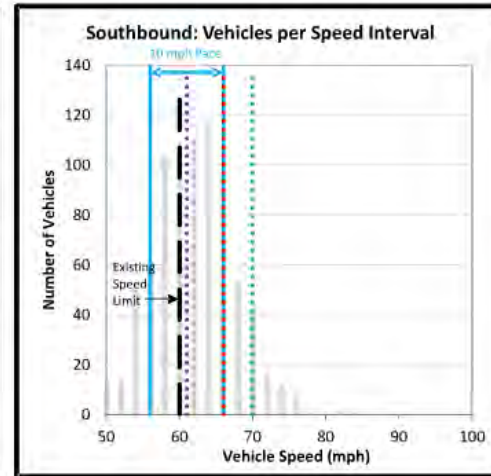
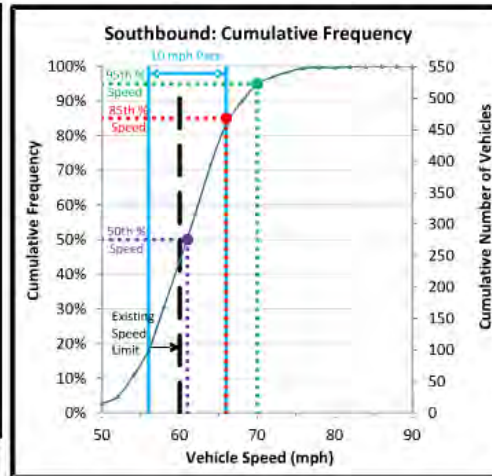
Spot Speed Study Results - Northbound

Mile Point	8.3
Existing Speed Limit	60 mph
Wednesday 08-26-2015	10:00 AM - 2:00 PM
Total Vehicles (Headway > 5.0 seconds)	971 vehicles
% Vehicles (Headway > 5.0 seconds)	38%
Mode Speed (Highest Frequency Speed)	63 mph
Mean Speed (Average Speed)	65 mph
50th Percentile (Median Speed)	64 mph
85th Percentile Speed	71 mph
95th Percentile Speed	76 mph
Speed Variance (Max Speed vs. Min Speed)	44 mph
10 mile per hour Pace	58 mph to 68 mph
Vehicles in 10 mph Pace	605 vehicles
% Vehicles in Pace	62%



Spot Speed Study Results - Southbound

Mile Point	8.3
Existing Speed Limit	60 mph
Wednesday 08-26-2015	10:00 AM - 2:00 PM
Total Vehicles (Headway > 5.0 seconds)	823 vehicles
% Vehicles (Headway > 5.0 seconds)	32%
Mode Speed (Highest Frequency Speed)	65 mph
Mean Speed (Average Speed)	61 mph
50th Percentile (Median Speed)	61 mph
85th Percentile Speed	66 mph
95th Percentile Speed	70 mph
Speed Variance (Max Speed vs. Min Speed)	46 mph
10 mile per hour Pace	56 mph to 66 mph
Vehicles in 10 mph Pace	537 vehicles
% Vehicles in Pace	65%



East Baton Rouge Parish- Site 5
East Baton Rouge Parish- Site 5
Northbound & Southbound
Speed Study Analysis

I-110 Speed Study

I-10 to US 61

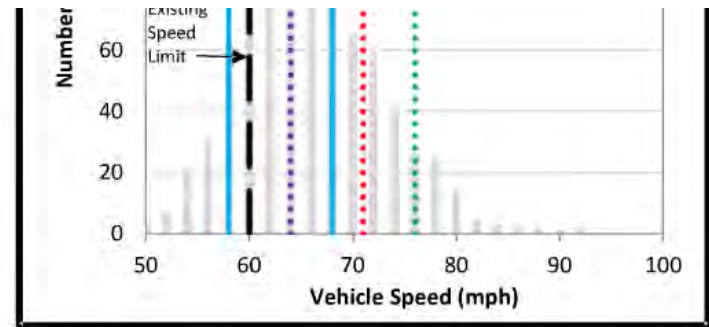
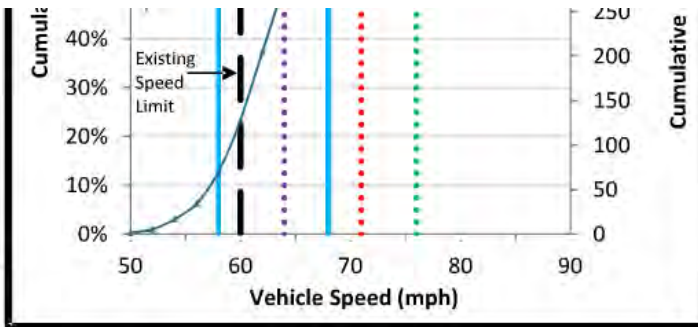
Route I-110
 State of Louisiana

Task Order H.011750.1
 State Contract No. 4400004011



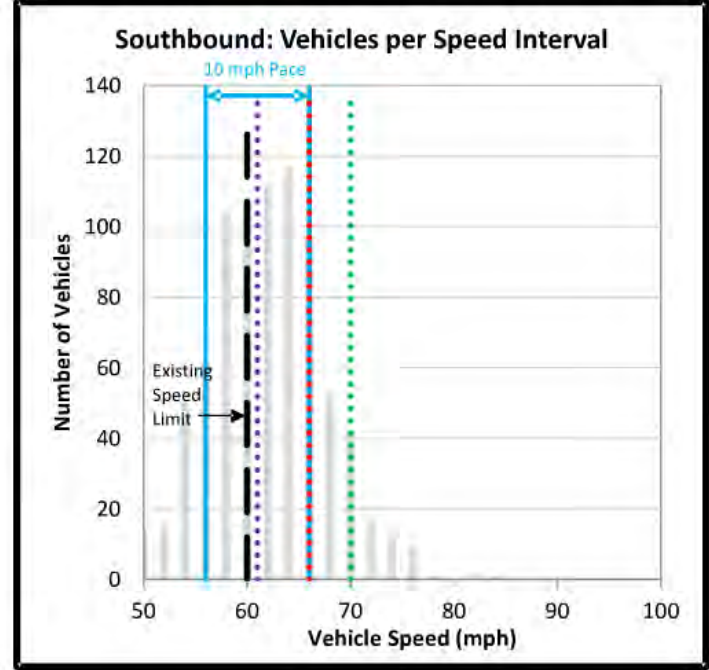
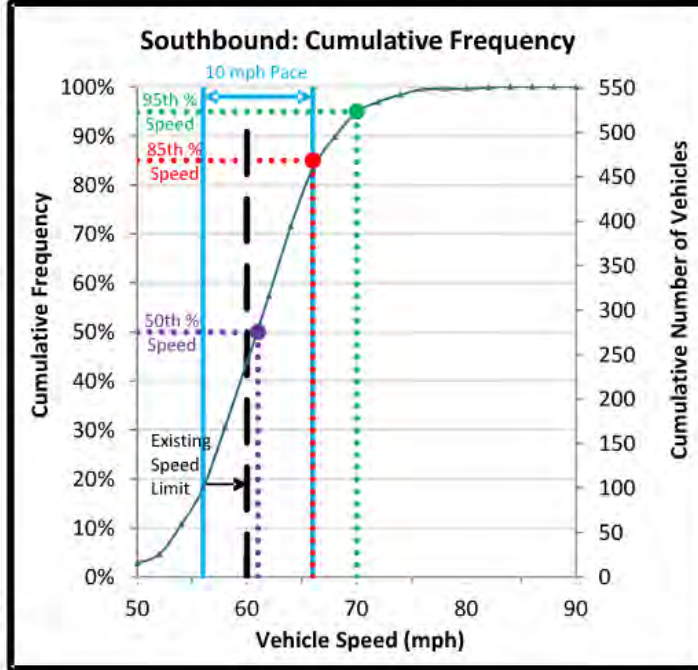
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AC	TM
Drawing File:	
Spot Speed Study Site.xls	
Drawing By:	Date:
AM	Sept, 2015
Project Number	Sheet Number
TM150018.0002	13

Median Speed)	64 mph
d	71 mph
d	76 mph
Max Speed vs. Min Speed)	44 mph
e	58 mph to 68 mph
Pace	605 vehicles
	62%



Study Results - Southbound

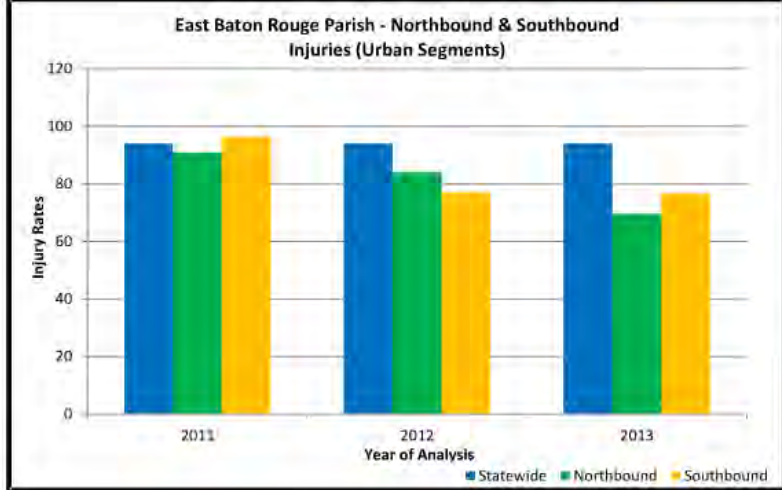
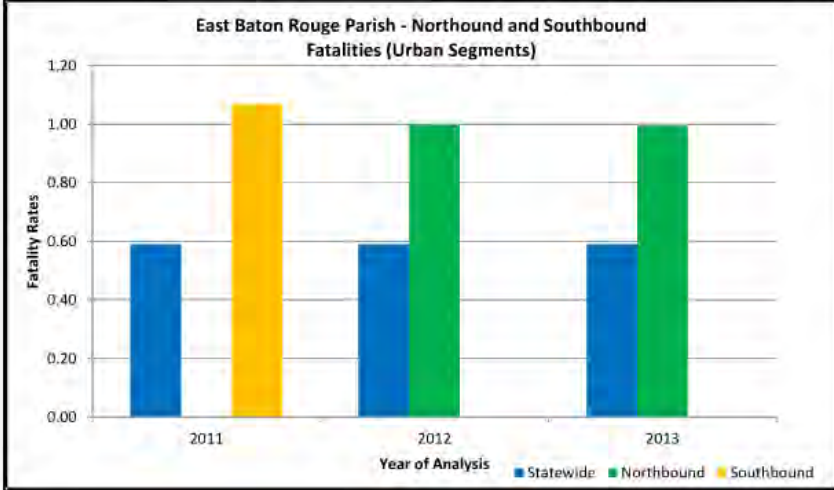
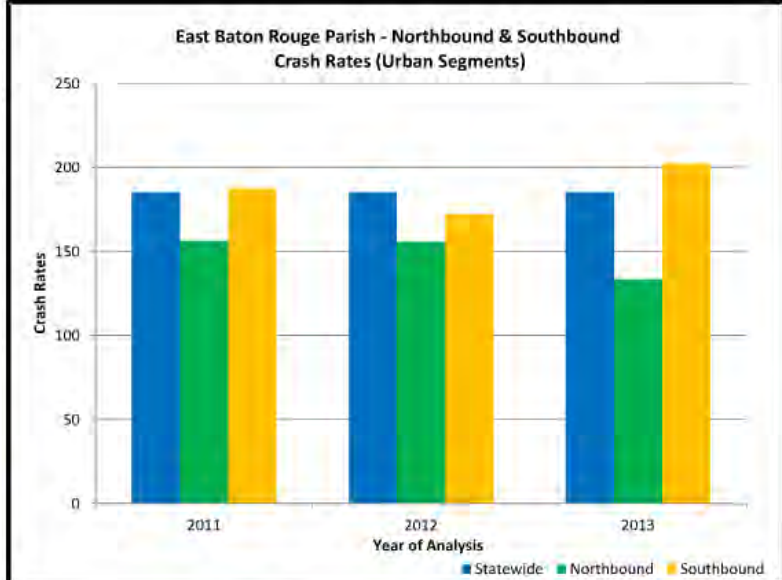
	8.3
	60 mph
015	10:00 AM - 2:00 PM
way > 5.0 seconds)	823 vehicles
y > 5.0 seconds)	32%
st Frequency Speed)	65 mph
ge Speed)	61 mph
ian Speed)	61 mph
d	66 mph
d	70 mph
x Speed vs. Min Speed)	46 mph
e	56 mph to 66 mph
Pace	537 vehicles
	65%



I-110: East Baton Rouge Parish

Northbound and Southbound Crash Rate Comparison (Urban Segments)

Segment Length =	9.03 miles	2011		2012		2013	
		NB	SB	NB	SB	NB	SB
Crash Type	Angle Crashes	0	0	0	2	1	0
	Rear-End Crashes	61	83	77	76	52	97
	Sideswipe (Same Direction)	37	36	39	45	47	52
	Not a Collision with a Motor Vehicle	41	49	35	45	30	47
	Head-On	1	0	1	0	0	2
	Other	6	7	4	4	4	5
	Left/Right Turn	0	0	0	0	0	0
Crash Summary	Total	146	175	156	172	134	203
	Fatalities	0	1	1	0	1	0
	Injuries	85	90	84	77	70	77
Crash Rates	Annual Million Vehicle Miles Traveled (MVMT)	94	94	100	100	101	101
	2011-2013 Statewide Crash Rate (per 100 MVMT)	185		185		185	
	Northbound Crash Rate (per 100 MVMT)	156	-	156	-	133	-
	Southbound Crash Rate (per 100 MVMT)	-	187	-	172	-	202
	2011-2013 Statewide Fatality (per 100 MVMT)	0.59		0.59		0.59	
	Northbound Fatality Rate (per 100 MVMT)	0.00	-	1.00	-	0.99	-
	Southbound Fatality Rate (per 100 MVMT)	-	1.07	-	0.00	-	0.00
	2011-2013 Statewide Injury (per 100 MVMT)	94		94		94	
	Northbound Injury Rate (per 100 MVMT)	91	-	84	-	70	-
	Southbound Injury Rate (per 100 MVMT)	-	96	-	77	-	77



I-110: East Baton Rouge Parish
Crash Rates
Urban Segments vs.
Statewide Comparisons

I-110 Speed Study
I-10 to US-61
Route I-110
State of Louisiana
Task Order H.011750.1
State Contract No. 4400004011

Note: This document and the information contained herein is prepared solely for the purpose of identifying, evaluating and planning safety improvements on public roads which may be implemented utilizing federal aid highway funds and is therefore exempt from discovery or admission into evidence pursuant to 23 U.S.C. 409



Project Manager:	Checked By:
AC	JM
Drawing File:	
I-110 East Baton Rouge Parish.xisx	
Drawing By:	Date:
QA	Sept 2015
Project Number:	Sheet Number:
TM150018.0001	7

Queue Analysis

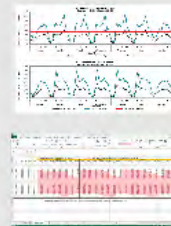
Policy

LADOTD Traffic Engineering Manual

- Queue analysis to determine delay caused by lane closure
- Threshold: 1,309 vehicles per hour per open lane

Data Analysis

- Verify raw tube data
- Adjust with seasonal factors from Planning Section



Policy

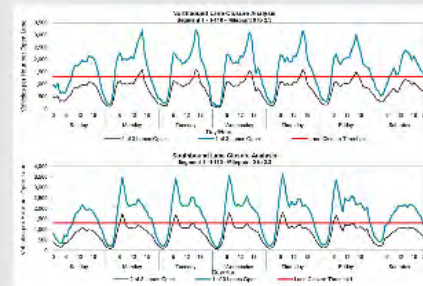
LADOTD Traffic Engineering Manual

- Queue analysis to determine delay caused by lane closure
- Threshold: 1,309 vehicles per hour per open lane



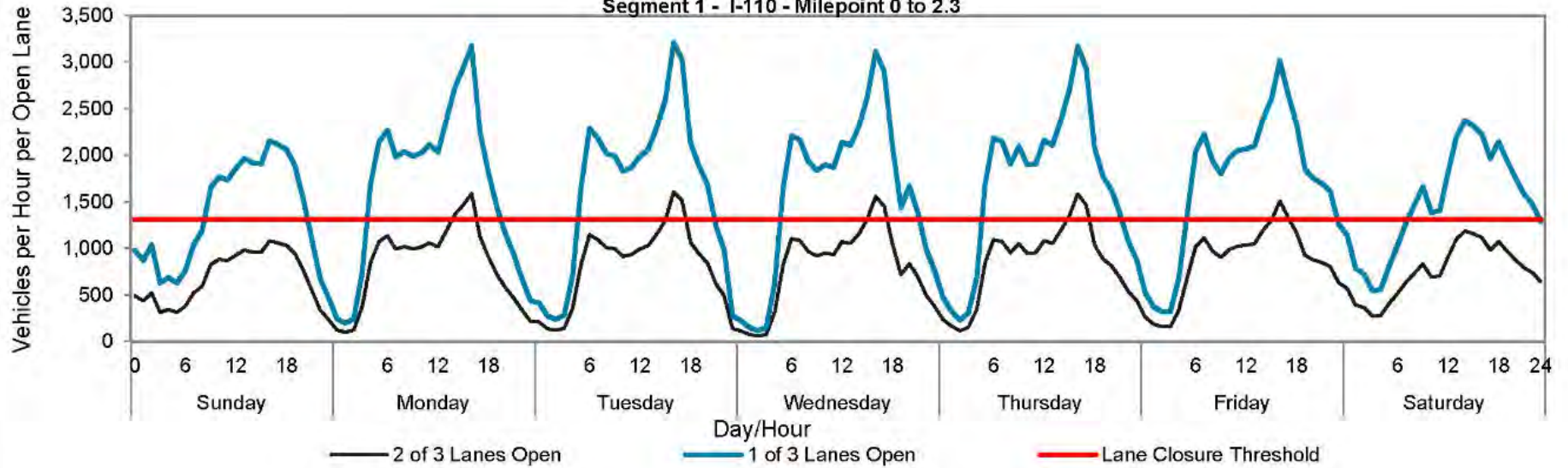
Data Analysis

- Verify raw tube data
- Adjust with seasonal factors from Planning Section

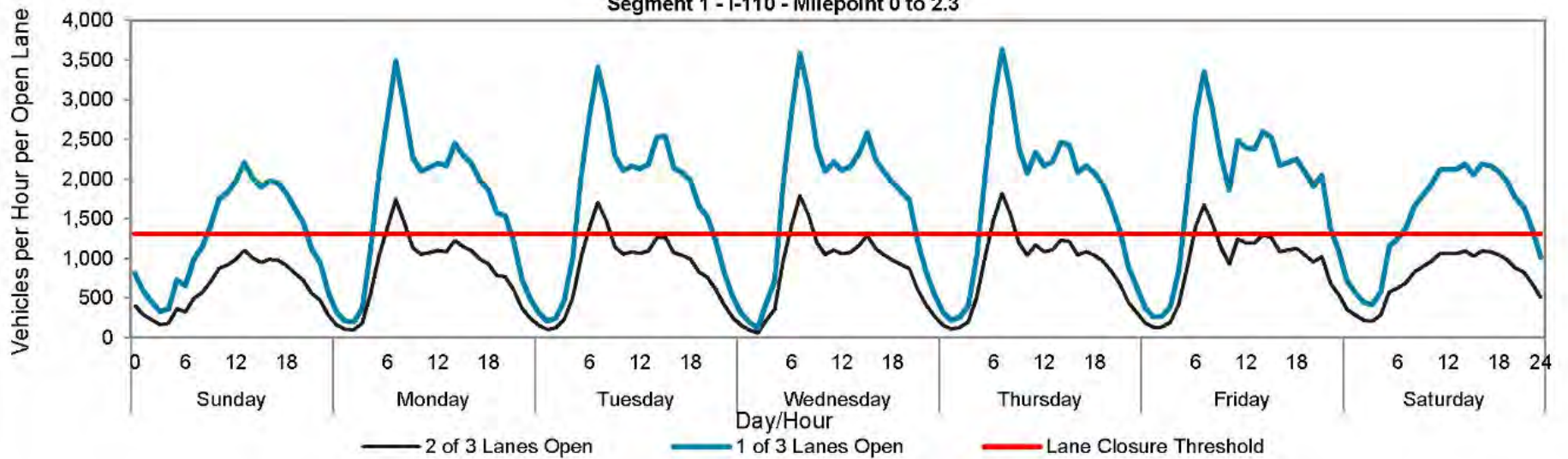


A screenshot of a data table with multiple columns and rows. The table contains numerical data, likely representing production rates or seasonal factors. The columns are labeled with dates and the rows contain numerical values. The table is displayed in a software application window.

Northbound Lane Closure Analysis
Segment 1 - I-110 - Milepoint 0 to 2.3



Southbound Lane Closure Analysis
Segment 1 - I-110 - Milepoint 0 to 2.3



Full Lane Closure Table Segment 02 NB onramp Blvd

Montz, Thomas

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER IPM Group ADD-INS ACROBAT

Cut Copy Paste Format Painter

Arial - 12 A+ A-

Wrap Text

General

Normal 2 Normal 2

Normal Bad

Insert Delete Format

AutoSum Fill Clear

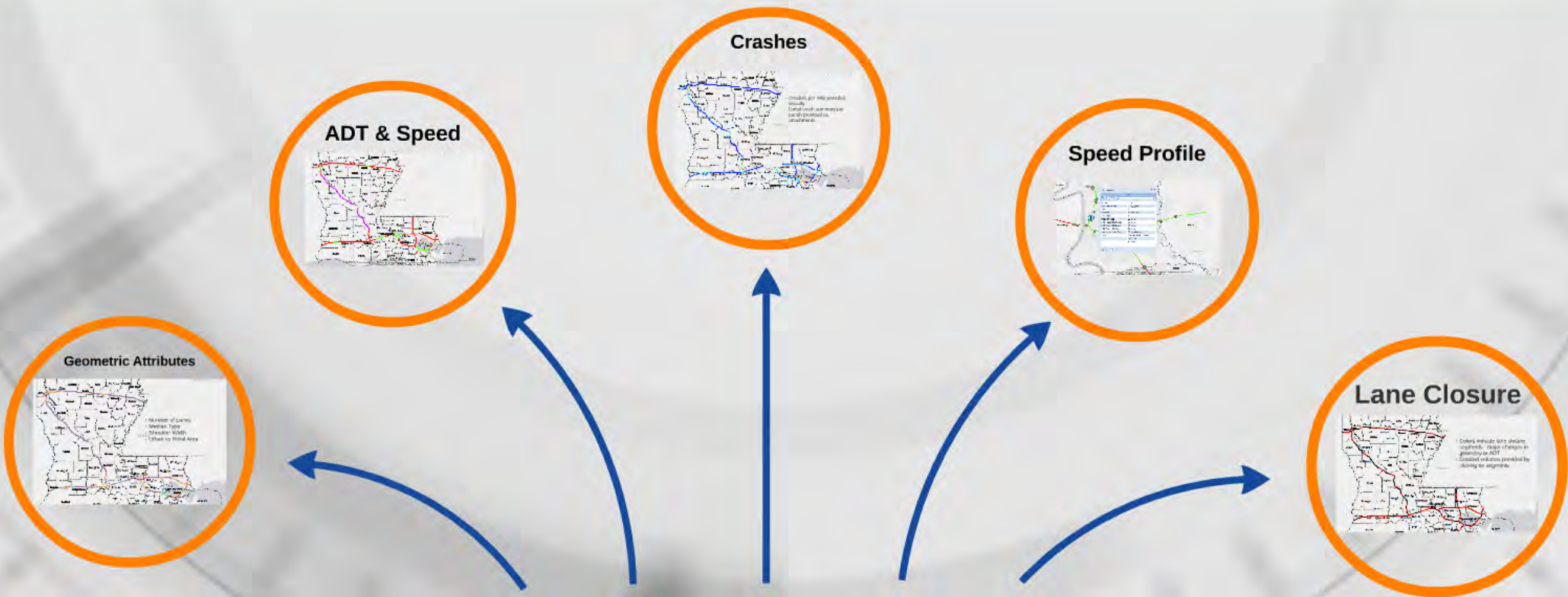
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Clipboard Font Alignment Number Styles Cells Editing

O46

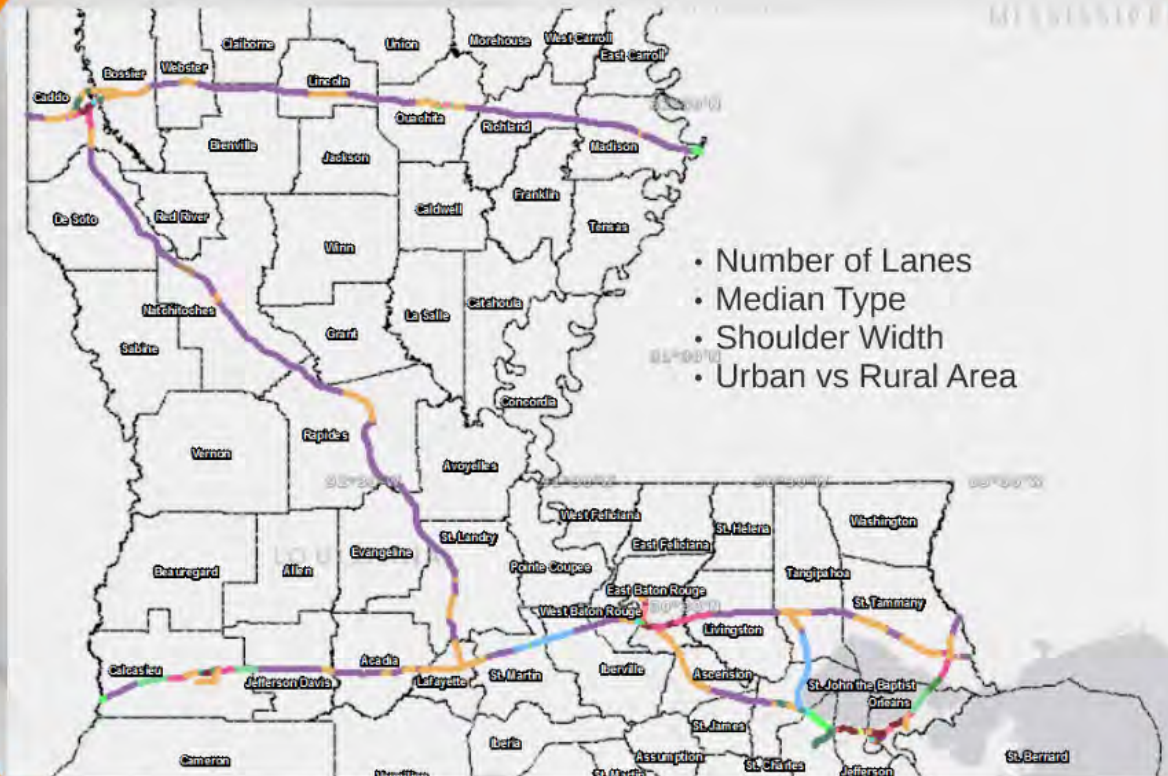
				2015 Adjusted Hourly Volumes (Vehicles Per Hour Per Lane)														- Lane Closure Not Recommended (volume >1309 veh/hr/ln, see EDMS V1.1.4)										
				JANUARY							FEBRUARY							MARCH										
	Ste	Dir	No. Lanes	Hour	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday
4	2	NB	3	0	380	353	377	381	429	807	819	400	371	396	401	451	849	861	415	385	411	416	468	881	893	407	378	41
5	2	NB	3	1	202	214	221	251	295	542	668	212	225	233	264	310	570	702	220	233	242	274	322	591	729	216	229	2
6	2	NB	3	2	152	179	207	188	242	436	482	160	189	218	197	254	458	507	166	196	226	205	264	475	526	163	192	2
7	2	NB	3	3	227	227	231	230	245	375	357	239	239	243	242	257	394	375	248	248	252	251	267	409	389	243	243	2
8	2	NB	3	4	538	547	559	536	525	432	423	566	575	587	564	552	454	445	587	596	610	585	573	471	462	577	586	5
9	2	NB	3	5	1313	1268	1248	1282	1074	829	464	1380	1333	1311	1348	1129	861	487	1432	1363	1361	1399	1171	686	506	1406	1358	13
10	2	NB	3	6	1956	1898	1984	1970	1813	857	633	2056	1995	2085	2071	1906	901	665	2134	2070	2164	2149	1978	935	690	2095	2033	21
11	2	NB	3	7	2050	2092	2121	2083	2082	1053	742	2155	2198	2230	2190	2189	1107	780	2236	2281	2314	2272	2271	1149	809	2196	2240	22
12	2	NB	3	8	1814	1841	1872	1789	1850	1228	938	1907	1935	1988	1880	1944	1291	986	1979	2008	2042	1951	2017	1338	1023	1943	1972	20
13	2	NB	3	9	1725	1724	1771	1785	1695	1535	1218	1813	1812	1861	1876	1782	1613	1280	1882	1881	1932	1947	1849	1874	1328	1848	1847	18
14	2	NB	3	10	1754	1649	1676	1683	1699	1498	1413	1844	1733	1781	1769	1786	1575	1485	1913	1798	1828	1836	1853	1634	1541	1879	1786	17
15	2	NB	3	11	1808	1835	1806	1770	1961	1589	1424	1901	1928	1898	1861	2081	1670	1497	1972	2001	1969	1931	2139	1733	1554	1937	1965	19
16	2	NB	3	12	1904	1903	1975	2049	2005	1750	1514	2001	2000	2076	2153	2107	1840	1591	2076	2075	2154	2234	2187	1909	1651	2039	2038	21
17	2	NB	3	13	1890	2026	1973	1987	2064	1806	1741	1986	2130	2074	2068	2169	1898	1830	2081	2210	2152	2146	2251	1969	1899	2024	2170	21
18	2	NB	3	14	2159	2206	2192	2281	2305	1886	1729	2269	2318	2304	2398	2422	1982	1817	2355	2406	2390	2488	2514	2057	1886	2312	2362	23
19	2	NB	3	15	2596	2787	2509	2603	2644	1921	1661	2729	2929	2638	2738	2779	2020	1748	2832	3040	2737	2839	2884	2096	1811	2781	2985	28
20	2	NB	3	16	3087	3193	3267	3095	3066	1959	1692	3245	3356	3434	3253	3223	2059	1778	3367	3482	3564	3376	3345	2137	1845	3306	3419	34
21	2	NB	3	17	3050	3182	3101	3021	2802	1827	1647	3206	3323	3259	3176	2945	1920	1731	3327	3449	3382	3296	3056	1993	1796	3267	3386	33
22	2	NB	3	18	2063	2204	2334	2032	2263	1758	1678	2168	2316	2453	2136	2378	1848	1763	2250	2404	2545	2216	2488	1917	1830	2209	2360	24
23	2	NB	3	19	1547	1838	1755	1685	1685	1604	1539	1626	1932	1845	1771	1771	1686	1618	1687	2005	1914	1838	1838	1749	1679	1657	1969	18
24	2	NB	3	20	1431	1629	1585	1572	1639	1606	1454	1504	1712	1686	1652	1723	1688	1528	1561	1777	1729	1715	1788	1751	1586	1533	1745	18
25	2	NB	3	21	1023	1211	1225	1249	1590	1557	1149	1076	1273	1288	1312	1671	1637	1207	1116	1321	1336	1362	1734	1698	1253	1096	1297	13
26	2	NB	3	22	829	872	910	986	1403	1291	901	871	917	957	1036	1474	1357	947	904	951	993	1075	1530	1408	983	888	934	9
27	2	NB	3	23	583	580	636	740	1073	990	593	613	610	668	778	1128	1040	624	636	633	693	807	1170	1080	647	625	622	6

* Adjusted volumes are based on 7-day, 24-hour classification counts collected in 2015 and were estimated using LADOTD Planning and Programming adjustment factors.



Speed Study Database Layers

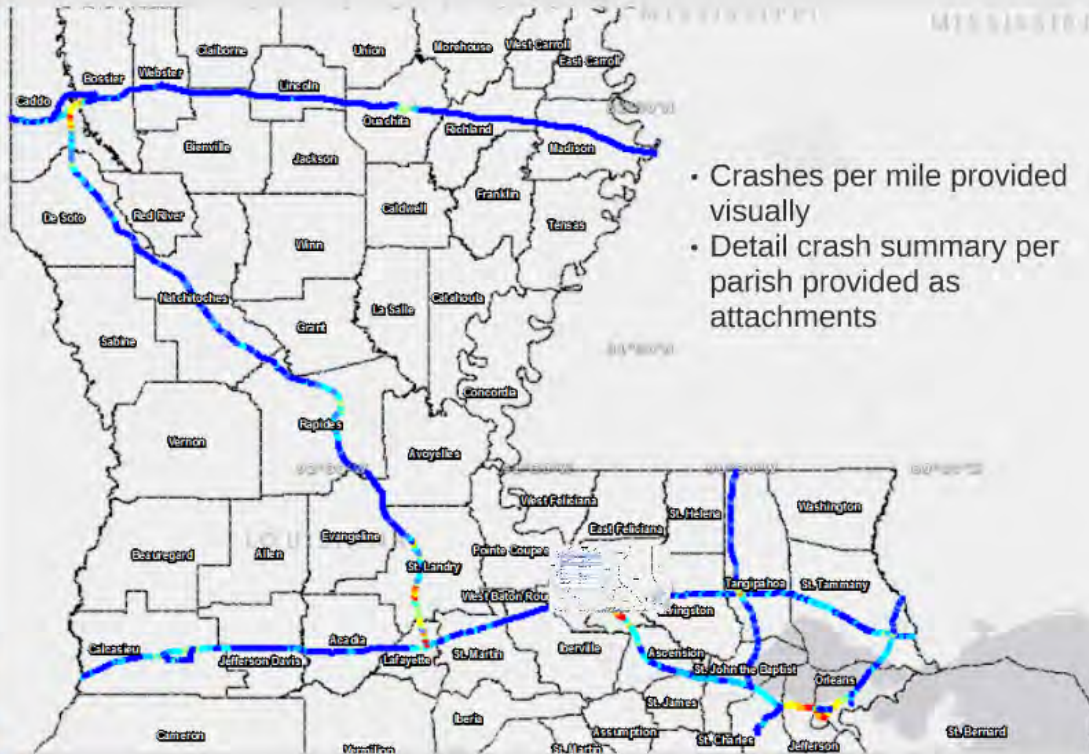
Geometric Attributes

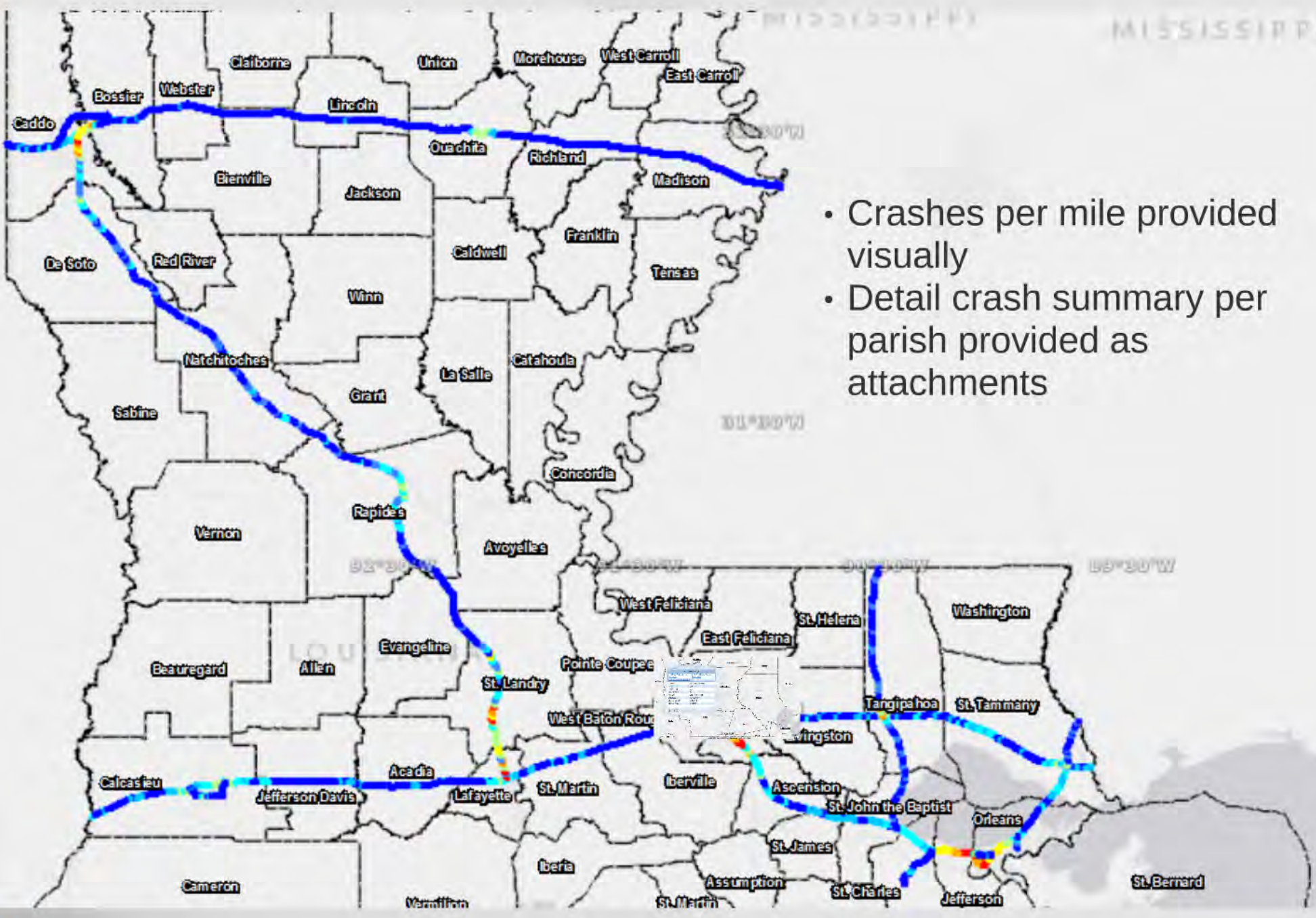




- Number of Lanes
- Median Type
- Shoulder Width
- Urban vs Rural Area

Crashes





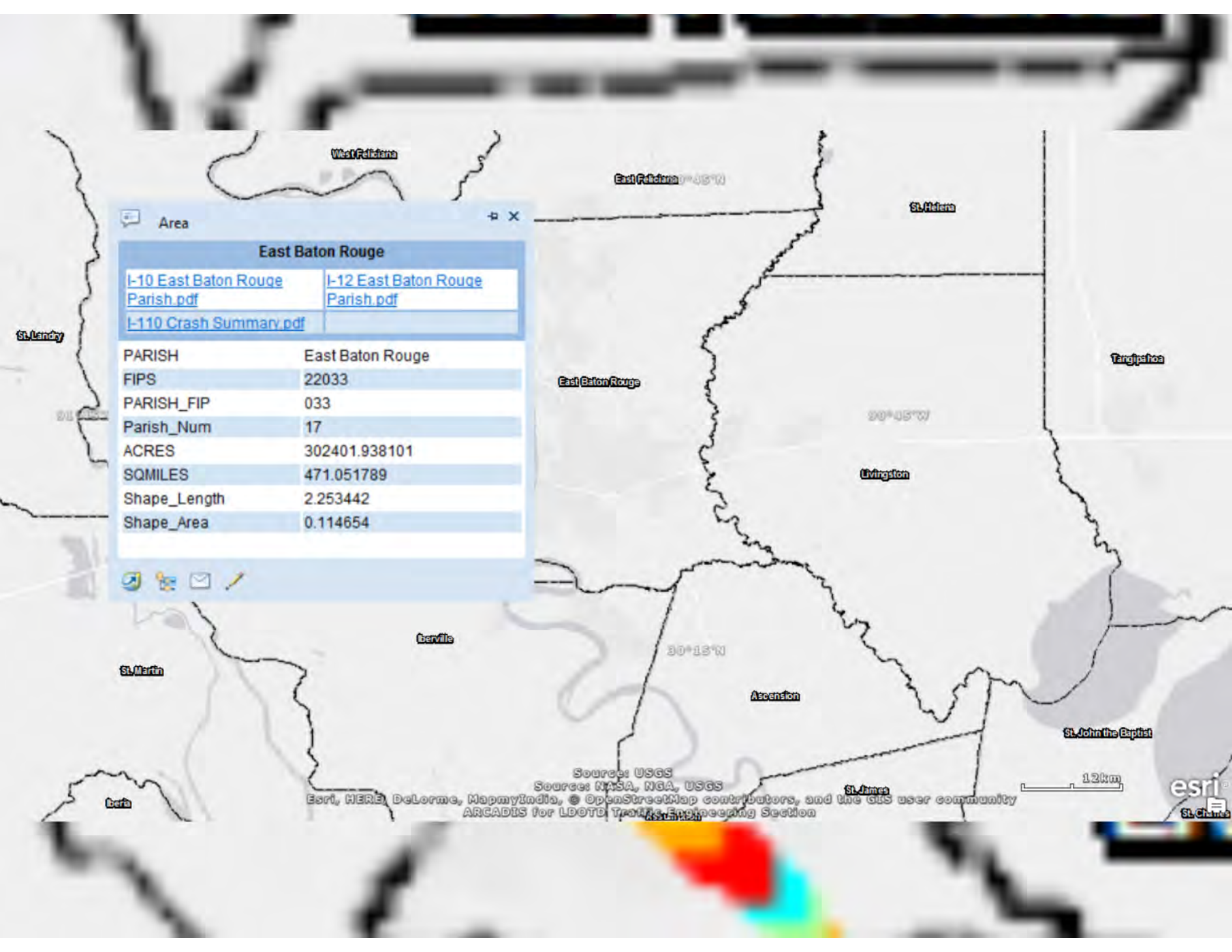
- Crashes per mile provided visually
- Detail crash summary per parish provided as attachments

Area

East Baton Rouge

I-10 East Baton Rouge Parish.pdf	I-12 East Baton Rouge Parish.pdf
I-110 Crash Summary.pdf	

PARISH	East Baton Rouge
FIPS	22033
PARISH_FIP	033
Parish_Num	17
ACRES	302401.938101
SQMILES	471.051789
Shape_Length	2.253442
Shape_Area	0.114654



Source: USGS
 Sources: NASA, NGA, USGS
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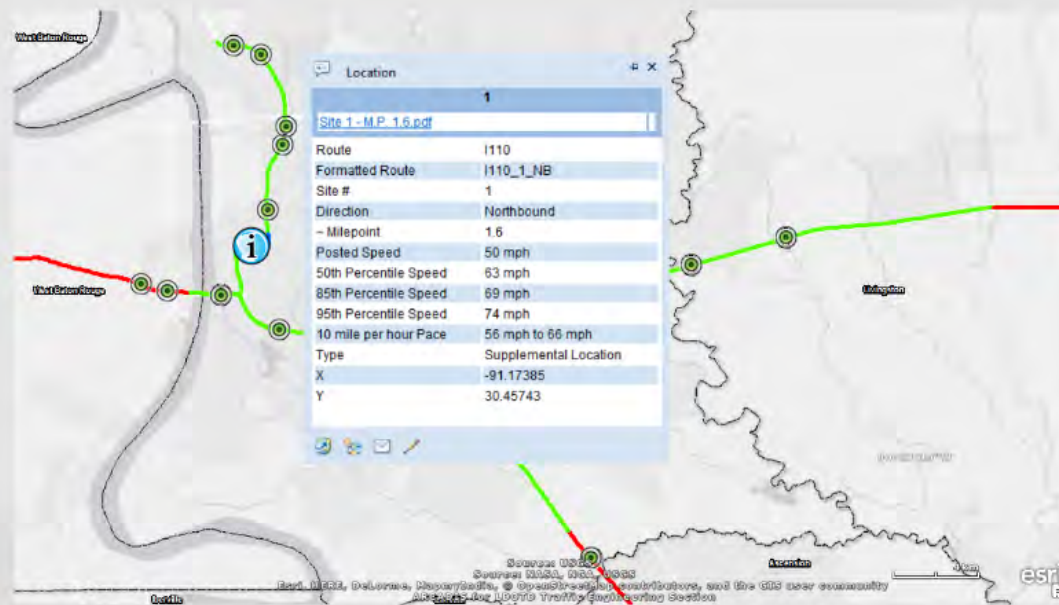
ADT & Speed

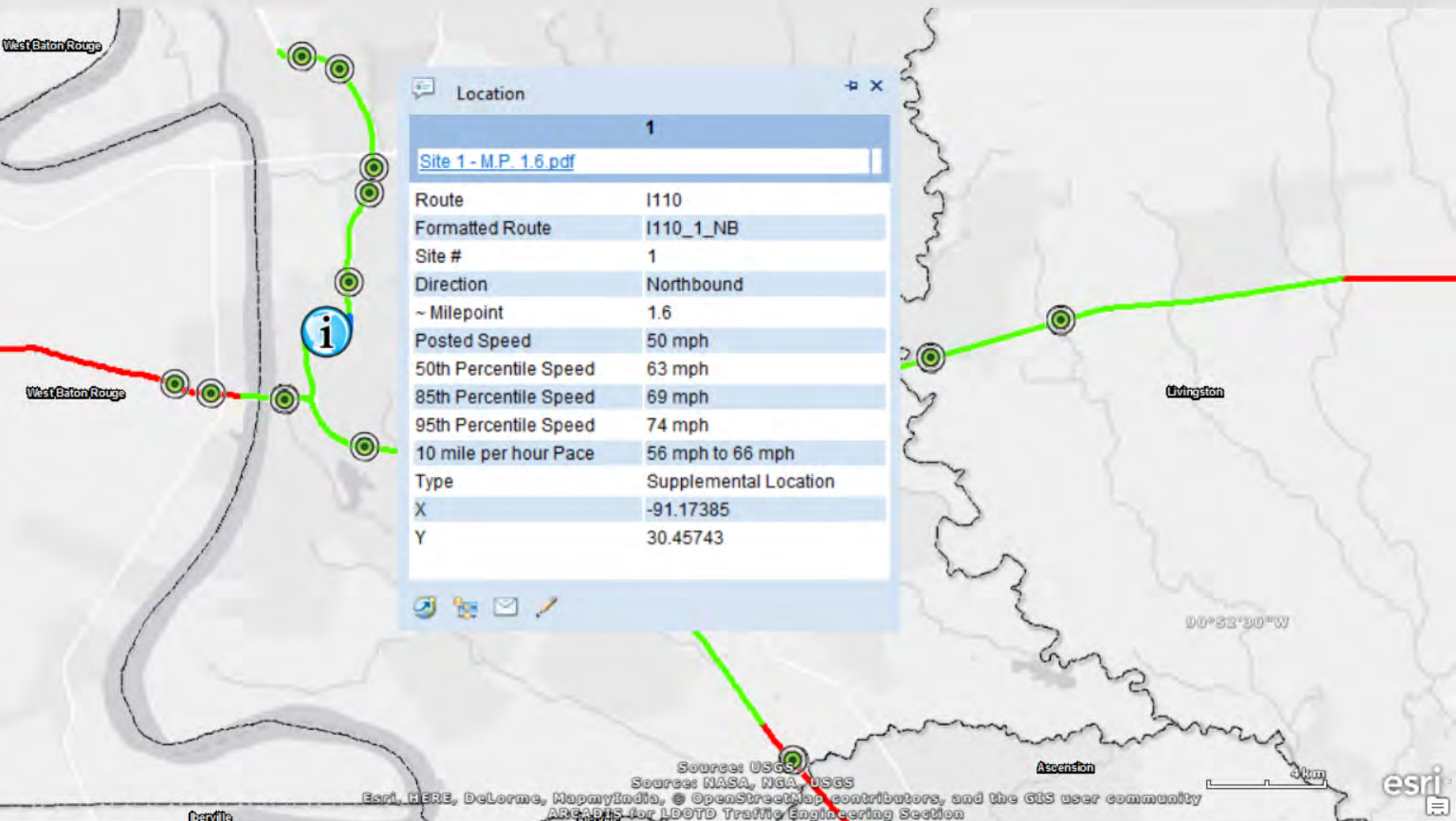




Source: USGS
 Source: NASA, NOAA, USGS
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Speed Profile

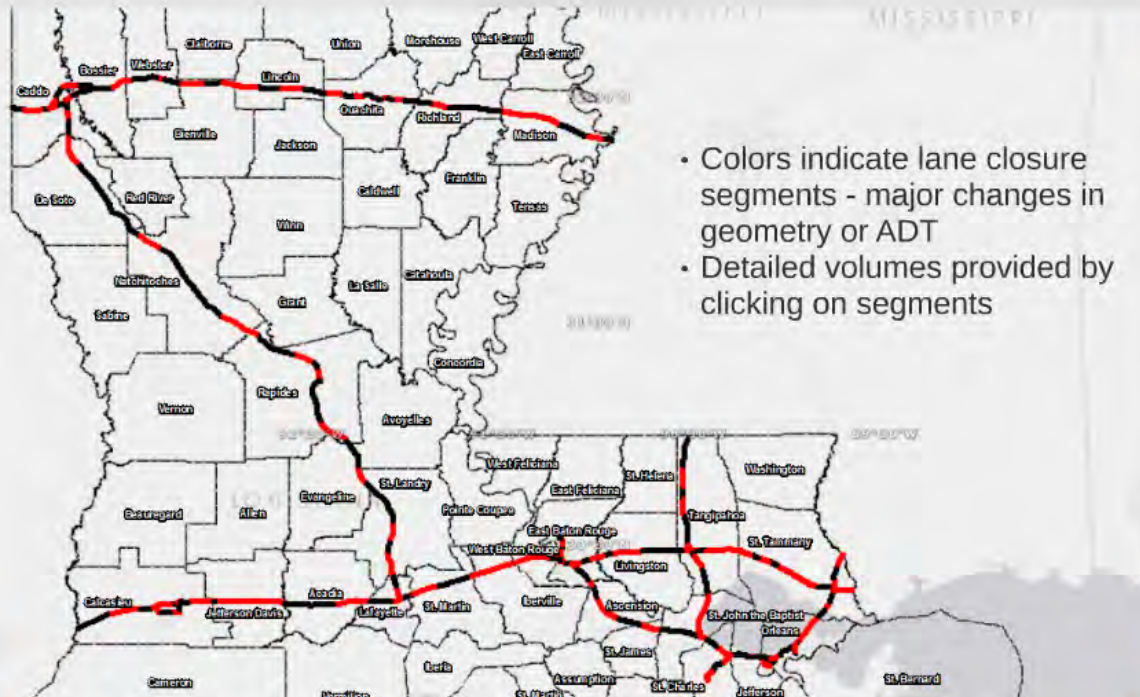




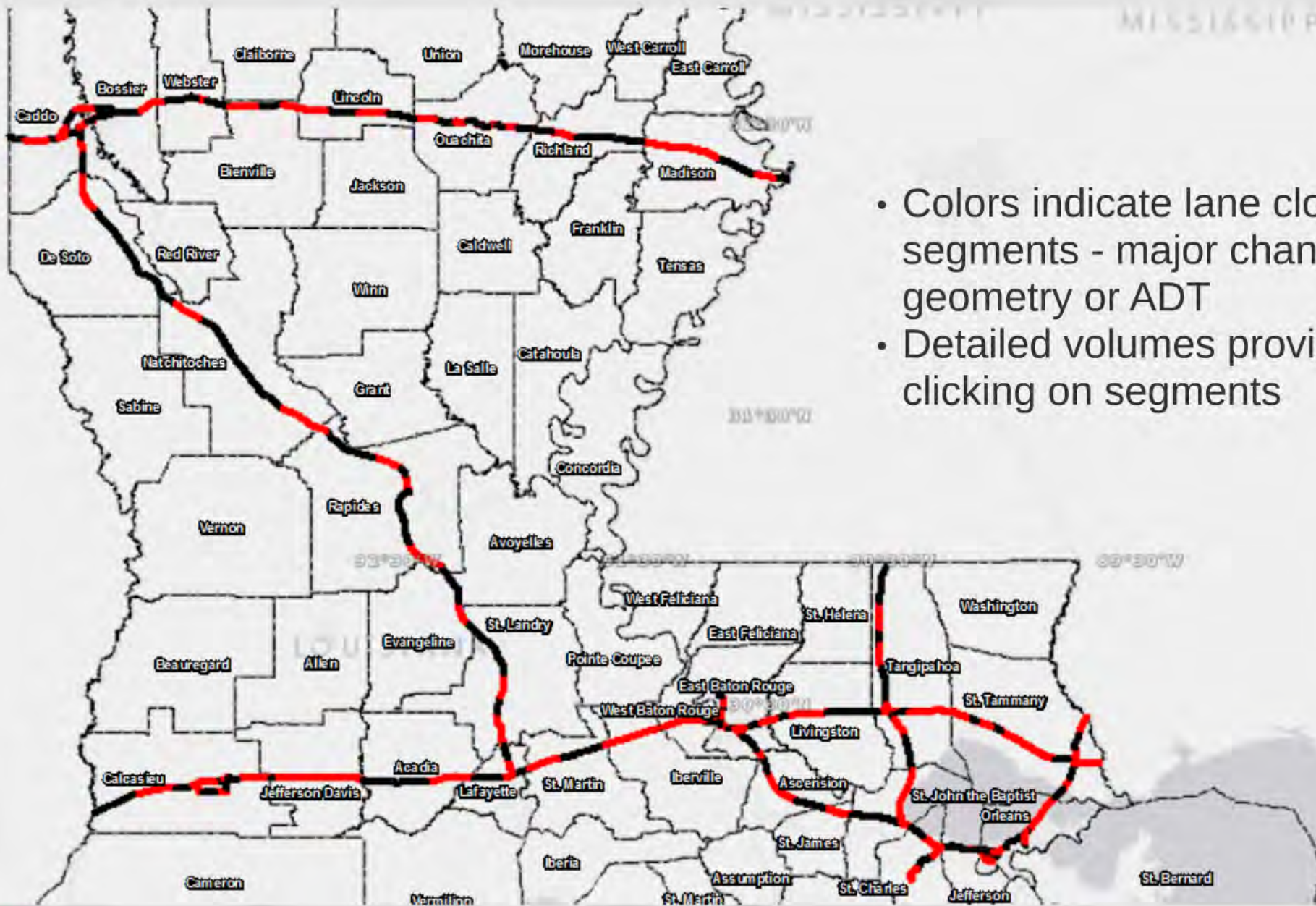
Source: USGS
 Source: NASA, NGA, USGS
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Lane Closure



LAKE CHARLES



- Colors indicate lane closure segments - major changes in geometry or ADT
- Detailed volumes provided by clicking on segments