



Here and Now – Ways DOTs and MPOs can use Data in Hand to Assess, Plan, Operate, and Implement Truck Parking Solutions

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June 29, 2022



Purpose

- The goal is to get to Truck Parking Information Systems and better parking options.
- For now, data available for other things (bottleneck analysis, etc.) may support truck parking:
 - Analytics as a catalyst to solutions.
 - Potential data feeds for truck parking availability intel.
- Not just another study! Necessary to justify investment of the public's money.
 - Can't get support for things people don't understand, visualizing data helps.
 - It is not enough to say there is a problem.

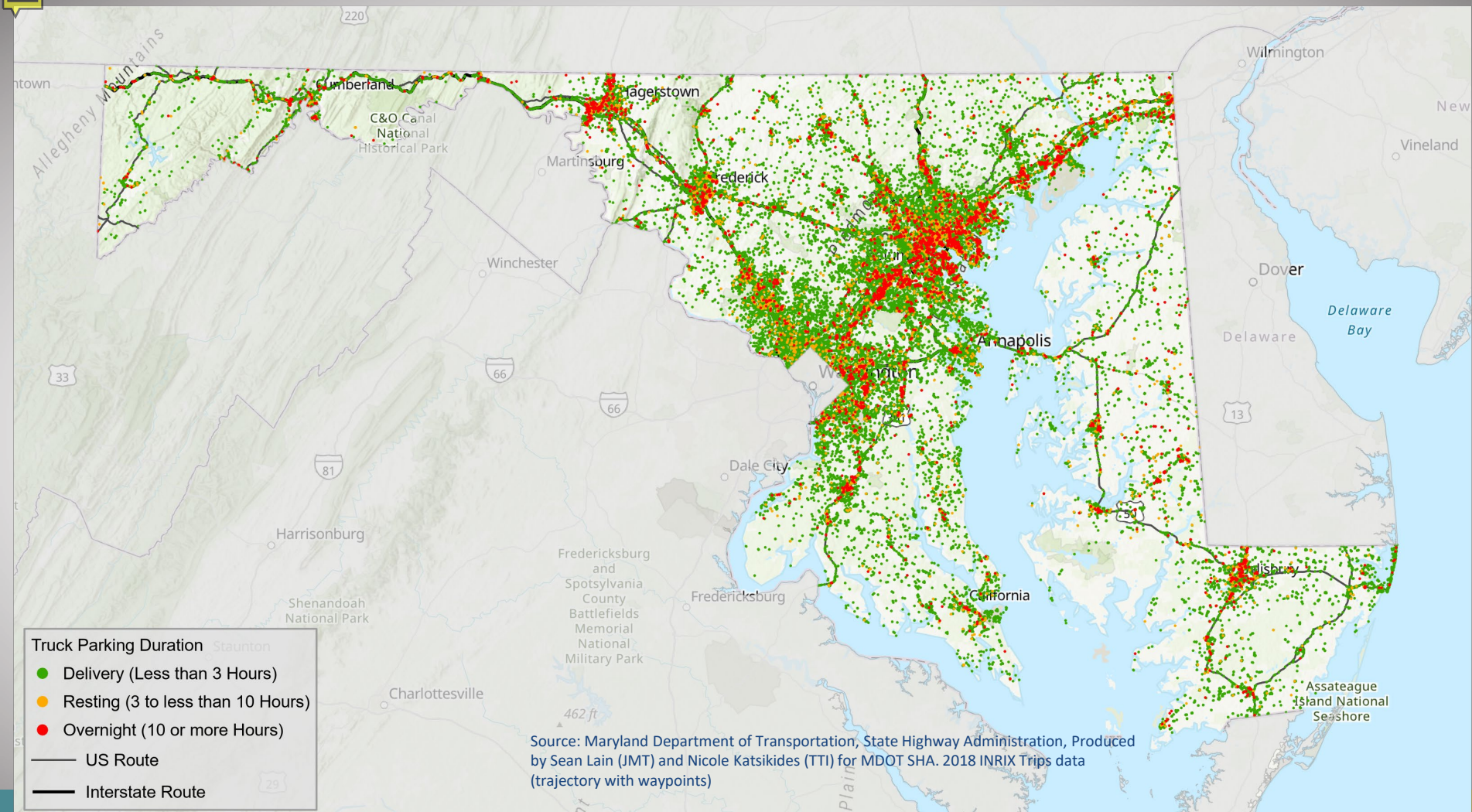
Uses of Data to Support Truck Parking

- **Demand:** Show where trucks are parking by:
 - different durations
 - official and unofficial parking
 - ripple effect of freight generators – what is the truck parking impact?
- **Usage/Capacity Analysis:** Develop usage statistics for existing facilities, show level of capacity and ramp usage
- **Identify Opportunity:** Marry parking data with geospatial data to understand areas of opportunity (TTI and VTTI)
- **Emergency Parking:** Assess emergency truck parking activity and need
- **Data Feeds:** Determine if historical data are reliable to use as information on likelihood of finding parking



Using Truck Probe Data to Visualize Demand and Engage Stakeholders on Solutions

MARYLAND TRUCK PARKING BY DURATION

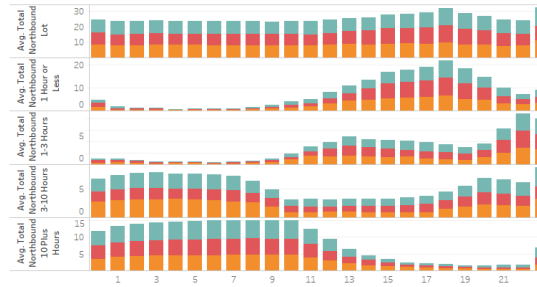


Quarter Snapshot of Trucks Parked in lot and ramps

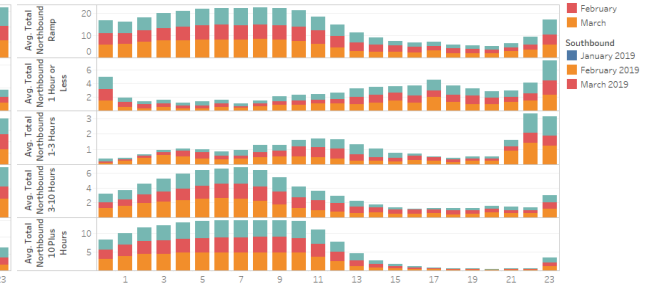
- During the first quarter of 2019, the data from INRIX show 31% of trucks parked in this area longer than 10 hours were on the ramps.



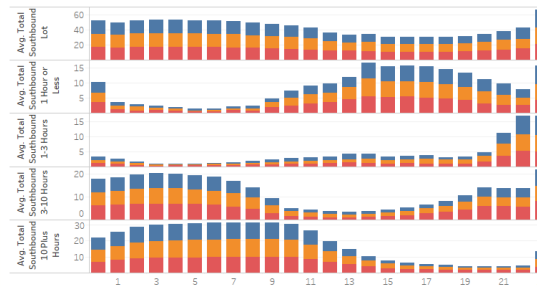
Parking by Day, Month and Length of Parking



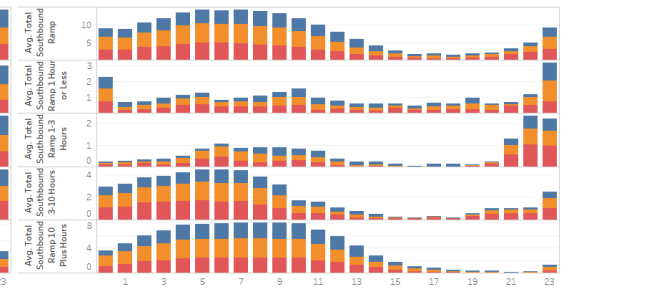
Parking by Day, Month and Length of Parking



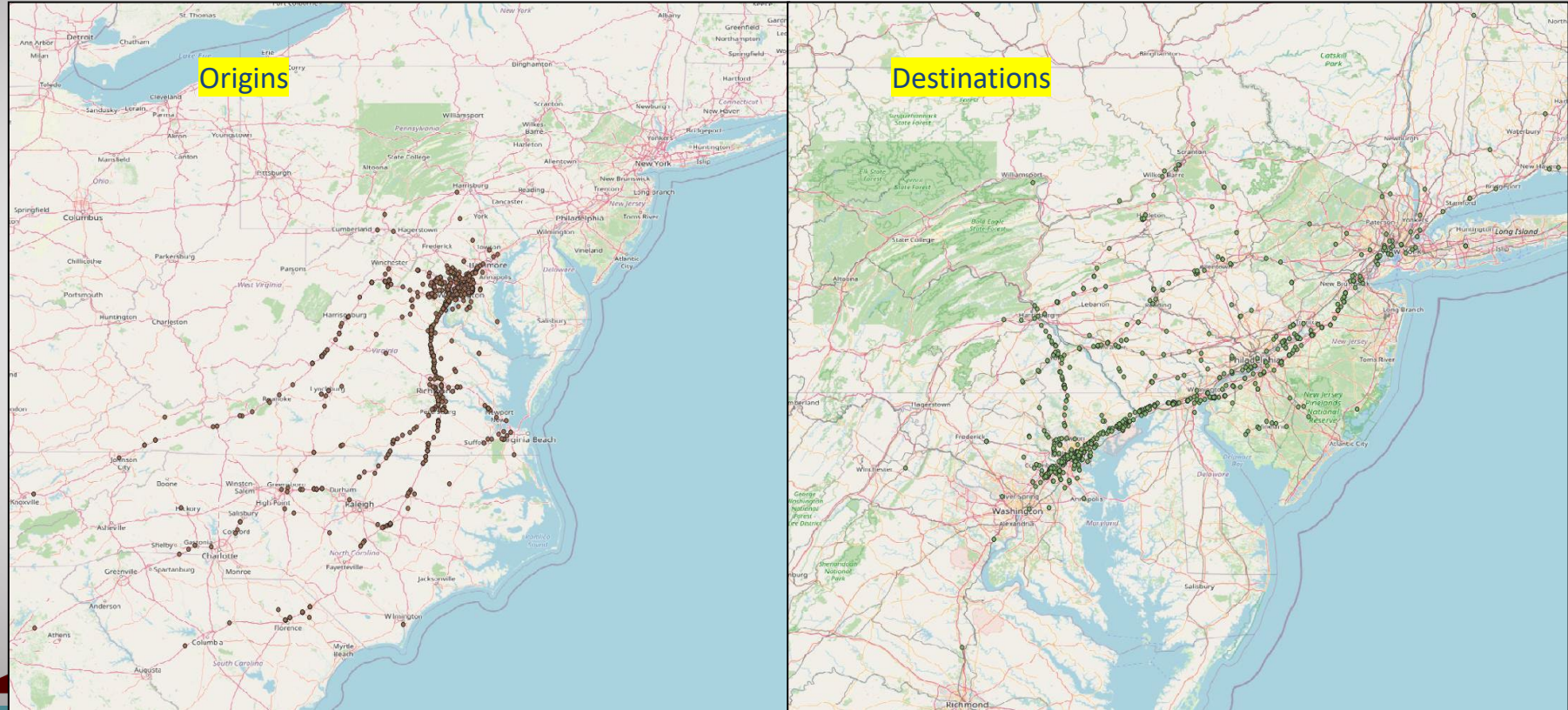
Utilization by Hour, Month and Length of Parking



Utilization by Hour, Month and Length of Parking



Origins and Destinations of Less Than 1 Hour Ramps Trucks, Northbound



Usage Numbers

Based on one to two nights a year of manual counts taken.

Based on one quarter of INRIX data in 2019. More detail and accuracy, more temporal detail.

Truck Stop	Roadway	County	Municipality	Usage (%)				
				2012	2013	2014	2016	2017
Youghiougheny Overlook Welcome Center	I-68 EB Friendsville	Garrett	Friendsville	82%	77%	95%	86%	95%
Mason Dixon Welcome Center ***	US 15 S of PA State Li	Frederick	Emmitsburg					
I-95 Welcome Center - Northbound	I-95 SB Laurel	Howard	Laurel	152%	257%	238%	248%	376%
I-95 Welcome Center - Southbound	I-95 NB Laurel	Howard	Laurel	87%	83%	93%	126%	111%
Maryland House - Northbound	I-95 NB Aberdeen	Cecil	Aberdeen	129%	N/A	154%	150%	243%
Maryland House - Southbound	I-95 SB Aberdeen	Cecil	Aberdeen	176%	N/A	148%	157%	67%
Chesapeake House - Northbound	I-95 NB North East	Cecil	North East	57%	74%	71%	83%	77%
Chesapeake House - Southbound	I-95 SB North East	Cecil	North East	49%	43%	38%	51%	35%
U.S. 13 Welcome Center - Northbound	US 13 NB at VA State	Worcester	Pocomoke City	129%	143%	143%	21%	7%
Bay Country Welcome Center	US 301 Centerville	Queen An	Centerville	56%	56%	76%	88%	96%
I-70 Welcome Center - Eastbound	I-70 EB South Mount	Frederick	Myersville	158%	150%	146%	142%	158%
I-70 Welcome Center - Westbound	I-70 WB South Mount	Frederick	Myersville	109%	104%	130%	100%	143%
I-70 Truck Rest Area	I-70 EB New Market	Frederick	New Market	111%	156%	144%	144%	178%

Hours Overnight	Northbound Parking Count	Northbound Ramp Count	Space Ratio	Ramp Ratio	Adjusted Parking Count	Adjusted Space Ratio
10:00 PM	7.98	3.12	38%	28%	39.89	190%
11:00 PM	10.93	5.71	52%	34%	54.67	260%
12:00 PM	8.12	5.58	39%	41%	40.61	193%
1:00 AM	7.82	5.36	37%	41%	39.11	186%
2:00 AM	7.92	6.04	38%	43%	39.61	189%
3:00 AM	8.01	6.66	38%	45%	40.06	191%
4:00 AM	7.87	7.00	37%	47%	39.33	187%
5:00 AM	7.92	7.34	38%	48%	39.61	189%
6:00 AM	7.97	7.49	38%	48%	39.83	190%
Spaces	21					
Hours Overnight	Southbound Parking Count	Southbound Ramp Count	Space Ratio	Ramp Ratio	Adjusted	Adjusted Space Ratio
10:00 PM	14.40	1.61	31%	10%	72.00	157%
11:00 PM	22.58	3.03	49%	12%	112.89	245%
12:00 PM	17.63	2.97	38%	14%	88.17	192%
1:00 AM	16.78	2.91	36%	15%	83.89	182%
2:00 AM	17.54	3.55	38%	17%	87.70	191%
3:00 AM	17.77	3.97	39%	18%	88.83	193%
4:00 AM	17.79	4.48	39%	20%	88.94	193%
5:00 AM	17.57	4.78	38%	21%	87.83	191%
6:00 AM	17.50	4.70	38%	21%	87.50	190%
Spaces	46					

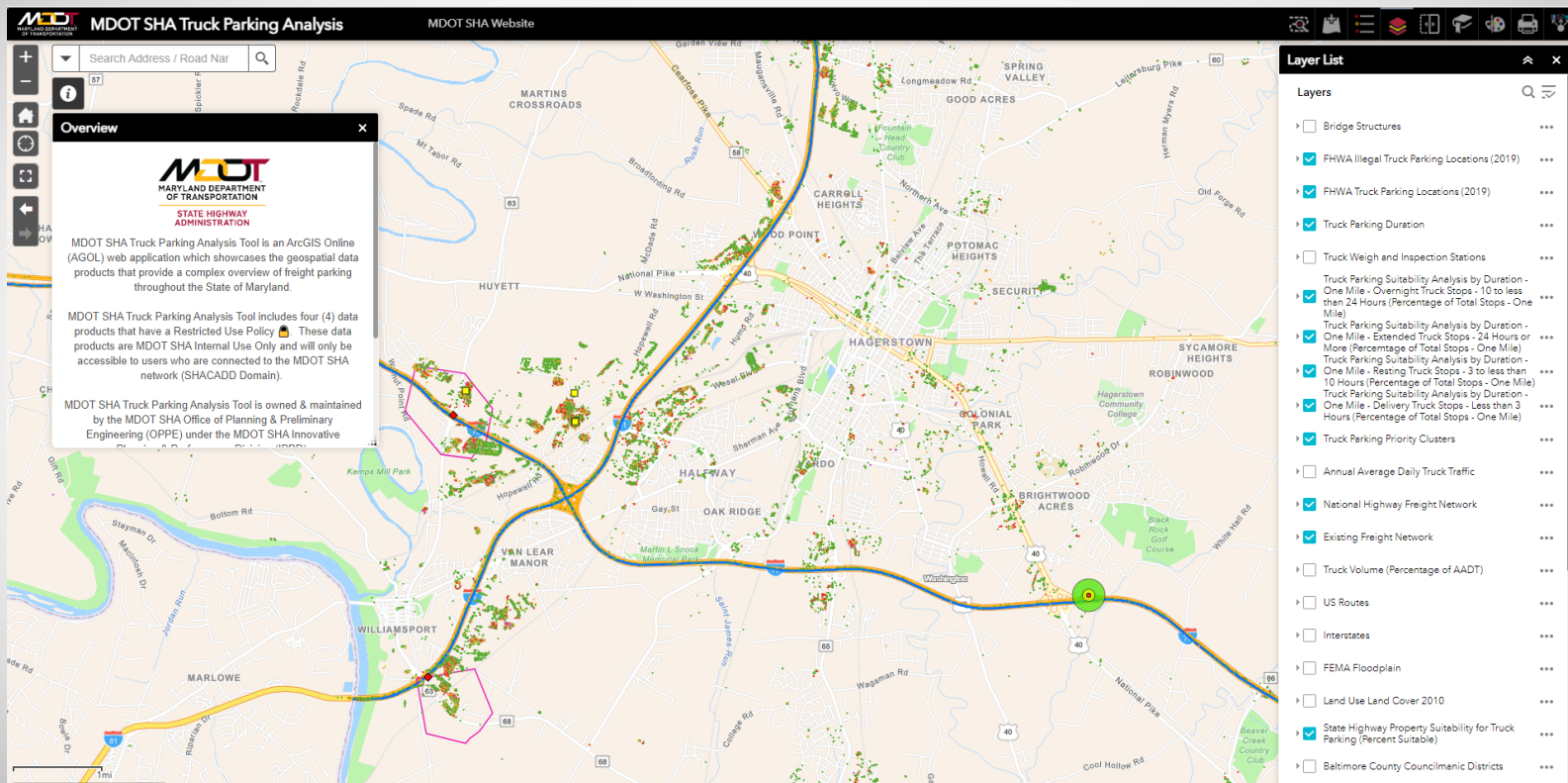
Maryland's Truck Parking Dashboard

- Four years of Data
- Shows demand and usage statistics
- Can be layered with MDOT's geospatial catalogue
- <https://trkparkingmd.tti.tamu.edu/>

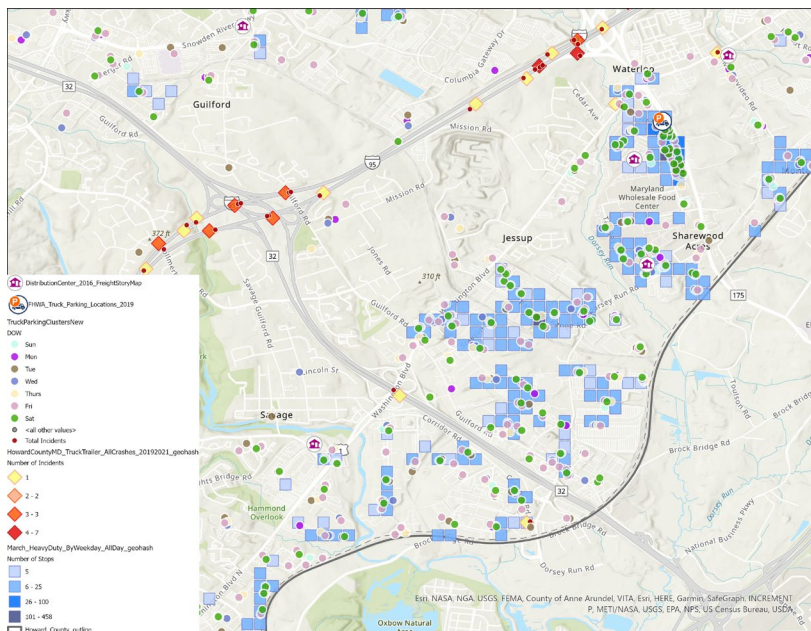


Matching Probe Data to Geospatial Information to Identify Property and Operational Solutions

MDOT SHA Property Suitability for Truck Parking Analysis

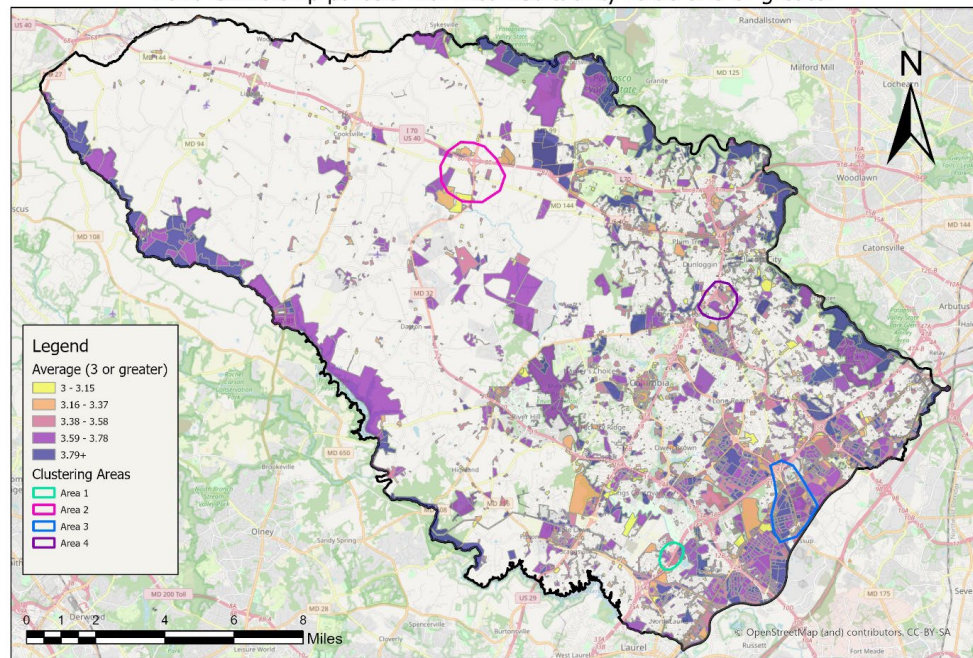


Probe Data and Geospatial Layering



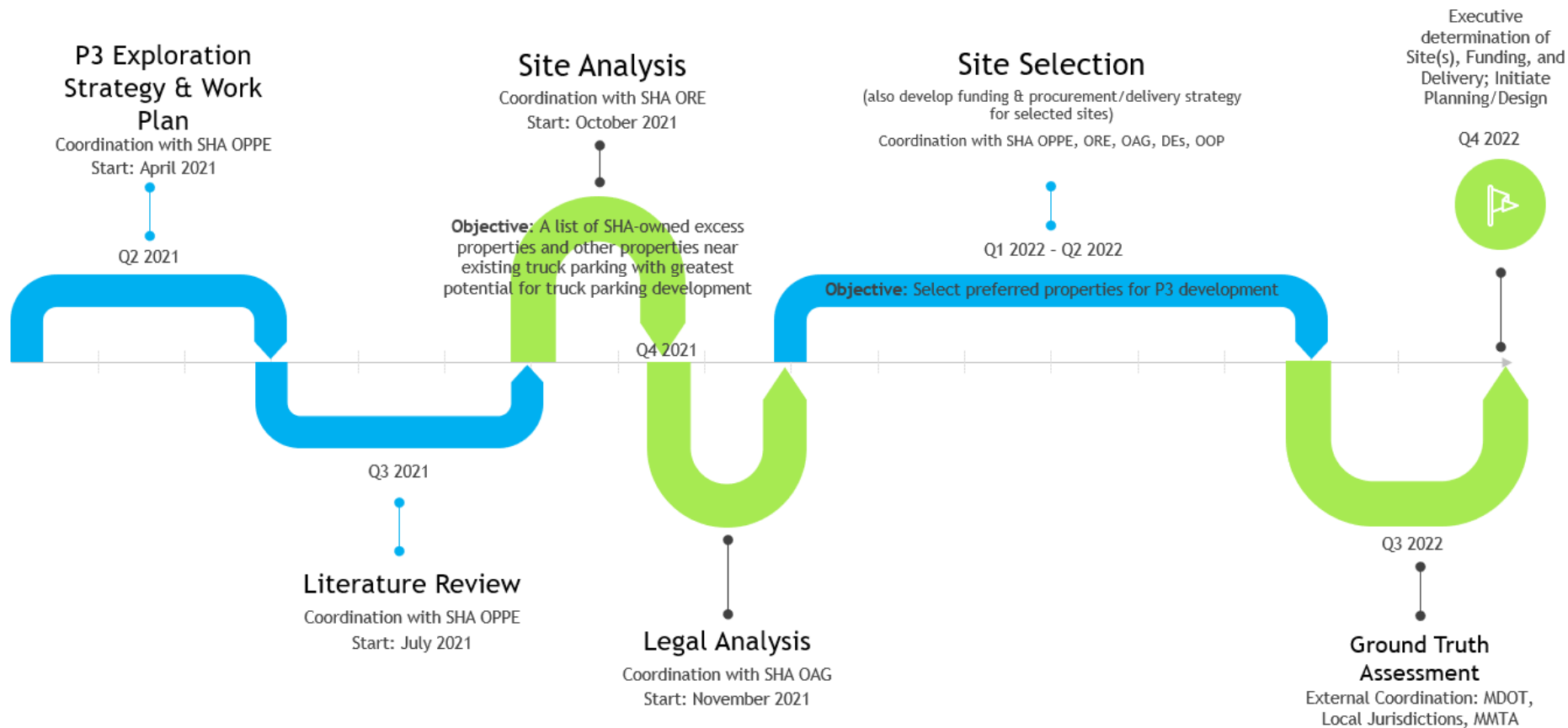
Howard County, MD Truck Parking Availability

Land Ownership parcels with mean Suitability value of 3 or greater



Source: VTTI, 2022

Maryland Truck Parking P3 Roadmap





Creating Information Feeds

Comparison of Three Years

2019 October

Characteristic	N = 3,094 [†]
authorized	
authorized	1,953 (63%)
unauthorized	1,141 (37%)
Parking duration	
1-3 hours	571 (18%)
3-10 hours	519 (17%)
less than 1 hour	1,718 (56%)
longer than 10 hours	286 (9.2%)
[†] n (%)	

2020 October

Characteristic	N = 2,604 [†]
authorized	
authorized	1,593 (61%)
unauthorized	1,011 (39%)
Parking duration	
1-3 hours	631 (24%)
3-10 hours	390 (15%)
less than 1 hour	1,583 (61%)
[†] n (%)	

2021 October

Characteristic	N = 2,269 [†]
authorized	
authorized	1,228 (54%)
unauthorized	1,041 (46%)
Parking duration	
1-3 hours	612 (27%)
3-10 hours	269 (12%)
less than 1 hour	1,257 (55%)
longer than 10 hours	131 (5.8%)
[†] n (%)	

Three Year Comparison (Raw Numbers Averaged by Hour for Each Day, Adjusted for Population, and Percent Full)

Day	12AM	1AM	2AM	3.00	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Sunday	5.00	5.33	7.33	8.33	8.00	8.00	8.33	8.67	9.00	9.33	8.00	8.67	8.67	6.33	7.33	6.67	7.33	9.00	8.33	9.33	8.33	8.33	8.00	10.33
Monday	7.67	7.00	8.00	7.67	9.67	9.33	10.33	11.67	11.33	11.67	9.67	11.00	10.33	8.33	9.00	8.67	14.67	17.67	19.33	19.00	21.67	16.67	10.67	12.00
Tuesday	11.00	10.00	10.33	10.33	11.00	9.00	10.67	10.67	12.67	11.33	12.67	10.00	14.00	16.00	14.33	16.00	19.33	22.33	23.67	29.00	26.33	21.33	14.67	14.67
Wednesday	15.33	11.33	11.33	12.33	12.00	12.00	12.33	14.00	15.67	15.00	13.33	14.00	12.33	8.00	11.00	14.33	16.00	15.67	24.00	27.00	22.00	18.00	14.67	15.33
Thursday	12.67	11.67	13.67	14.00	15.00	14.00	14.67	16.00	15.67	16.67	18.00	18.67	18.00	17.33	13.67	15.67	16.33	16.33	26.33	32.00	34.00	29.00	21.00	19.67
Friday	12.67	10.00	12.33	12.00	11.67	12.33	12.67	11.67	10.67	11.00	15.00	17.33	14.67	16.00	15.33	17.33	15.67	16.33	19.33	24.33	26.67	23.00	17.33	14.33
Saturday	12.33	10.00	9.33	9.33	9.00	9.33	8.67	8.33	8.33	10.00	9.67	11.00	11.00	9.00	7.00	6.67	5.33	7.67	16.67	27.00	20.67	12.33	8.33	6.67

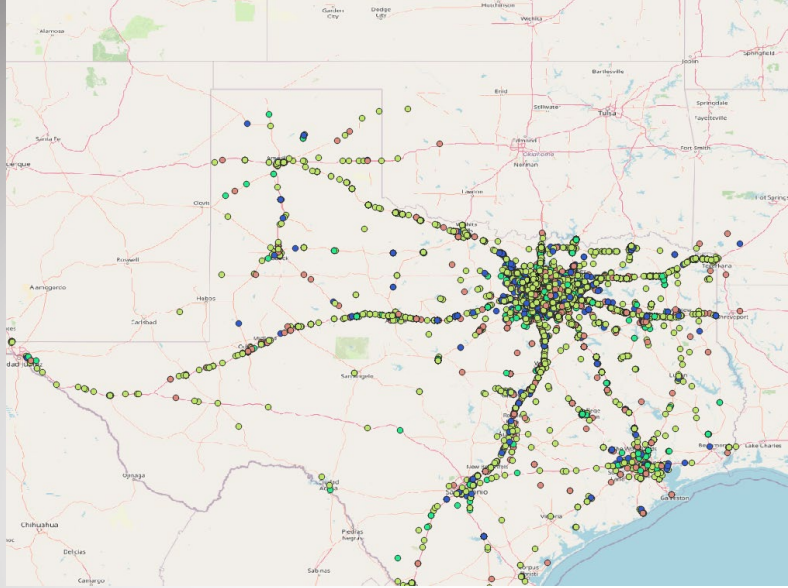
Day	12AM	1AM	2AM	3.00	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Sunday	25.00	26.67	36.67	41.67	40.00	40.00	41.67	43.33	45.00	46.67	40.00	43.33	43.33	31.67	36.67	33.33	36.67	45.00	41.67	46.67	41.67	41.67	40.00	51.67
Monday	38.33	35.00	40.00	38.33	48.33	46.67	51.67	58.33	56.67	58.33	48.33	55.00	51.67	41.67	45.00	43.33	73.33	88.33	96.67	95.00	108.33	83.33	53.33	60.00
Tuesday	55.00	50.00	51.67	51.67	55.00	45.00	53.33	53.33	63.33	56.67	63.33	50.00	70.00	80.00	71.67	80.00	96.67	111.67	118.33	145.00	131.67	106.67	73.33	73.33
Wednesday	76.67	56.67	56.67	61.67	60.00	60.00	61.67	70.00	78.33	75.00	66.67	70.00	61.67	40.00	55.00	71.67	80.00	78.33	120.00	135.00	110.00	90.00	73.33	76.67
Thursday	63.33	58.33	68.33	70.00	75.00	70.00	73.33	80.00	78.33	83.33	90.00	93.33	90.00	86.67	68.33	78.33	81.67	81.67	131.67	160.00	170.00	145.00	105.00	98.33
Friday	63.33	50.00	61.67	60.00	58.33	61.67	63.33	58.33	53.33	55.00	75.00	86.67	73.33	80.00	76.67	86.67	78.33	81.67	96.67	121.67	133.33	115.00	86.67	71.67
Saturday	61.67	50.00	46.67	46.67	45.00	46.67	43.33	41.67	41.67	50.00	48.33	55.00	55.00	45.00	35.00	33.33	26.67	38.33	83.33	135.00	103.33	61.67	41.67	33.33

Day	12AM	1AM	2AM	3.00	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Sunday	19.05	26.98	74.60	98.41	90.48	90.48	98.41	106.35	114.29	122.22	90.48	106.35	106.35	50.79	74.60	58.73	74.60	114.29	98.41	122.22	98.41	98.41	90.48	146.03
Monday	82.54	66.67	90.48	82.54	130.16	122.22	146.03	177.78	169.84	177.78	130.16	161.90	146.03	98.41	114.29	106.35	249.21	320.63	360.32	352.38	415.87	296.83	153.97	185.71
Tuesday	161.90	138.10	146.03	146.03	161.90	114.29	153.97	153.97	201.59	169.84	201.59	138.10	233.33	280.95	241.27	280.95	360.32	431.75	463.49	590.48	526.98	407.94	249.21	249.21
Wednesday	265.08	169.84	169.84	193.65	185.71	185.71	193.65	233.33	273.02	257.14	217.46	233.33	193.65	90.48	161.90	241.27	280.95	273.02	471.43	542.86	423.81	328.57	249.21	265.08
Thursday	201.59	177.78	225.40	233.33	257.14	233.33	249.21	280.95	273.02	296.83	328.57	344.44	328.57	312.70	225.40	273.02	288.89	288.89	526.98	661.90	709.52	590.48	400.00	368.25
Friday	201.59	138.10	193.65	185.71	177.78	193.65	201.59	177.78	153.97	161.90	257.14	312.70	249.21	280.95	265.08	312.70	273.02	288.89	360.32	479.37	534.92	447.62	312.70	241.27
Saturday	193.65	138.10	122.22	122.22	114.29	122.22	106.35	98.41	98.41	138.10	130.16	161.90	161.90	114.29	66.67	58.73	26.98	82.54	296.83	542.86	392.06	193.65	98.41	58.73



Understanding Development Impacts and Needs

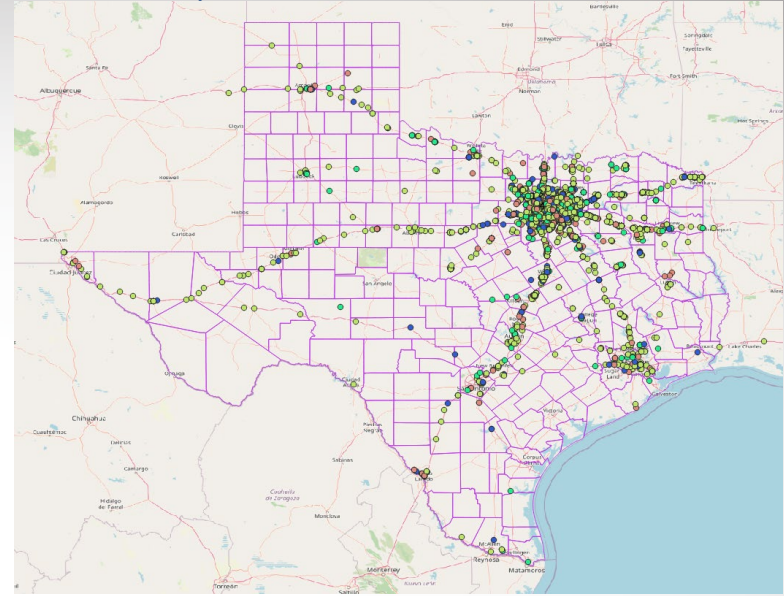
Last Stop Prior to Alliance, Texas



Land use type	N	commer_indus, N = 11,525 ¹	nearhwy, N = 770 ¹	parkinglot, N = 2,255 ¹	Possible parking space, N = 4,492 ¹	resid_edu, N = 973 ¹
Parking duration	20,015					
less than 1 hour		6,899 (60%)	548 (71%)	1,296 (57%)	2,770 (62%)	428 (44%)
1-3hours		2,152 (19%)	124 (16%)	215 (9.5%)	710 (16%)	176 (18%)
3-10hours		1,082 (9.4%)	44 (5.7%)	307 (14%)	452 (10%)	159 (16%)
longer than 10 hours		1,392 (12%)	54 (7.0%)	437 (19%)	560 (12%)	210 (22%)
¹ n (%)						

TTI analysis of freight generators for TxDOT and Cambridge Systematics support of FHWA Truck Parking Demand Guidebook.

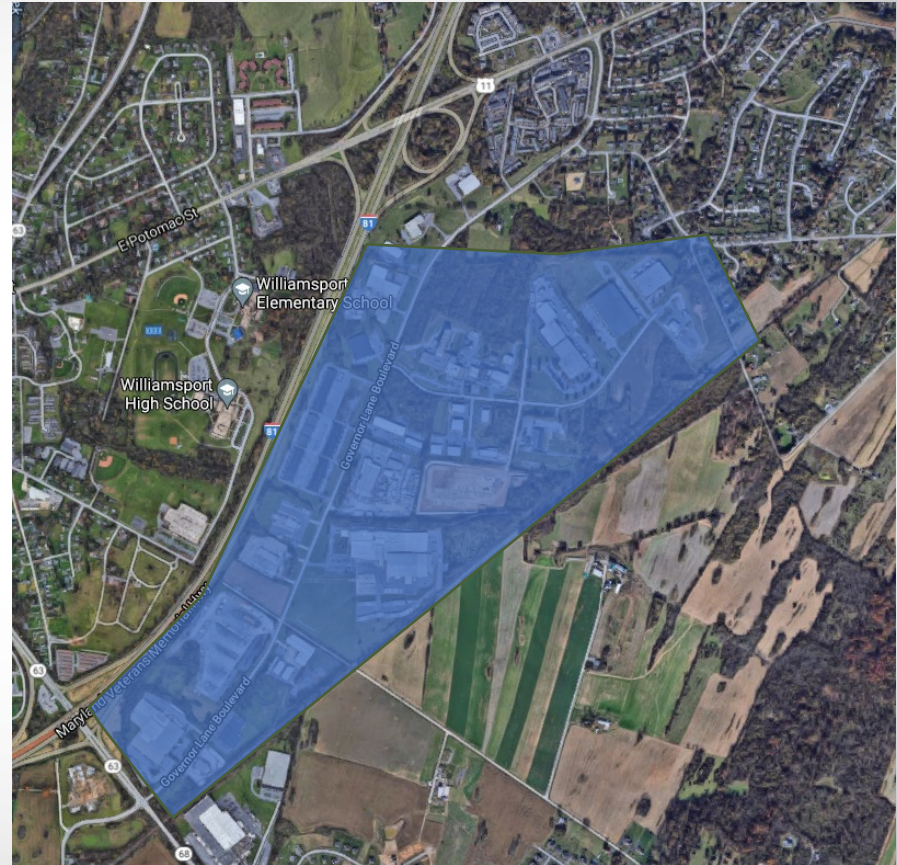
First Stop After Alliance, Texas



Land use type	N	commer_indus, N = 3,788 ¹	nearhwy, N = 255 ¹	parkinglot, N = 773 ¹	Possible parking space, N = 1,722 ¹	resid_edu, N = 301 ¹
Parking duration	6,839					
less than 1 hour		2,193 (58%)	185 (73%)	440 (57%)	1,021 (59%)	132 (44%)
1-3hours		736 (19%)	28 (11%)	105 (14%)	292 (17%)	51 (17%)
3-10hours		445 (12%)	26 (10%)	125 (16%)	214 (12%)	47 (16%)
longer than 10 hours		414 (11%)	16 (6.3%)	103 (13%)	195 (11%)	71 (24%)
¹ n (%)						

Yellow is less than 1 hour (greater than 15 minutes), Red is 1-3 hours, Green is 3-10 hours, and Blue is longer than 10 hours

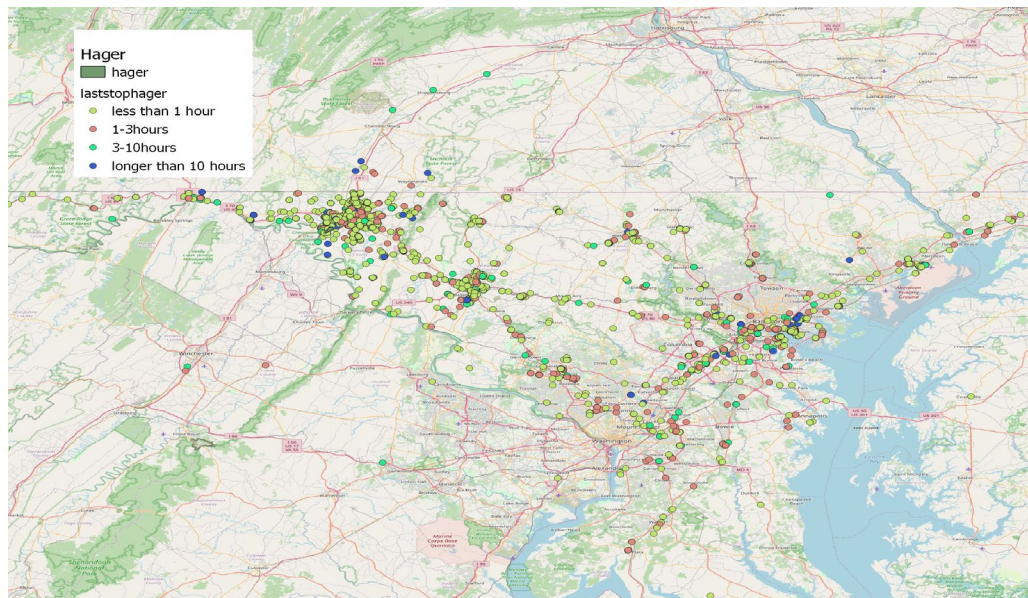
Hagerstown Last Stop Prior to Industrial Location Example



Last Stop Analysis Prior to Reaching Hagerstown Industrial Area

Characteristic	N = 7,398 [†]
counties	
inside	4,457 (60%)
outside	2,941 (40%)
Parking duration	
less than 1 hour	5,097 (69%)
1-3hours	1,176 (16%)
3-10hours	526 (7.1%)
longer than 10 hours	599 (8.1%)
[†] n (%)	

counties	N	inside, N = 4,457 [†]	outside, N = 2,941 [†]
Parking duration	7,398		
less than 1 hour		3,143 (71%)	1,954 (66%)
1-3hours		647 (15%)	529 (18%)
3-10hours		299 (6.7%)	227 (7.7%)
longer than 10 hours		368 (8.3%)	231 (7.9%)
[†] n (%)			

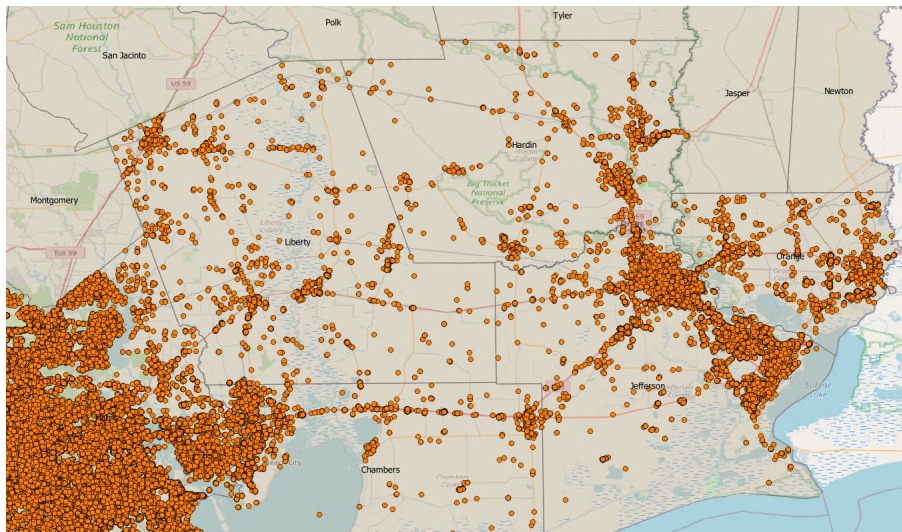




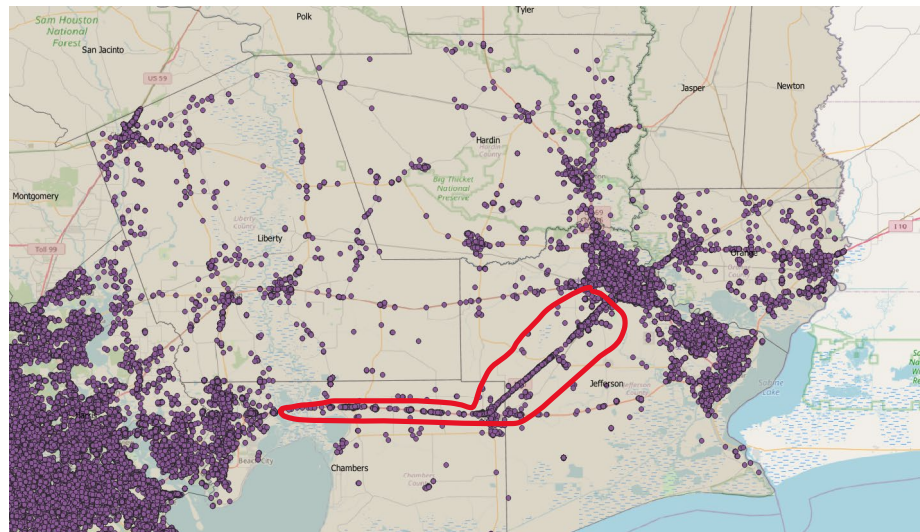
Emergency Parking Need Identification

Emergency Truck Parking Analysis

Parking events before Imelda tropical storm (Sep16-17)



Parking events during Imelda tropical storm (Sep18-19)



Next Steps

- Develop Dashboards
- Expand freight generator and emergency parking
- Continue working with available and suitable property
- Discuss TSMO options
- Continue to engage local governments and share data

For More Information

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Background and Literature Review

- Maryland wanted usage information for its lots
- Literature Review:
 - University of Tennessee (geospatial analysis)
 - Minnesota/ATRI (Use of ATRI data, usage measurement, StreetLight assessment)
 - Arizona and Maryland/CPCS (ATRI and INRIX parking clusters)
 - StreetLight/Fehr & Peers (assessment of unauthorized parking)
 - Cambridge Systematics/ATRI TxDOT Truck Parking Plan
- Our work adds:
 - Assessments using INRIX Trips data that states have available
 - Testing of performance measures, new distributions of duration
 - O/D visibility
 - Visualization
 - Value added capabilities using the data (what else can we do with it?)

Last Stop Clusters

