Transportation Research: From Theory to Practice

Louisiana Parish Engineers Association (LPESA)
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Outline

- Background
- 19-4SA: Impact of centerline and shoulder rumble strips
- 18-6SS: Consultant plan development and performance ratings
- RITIS Data
- Summary
- Discussion

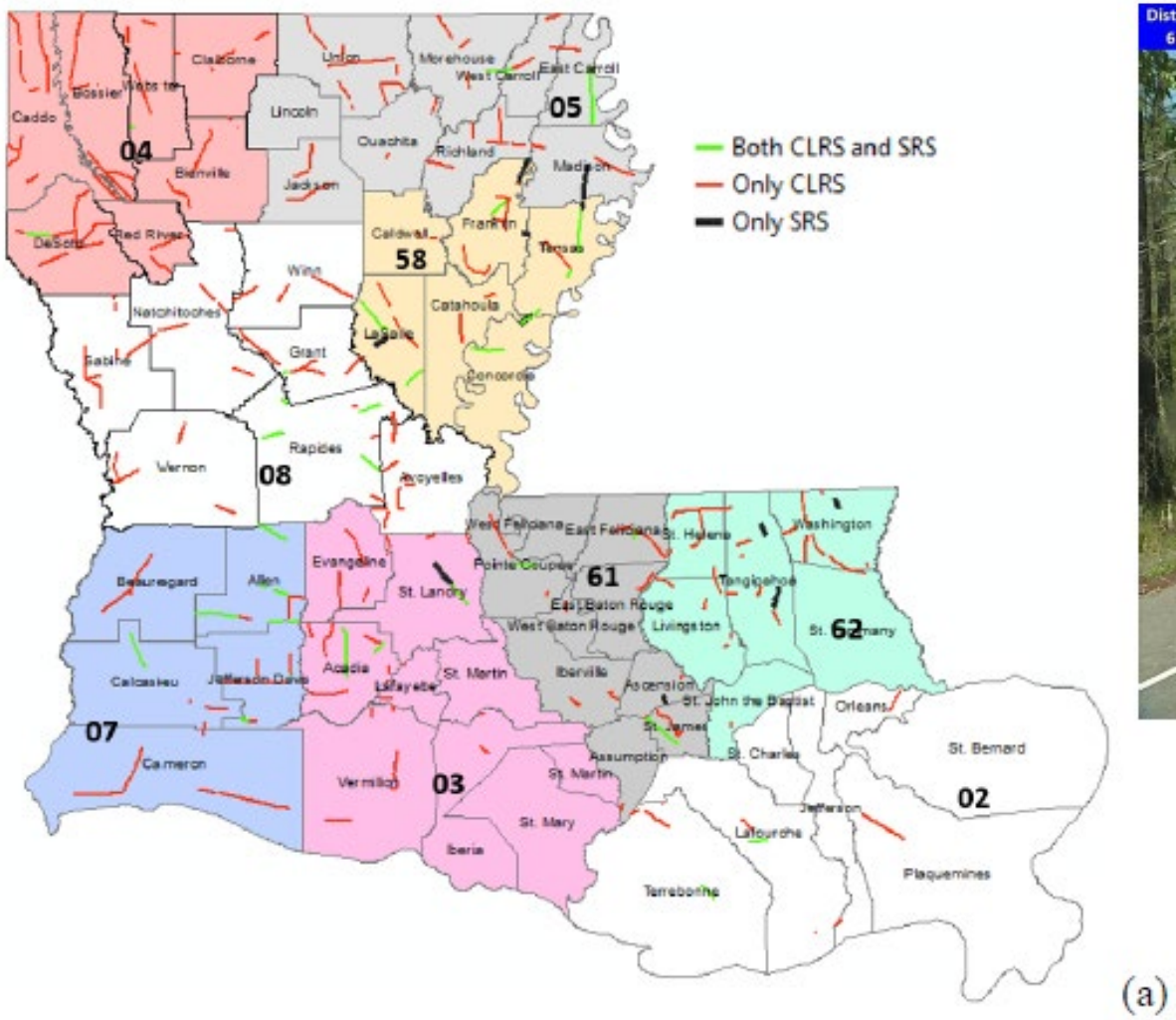
Background

- LTRC's role
  - Conduct a comprehensive, high quality, research program
  - Foster innovative solutions to complex transportation problems
  - Benefit DOTD, local entities, consultants, contractors, and traveling public
- Research to practice
  - How long does it take?
- Barriers to implementation?

19-4SA: Rumble Strips

- Impact of centerline rumble strips (CLRS) and shoulder rumble strips (SRS) on all roadway departure crashes in Louisiana two-lane highways
- Contractor
  - Xiaoduan Sun
  - Department of Civil and Environmental Engineering
  - UL-Lafayette

CLRS and SRS Locations



Objectives

- Investigate the safety effectiveness of CLRS and SRS (in single or combination) in two-lane highways under the DOTD system
- Estimate the safety benefit-cost ratio of the countermeasures
- Conducted on rural and urban system

Methodology

- Literature review
- Database was developed and verified
  - Data from rumble strip location (DOTD)
  - Crash 1 database
  - Highway section database
- Benefit-Cost analysis
  - Reduction in crash frequency
  - Reduction in level of crash injury severity

Results – changes in total crashes

Crash Frequency and Rate for All RS Locations	R2L	U2L
Number of crashes Before	5,245	1,085

Crash Frequency and Rate for All RS Locations	R2L	U2L
Number of crashes After	4,346	831
Reduction	**899 (17.1%)**	**254 (23.4%)**
Average crash rate Before	1.15	1.59
Average crash rate After	1.01	1.07
Reduction	**0.14 (12.2%)**	**0.52 (32.7%)**

Results – changes in crash severity (rural)

Rumble Strips	Total by RS Location			Fatal and Severe Injury			Moderate and Complaint Injury			PDO		
	Before	After	Crash Reduction	Before	After	Crash Reduction	Before	After	Crash Reduction	Before	After	Crash Reduction
CLRS	4,435	3,614	18.5%	162	104	35.8%	1,919	1,369	28.7%	2,354	2,141	9.1%
SRS	97	109	-12.4%	2	2	0%	41	35	14.6%	54	72	-33.3%
Both CLRS and SRS	713	623	12.6%	27	21	22.2%	275	250	9.1%	411	352	14.4%
Total	**5,245**	**4,346**	**17.1%**	**191**	**127**	**33.5%**	**2,235**	**1,654**	**26%**	**2,819**	**2,565**	**9%**

Results – changes in crash severity (urban)

Rumble Strips	Total by RS Location			Fatal and Severe Injury			Moderate and Complaint Injury			PDO		
	Before	After	Crash Reduction	Before	After	Crash Reduction	Before	After	Crash Reduction	Before	After	Crash Reduction
CLRS	893	673	24.6%	23	12	47.8%	325	239	26.5%	545	422	22.6%
SRS	74	47	36.5%	0	3	-100%	30	18	40.0%	44	26	40.9%
Both CLRS and SRS	118	111	5.9%	8	2	75.0%	48	39	18.8%	62	70	-12.9%
Total	1,085	831	23.4%	31	17	45.2%	403	296	26.6%	651	518	20.4%

Results – Crash Type

Manner of Collision for All RS Locations	Before	After	Crash Reduction
Non-Collision (Single vehicle)	3,012	2,462	18.3%
Rear end	846	842	0.5%
Head on	128	86	32.8%
Right angle	218	188	13.8%
Left turn	242	228	5.8%
Right turn	19	20	-5.3%
Sideswipe same direction	193	130	32.6%
Sideswipe opposite direction	223	153	31.4%
Other and unknown	364	237	34.9%
Total	**5,245**	**4,346**	**17.1%**

Cost-Benefit ($) (Top – Rural; Bottom – Urban)

	Unit Cost	All RS				CLRS				SRS				Both CLRS and SRS			
		B	A	B-A	Benefit	B	A	B-A	Benefit	B	A	B-A	Benefit	B	A	B-A	Benefit
Fatal	$1,710,561	134	87	47	$80,396,367	112	71	41	$70,133,001	1	1	0	$0	21	15	6	$10,263,366
Severe	$489,446	57	40	17	$8,320,582	50	33	17	$8,320,582	1	1	0	$0	6	6	0	$0
Moderate	$173,578	627	409	218	$37,840,004	550	353	197	$34,194,866	12	4	8	$1,388,624	65	52	13	$2,256,514
Complaint	$58,636	1608	1245	363	$21,284,868	1369	1016	353	$20,698,508	29	31	-2	-$117,272	210	198	12	$703,632
No injury	$24,982	2819	2565	254	$6,345,428	2354	2141	213	$5,321,166	54	72	-18	-$449,676	411	352	59	$1,473,938
Total					**$154,187,249**				**$138,668,123**				**$821,676**				**$14,697,450**

	Unit Cost	All RS				CLRS				SRS				Both CLRS and SRS			
		B	A	B-A	Benefit	B	A	B-A	Benefit	B	A	B-A	Benefit	B	A	B-A	Benefit
Fatal	$1,710,561	14	10	4	$6,842,244	9	6	3	$5,131,683	0	3	-3	-$5,131,683	5	1	4	$6,842,244
Severe	$489,446	17	7	10	$4,894,460	14	6	8	$3,915,568	0	0	0	$0	3	1	2	$978,892
Moderate	$173,578	104	55	49	$8,505,322	87	46	41	$7,116,698	5	2	3	$520,734	12	7	5	$867,890
Complaint	$58,636	299	241	58	$3,400,888	238	193	45	$2,638,620	25	16	9	$527,724	36	32	4	$234,544
No injury	$24,982	651	518	133	$3,322,606	545	422	123	$3,072,786	44	26	18	$449,676	62	70	-8	-$199,856
Total					**$26,965,520**				**$21,875,355**				**-$3,633,549**				**$8,723,714**

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Results - Cost-Benefit

		Only CLRS	Only SRS	Both CLRS and SRS	All RS
Option 1	Rural two-lane	14.64	1.9	7.37	12.98
	Urban two-lane	38.27	Negative	83.55	37.2
Option 2	Rural two-lane	120.44	16.96	35.58	95.6
	Urban two-lane	314.73	Negative	403.20	278.78

Conclusions

- CLRS – very effective countermeasure; especially for fatal and severe injury crashes
  - Reduces head-on collisions by nearly 50%
- DOTD rumble strip program is good and should be continuously used as a key crash countermeasure
- Technical summary
  - https://www.ltrc.lsu.edu/pdf/2021/ts_648.pdf

18-6SS: Plan Development and Performance

- Assessment of Consultant Plan Development and Performance Rating Processes
- Contractor
  - Ron Hamilton, Caroline Leary, Bill Dye
  - Dye Management Group, Inc.

Background and Methodology

- High-quality engineering plans are essential
  - Errors and omissions impact safety, cause delays and cost overruns
- This project was used to identify opportunities for improving consultant plan quality through the use of the following:
  - Literature review
  - Focus group surveys
  - Best practices survey of other DOT's

Objectives

- Identify best practices among other DOT's for evaluation of consultant plan deliverables
- Conduct a thorough assessment of DOTD consultant plan delivery process
- Identify best practices
- Evaluate effectiveness and subjectivity of DOTD's current consultant rating system

Recommendations – Plan Quality

- Create a plan development quality assurance manager position within a plan checking unit
  - Complete
- Review all DOTD manuals, directives, policy guides, etc. for consistency and needed updates
  - Monthly meetings now take place to achieve this recommendation
- Implement standard practices for pan review comments and responses
  - Comment tracking systems has been developed and comments are sent through the PM using Blue Beam and Excel

Recommendations – Plan Quality

- Provide QC/QA training
  - Position created to allow temporary 1-year appointments within plan quality unit (PQU)
- Require consultants prepare formal QC/QA plans
  - Complete prior to research project
- Consider creating a constructability-biddability (C/B) review team
  - PQU does this now
- Strengthen post-construction review process
  - PQU has created a form/survey for use

Recommendations – Plan Quality

- Consider adding QC/QA line items within the consultant fee proposal
  - PM's may include this at their discretion when and where it is justifiable to do so
- Consider annual design conference
  - DOTD already conducts LTC, etc.

Recommendations – Consultant Past Performance Rating System (CPPR)

- Prepare a CPPR guide & provide CPPR training
  - Newly updated rating system with narrative format with expectations of what is to be included
- Reduce number of rating criteria
  - Reduced categories from 55 to 14
- Develop objective measures of plan quality
  - Evaluative comments on plan quality required to be entered on quality of deliverables
- Identify performance expectations at project kickoff meeting
  - PM and consultants are encouraged to agree upon these

Recommendations – Consultant Past Performance Rating System (CPPR)

- Require DOTD – Consultant meeting after each performance rating
  - In accordance with 23 CFR 172 the consultant is afforded the opportunity to respond in writing to the narrative evaluation
- Use a notification system
  - Not applicable since DOTD created their own system

RITIS Data Contract

Background

- Probe data from cell phones
  - Creates an intricate data-streaming network of real-time positioning and speeds of vehicles
- 72,300 roadway segments of local data updated every minute
- Gives accurate shots of congestion, performance, and travel patterns

Where Does the Data Come From?

- Vehicle streaming technologies
- Mobile device positioning data (location intelligence)
- Data fusion, and artificial intelligence

- Data streams are ALL completely anonymized to ensure NO personally identifiable data is handled by DOT's

What Can we do with the Data?

- By combining with other data streams such as crashes weather, signal locations, etc. we can visualize the roadway performance
- Provides insights into congestion and system performance

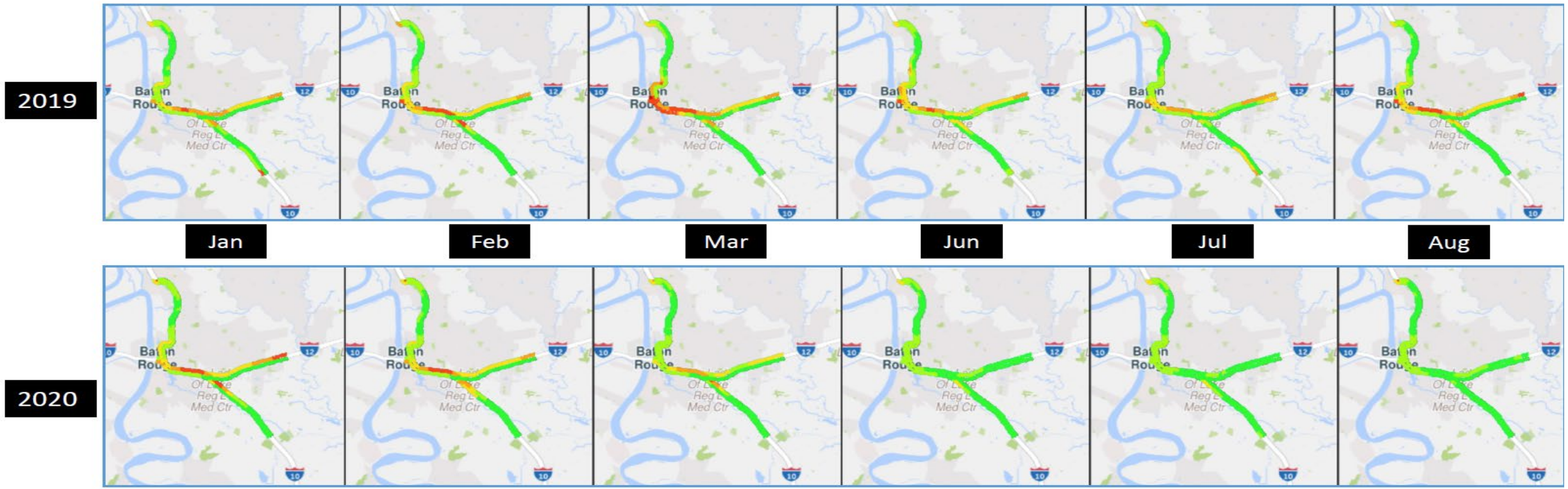
Why do we care?

- RITIS access allows Department officials to accurately report to media or elected official in near real-time about incidents, etc.
- Lower cost that installing (literally millions of sensors in/near roadways)
- Available to DOTD employees, MPO's, and consultants by contacting Dr. Julius Codjoe

Visualization – Pre-COVID vs COVID traffic

All Baton Rouge Interstate Traffic

Mid-week (Tue, Wed, Thur only) average SPEEDS by month at 8:00 AM

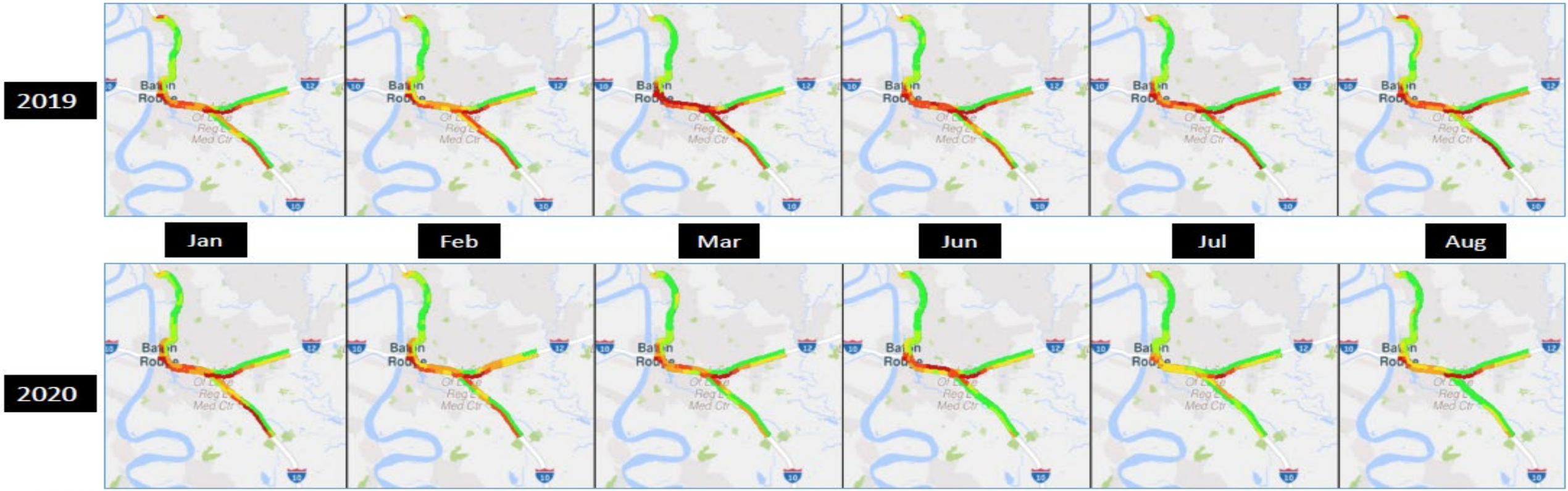


(Data Source: NPMRDS)

Visualization – Pre-COVID vs COVID traffic

All Baton Rouge Interstate Traffic

Mid-week (Tue, Wed, Thur only) average SPEEDS by month at 5:00 PM



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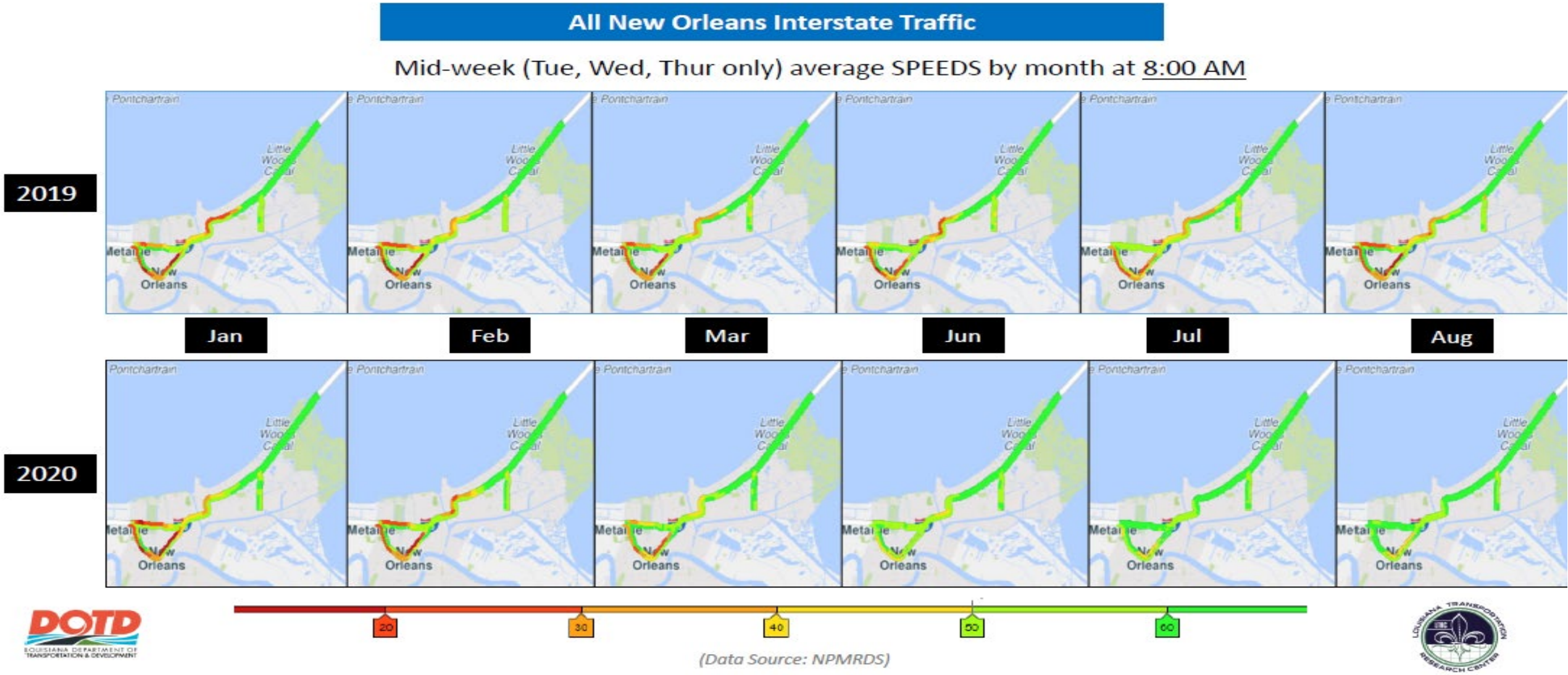

Visualization – Pre-COVID vs COVID traffic

Summary

- Final reports
  - http://www.ltrc.lsu.edu/pubs_final_reports.html
- Technical Summaries
  - http://www.ltrc.lsu.edu/pubs_final_reports.html
- Project Capsules
  - http://www.ltrc.lsu.edu/pubs_projectcapsules.html

Summary

- ALWAYS looking for subject matter experts to serve on Project Review Committees (PRC's)
  - Review scope of work, research team qualifications, and review deliverables
- ALWAYS looking for potential implementation avenues for completed research products
  - LCG has been a GREAT ally in this arena in the past decade


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