

Improving Work Zone Safety and Mobility





Background

Motivation

Compliance with Final Rule on Work Zone Safety and Mobility

Funding

In 2013 MD SHA and FHWA funded a project to develop a real time performance monitoring tool for work zones using INRIX probe vehicle data and event data.

















Data Sources and Key Definitions

- Active work zone information provided by SHA CHART system in real-time.
- Probe vehicle speed information from INRIX.



Queue/Bottleneck



	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Tue 5/06/2014	\$3.08	\$108.81	\$7,128.14	\$27.44	\$65.90	\$18.84	\$7,352.21
Wed 5/07/2014	\$4.96	\$109.18	\$8,340.98	\$1,363.86	\$69.40	\$22.46	\$9,910.84
Thu 5/08/2014	\$14.66	\$25.33	\$3,590.53	\$3,622.06	\$110.97	\$80.95	\$7,444.50
Fri 5/09/2014	\$3.96	\$19.39	\$617.81	\$16.48	\$2,440.87	\$6.42	\$3,104.93
Sat 5/10/2014	\$4.07	\$0.49	\$0.00	\$36.27	\$12.90	\$54.81	\$108.54
Sun 5/11/2014	\$4.41	\$10.43	\$0.00	\$4,314.89	\$0.00	\$6.63	\$4,336.36
Mon 5/12/2014	\$2.58	\$201.15	\$8,183.06	\$3,144.59	\$349.59	\$27.50	\$11,908.47
Hourty Totals	\$37.72	\$474.78	\$27,860.52	\$12,525.59	\$3,049.63	\$217.61	Grand Total: \$44,165.85
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Calculated using:

- ADT (AADT with adjustment factor)
- Passenger/commercial vehicle percentages
- Speed reduction factor
 - Delay



Audience and Goals

Work Zone Performance Monitoring

WORKZONE LOCATION

- Audience: Project Engineers and Managers
- Goals:
 - Real time performance
 - Alerts when thresholds exceeded
 - Potential actions based on identified performance
- Audience: Public Relations
- Goals:
 - Real time and historical performance
 - Responding to complaints and inquiries
- Audience: Planners and Decision Makers
- Goals:
 - Closure costs
 - Review of previous performance

	USER D	ELAY COST BY CORR	IDOR AND DAY OF W	EEK		Gaithersburg
		Total User De	ay Cost 🔹 👻			
	I-95	I-695	US-50	I-70	Daily Tot	Bowie 2 50
5un 5/04/2014	\$2,293,148.25	\$27,007.79	\$91,719.43	\$24,818.81	\$2,436,69	Washington
Aon 5/05/2014	\$2,690,597.77	\$790,679.54	\$245,683.44	\$176,684.45	\$3,903,64	Alexandria
ue 5/06/2014	\$2,615,804.89	\$862,341.67	\$384,208.20	\$48,224.65	\$3,910,57	
Ved 5/07/2014	\$2,845,013.60	\$884,413.37	\$380,984.89	\$115,593.89	\$4,226,00	
Thu 5/08/2014	\$1,467,929.80	\$1,655,892.91	\$499,083.14	\$248,688.56	\$3,871,59	
Fri 5/09/2014	\$1,892,924.58	\$1,144,372.86	\$315,555.14	\$107,486.88	\$3,460,339.47	Regional performance
Sat 5/10/2014	\$3,304,754.54	\$303,579.23	\$121,740.65	\$14,313.28	\$3,744,387.71	- .
5un 5/11/2014	\$2,435,040.40	\$48,424.94	\$268,858.10	\$6,513.70	\$2,758,837.15	
Canada a Tabala	\$10 545 213 84	\$5 716 712 31	\$2 307 833 00	\$742 324 22	Grand Total:	

Corridor performance



Individual work zone performance

Work Zone Dashboard



QUEUE LENGTH (MI)

LANE STATUS

USER DELAY COST (\$)

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Workzone Dashboard

CURRENT WORKZONES IN MARYLAND				
EGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELA COST (\$)	SEVERITY
- Maryland (76)	2043	1.06	\$374,858.0	
✓ Allegany (3)	0	0	\$9,618.00	
🚯 I-68 EAST AT PLEASANT VALLEY RD	0		į \$1,396.00	
US 220 SOUTH SOUTH OF MP 12.75	0	0	_, \$59.00	
1-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$8,163.00	
Anne Arundel (2)	0	0	\$18,167.00	
🚸 MD 198 EAST AT MD 295	0	•		
MD 2 NORTH AT MD 255	0	0	\$9,793.00	
▼ Baltimore (15)	197	0.22	\$77,435.00	
🚸 MD 26 EAST AT DEER PARK RD	0	•		
1-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0		1, \$431.00	
MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0			
T 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83		-1, \$9,748.00	
1-895 SOUTH PRINT TO FWT 4 MD 295 PHYTIMORE MICH NOTON PAPERVAX IN NO TERM & CONTINUO		0	, 60 ,718.00	
MD 45 SOUTH BE EEN PA INIA RD D TIM HUM RD	0		880.00	
I-83 NORTH AT F 27 MD 1 WT KMEL R	0	0	\$8,648.00	
NOBTLY WEEN FORGE DERRY HUSED	0		-I_\$9,028.00	
1-70 EAST BETWEEN ROLLING RD AND COOKS LA	0		-1_\$5,854.00	
MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0	0.22 →		
1-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0		10 \$6,995.00	
MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$939.00	
MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$2,107.00	
1-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE	1	•	-i_\$4,168.00	, 74
MD 45 SOUTH FROM WINDWOOD RD TO DUNKIR	0		-i, \$9,181.00	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
→ Baltimore City (4)	178	0	\$26,997.00	
(I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LAN HIFT/LONG-TERM)	17	0		
1-895 NORTH AT POTEE ST ON POTEE ST	0		\$2,945.00	
1-695 INNER LOOP PAST EXIT 1 MD 173 HAWKINS POINT RD	0			/ / 👼
I-895 SOUTH AT EXIT 7 MD 2 POTEE ST (LONG TERM-CONTINUOUS 1/02/14-06/31/14)	161			1
← Calvert (1)	0	0	\$324.00	
MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$324.00	
← Carroll (3)	1	0	\$18,550.00	\sim
MD 26 WEST AT MP 16.7	0	0	\$7,678.00	\succ
MD 97 SOUTH/NORTH AT OLD HANOVER RD	0	0	4 \$1,092.00	2
MD 26 EAST/WEST BETWEEN MD 27 AND BUFFALO RD	1	0	-1 \$9,780.00	
▼ Cecil (4)	20	0	\$22,638.00	
🚸 US 40 WEST AT Thomas Hatem Memorial Bridge	0	0	\$5,919.00	\sim
I-95 SOUTH PRIOR TO EXIT 100 MD 272 NORTHEAST RD (MM 99.54 -96.73)	19	0	4 \$8,071.00	1
I-95 SOUTH PAST EXIT 93 MD 222 BAINBRIDGE RD (MM92-89)	0	0	4 \$7,475.00	~ 1
L-95 SOUTH PAST EXIT 100 MD 272 NORTHEAST RDIMM. 100-98.51	1	0	\$1,173,00	soft

Critical	

TOP CRITICAL WORKZONES

WORKZONE LOCATIONS		USER D	ELAY COST BY CORR	DOR AND DAY OF WI	EEK	*
			Total User De	ay Cost 🔹		
Willinington		1-95	I-695	US-50	I-70	Daily Totals
	Wed 4/09/2014	\$2,678,358.64	\$626,606.88	\$229,861.28	\$48,652.15	\$3,583,478.94
	Thu 4/10/2014	\$1,239,852.54	\$1,050,702.81	\$301,406.33	\$77,104.65	\$2,669,066.33
	Fri 4/11/2014	\$1,806,- 05	\$1,105,801.53	\$474,634.47	\$107,010.25	\$3,493,788.29
	Sat 4/12/2014	\$3,367,462	\$179,0 1.99	\$107,675.0.	6,721.7	\$3,660,917.46
	Sun 4/13/2014	\$2,548,28 .0	\$37,468.98	\$,927.57	S. 115 7	\$2,677,692.82
	Mon 4/14/2014	¥2,001,674.91	3 ,	\$190,	\$184 .0.13	\$3,369,250.33
Bown Washington	Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$1,311.87	\$4,128,557.87
Alexandria (Constanting of the second se	Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
	Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03
			w	eekend Lowest		Highest No Data



Overview List

REGION/EVENT		# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
		527	5.24	\$310,306.00
		0	0	\$6,278.00
0.34		0	0	4 \$6,278.00
0.01		0	0	\$20,774.00
		0	0	4 \$9,431.00
0 2		0	0	4 \$1,364.00
		0	0	4 \$9,979.00 2
0.04		87	2.73	\$78,513.00
		0	0	\$8,660.00
		0	0	4 \$5,553.00
0 1		0	0	\$1,926.00
A		86	0 	\$6,712.00
		0	2.35	54,940.00
MD 151 SOUTH/NORTH BETWEEN NORTH POINT BLVD AND WISE AVE		0		4 \$9,900.00 2
1-695 OUTER LOOP AT HARFORD RD		0		\$2,903.00
MD 26 EAST/WEST BETWEEN PIKESWOOD DR. AND TIVERTON RD		0		4 \$4,873.00 2
I-83 NORTH AT EXIT 31 MIDDLETOWN RD		0	0	\$8,583.00
		0	\rightarrow	4 \$5,448.00 2
1 7 9		0	0.04	4 \$2,880.00 1
1.30		0	0	\$6,473.00
			0	4 \$4,803.00
0	3	0	0	\$4,859.00
	-	2	1.38	\$14,329.00
		1		\$5,945.00
1-695 INNER LOOP AT MP 49.3 (FRANCIS SCOTT KEY BRIDGE)		0		2,314.00
1-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)		1	1.38 +	4 5 5,070.00
✓ Calvert (3)		0	0	\$24,014.00

Work Zone Dashboard



Workzone Dashboard

CURRENT WORKZONES IN MARYLAND				TOP CRITICAL WORKZONES					
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	QUEUE SEVERITY/EVENT LANE STATUS LENGTH (MI	USER DEL II) COST (\$)				
▼ Maryland (55)	527	5.24	\$310,306.00	✓ Critical (1) 2.35	\$7,781.00				
✓ Allegany (1)	0	0	\$6,278.00	🚯 I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD	-2.35 \$7,781.00				
1-68 EAST AT NEW GEORGES CREEK RD	0	•		▼ Major (2) 2.51	\$9,527.00				
Anne Arundel (3)	0	0	\$20,774.00	RIVERDALE RD WEST BETWEEN 67TH PL AND MD 410	1.01 \$5,507.00				
🚯 MD 170 SOUTH BETWEEN MIDWAY RD AND ROGERS LA	0		i \$9,431.00	I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)	. 1.5 \$4,020.00				
1-97 SOUTH FROM NEW CUT RD TO BRIGHTVIEW DR	0	0	1, \$1,364.00						
MD 10 NORTH FROM 1-695 TO MD 648	0	0	\$9,979.00						
→ Baltimore (14)	87	2.73	\$78,513.00						
MD 128 SOUTH/NORTH BETWEEN FIRST AVE AND HANOVER PIKE	0	0	1 \$8,660.00						
toch raven blvd north between Joan ave and white oak ave	0	0	\$5,553.00						
1-695 INNER LOOP/OUTER LOOP BETWEEN COVE RD AND NORTH POINT BLVD	0	0	\$1,926.00						
1-895 NORTH PAST 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	86	0	56,712.00						
1-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD	0	2.35	54,940.00						
🚸 MD 151 SOUTH/NORTH BETWEEN NORTH POINT BLVD AND WISE AVE	0	0	12 \$9,900.00						
1-695 OUTER LOOP AT HARFORD RD	0	0	15 \$2,903.00						
MD 26 EAST/WEST BETWEEN PIKESWOOD DR AND TIVERTON RD	0	0	4,873.00						
1-83 NORTH AT EXIT 31 MIDDLETOWN RD	0	0	\$8,583.00						
MD 150 WEST AT PEMBROOKE BLVD	0	0.34	12 \$5,448.00						
🚸 MD 122 EAST/WEST BETWEEN WHITEHEAD RD AND KERNAN DR	0	0.04 →	52,880.00						
K MD 372 WEST BETWEEN HILLTOP RD AND ROLLING RD	0	0	\$6,473.00						
K MD 45 SOUTH BETWEEN PADONIA RD AND TIMONIUM RD	1	0	4,803.00						
🚸 I-695 INNER LOOP AT EXIT 34 MD 7 PHILADELPHIA RD	0	0	\$4,859.00	Total User Delay Cost					
→ Baltimore City (3)	2	1.38	\$14,329.00	Reading 77 1 105 1695 1550 1.70	Daily Totals				
🚸 I-895 SOUTH PAST EXIT 14 MORAVIA RD[MM, 13.5-13.3]	1	0	\$5,945.00		Daily rotals				
I-695 INNER LOOP AT MP 49.3 (FRANCIS SCOTT KEY BRIDGE)	0	0	2 \$2,314.00	Wed 4/16/2014 \$2,937,018.16 \$500,186.92 \$212,687.02 \$83,203.90 \$	\$3,733,096.00				
🚯 I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)	1	1.38	56,070.00	Willington Thu 4/17/2014 \$1,459,034.41 \$794,467.52 \$322,713.48 \$198,072.22 \$	\$2,774,287.63				
✓ Calvert (3)	0	0	\$24,014.00						
🚯 MD 765 NORTH FROM DOWELL RD TO PATUXENT POINT PKWY	0	0	\$8,400.00	Vineland Fri 4/18/2014 \$2,576,007.61 \$189,469.57 \$216,524.22 \$56,219.54 \$	3,038,220.94				
MD 231 EAST AT SKIPJACK RD	0	0	\$9,039.00	Sat 4/19/2014 \$3,424,527.24 \$21,110.66 \$93,743.13 \$5,851.83 \$	\$3,545,232.86				
MD 765 NORTH BETWEEN DOWELL RD AND PATUXENT POINT PKWY	0	0	\$6,575.00						
✓ Carroll (2)	0	0	\$12,274.00	Sun 4/20/2014 \$2,/20,252.20 \$45,957.86 \$65,368.03 \$12,296.07 \$	52,843,874.16				
MD 140 WEST EAST OF DEDE RD	0	0	i \$3,308.00	Alexandria Ale	\$3,279,816.59				
MD 27 NORTH BETWEEN BOND ST AND I-70	0	0	1 \$8,966.00 2		to 741 200 79				
✓ Cecil (1)	0	0	\$7,433.00		5,741,500.78				
I-95 SOUTH PAST EXIT 109 MD 279 ELKTON NEWARK RD[MM.106.4-105.9]	0	0	\$7,433.00	Wed 4/23/2014 \$2,494,435.45 \$1,022,402.79 \$992,287.48 \$142,072.49 \$	\$4,651,198.21				
✓ Frederick (3)	0	0	\$8,450.00						
US 15 NORTH PAST ANGLEBERGER RD	0	0	\$4,280.00	Corridor Totals \$21,049,545.30 \$3,577,022.15 \$2,425,984.71 \$554,475.02	Grand Total: \$27,607 <u>,027.18</u>				
US 340 WEST AT HORINE RD	0	0	\$3,190.00						
US 15 NORTH AT MT ZION RD	0	0	\$980.00	Weekend Lowest High	iest No Data				
✓ Garrett (1)	1	0	\$5,685.00	Richmond A					



TOP CRITICAL WORKZONES			٠
SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
- Critical (1)		2.35	\$7,781.00
I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD		2.3	5 \$7,781.00
- Major (2)		2.51	\$9,527.00
RIVERDALE RD WEST BETWEEN 67TH PL AND MD 410		1.0	1 \$5,507.00
I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)		1.5	\$4,020.00

Critical Work Zone Parameters



TOP CRITICAL WORKZONES	* *
SEVERITY/EVENT	TOP CRITICAL RANGE
✓ Major (80)	0 5 10 15 20
MD 216 EAST/WEST BETWEEN I-95 AND US 29	0 miles 5 miles
MD 26 WEST AT MP 16.7	0 \$3,450.00
MD 26 EAST AT DEER PARK RD	0 \$3,907.00
MD 528 NORTH FROM 56TH ST TO 72ND ST	↓ 1 1 1 1 1 1 0 \$9,925.00
I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	↓ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	↓ ↓ ↓ ↑ ↓ ↓ ↓ ↑ ↓ ↓ ↓ ↓ 0 \$9,027.00
I-95 OUTER LOOP AT ARDWICK ARDMORE RD	1.28 \$8,780.00
MD 191 EAST AT LELAND ST	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
1-81 SOUTH FROM MP 0.84 TO MP 3.13	
US 40 EAST/WEST FROM WASHINGTON ST TO I-81	↓ ↑ ↑ 0 \$9,515.00
MD 79 SOUTH/NORTH BETWEEN MD 17 AND MD 180	0 \$3,772.00
I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	
MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	↓ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓
MD 193 SOUTH/NORTH AT CAPITAL BELTWAY	
US 40 EAST/WEST BETWEEN I-70 AND BLENTLINGER RD	↓ ↑ ↑ ↓ ↑ ↓ ↓ ↑ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
MD 136 SOUTH/NORTH AT KERR RD	0 \$9,216.00
I-895 NORTH AT POTEE ST ON POTEE ST	0 \$3,103.00
MD 64 EAST FROM FRANKS RUN RD TO MD 418	↓ ↓ ↑ ↑ ↑ ↑ ↓ ↑ _ 0 \$1,843.00
MD 68 EAST/WEST AT MD 63	0 \$5,726.00
MD 97 SOUTH/NORTH AT I-70	↓ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

Work Zone Dashboard



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Workzone Dashboard

CURRENT WORKZONES IN MARYLAND				TOP CRITICAL WORKZONES			*
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
- Maryland (80)	2043	1.87	\$397,617.00	▼ Major (80)		2.1	\$378,117.00
✓ Allegany (3)	0	0	\$9,455.00	MD 216 EAST/WEST BETWEEN I-95 AND US 29		0	\$8,105.00
I-68 EAST AT PLEASANT VALLEY RD	0			MD 26 WEST AT MP 16.7		0	\$1,569.00
US 220 SOUTH SOUTH OF MP 12.75	0	0	-1, \$2,976.00	MD 26 EAST AT DEER PARK RD		0	\$878.00
1-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$2,080.00	MD 528 NORTH FROM 56TH ST TO 72ND ST		0	\$8,353.00
 Anne Arundel (2) 	0	0	\$13,780.00	I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)		0	\$3,225.00
MD 198 EAST AT MD 295	0	0		🚸 I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]		0	\$4,445.00
MD 2 NORTH AT MD 255	0	0	\$8,739.00	1-95 OUTER LOOP AT ARDWICK ARDMORE RD		1.	.39 \$3,830.00
- Baltimore (15)	197	0.31	\$63,495.00	AD 191 EAST AT LELAND ST		0	\$9,752.00
MD 26 EAST AT DEER PARK RD	0	0		1-81 SOUTH FROM MP 0.84 TO MP 3.13		0	\$1,319.00
1-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0	0	12 \$4,992.00	🚸 US 40 EAST/WEST FROM WASHINGTON ST TO I-81	↓↓ ↑ ↑	0	\$3,944.00
MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0	0	4,551.00	AD 79 SOUTH/NORTH BETWEEN MD 17 AND MD 180	↓↓ ↑ ↑	0	\$4,691.00
1-895 NORTH PAST 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83	0	1 \$9,897.00	🚸 I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)			.02 \$7,457.00
🚸 1-895 SOUTH PRIOR TO EXIT 4 MD 295 BALTIMORE WASHINGTON PARKWAY (LONG-TERM & CONTINUOUS)	113	0	1 \$3,087.00	🚸 MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA		0	\$119.00
MD 45 SOUTH BETWEEN PADONIA RD AND TIMONIUM RD	0	0	4 \$9,205.00	🚸 MD 193 SOUTH/NORTH AT CAPITAL BELTWAY			\$6,196.00
🚸 I-83 NORTH AT EXIT 27 MD 137 MT CARMEL RD	0	0	\$7,528.00	🚸 US 40 EAST/WEST BETWEEN I-70 AND BLENTLINGER RD		0	\$982.00
🚸 US 1 NORTH BETWEEN FORGE RD AND PERRY HALL RD	0	0	-1 \$6,892.00	A MD 136 SOUTH/NORTH AT KERR RD	↓ ↓ ↑ ↑	0	\$9,531.00
1-70 EAST BETWEEN ROLLING RD AND COOKS LA	0	0		🚸 I-895 NORTH AT POTEE ST ON POTEE ST		0	\$286.00
MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0		ц \$5,985.00	AD 64 EAST FROM FRANKS RUN RD TO MD 418		0	\$8,750.00
1-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0	0	4 \$1,407.00	MD 68 EAST/WEST AT MD 63	↓↓↑	0	\$6,968.00
MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$689.00	AD 97 SOUTH/NORTH AT I-70		0	\$7,749.00
MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$2,268.00	WORKZONE LOCATIONS	IDOR AND DAY OF WEEK		٠
🚸 1-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE BELTWAY	1	0		Total User De	lay Cost 🔹	,	
MD 45 SOUTH FROM WINDWOOD RD TO DUNKIRK RD	0	0	–ı ₃ \$3,761.00		US-50	I-70 I	Daily Totals
→ Baltimore City (5)	178	0.02	\$23,704.00	Wilmington			
1-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	17	0		Wed 4/09/2014 \$2,678,358.64 \$626,606.88	\$229,861.28 \$	48,652.15 \$3	,583,478.94
1-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	0	0.02		Thu 4/10/2014 \$1,239,852.54 \$1,050,702.81	\$301,406.33 \$	77,104.65 \$2	,669,066.33
1-895 NORTH AT POTEE ST ON POTEE ST	0	0	-1 \$2,675.00		\$474 634 47 \$1	07 010 25	403 788 20
1-695 INNER LOOP PAST EXIT 1 MD 173 HAWKINS POINT RD	0	0	-1 \$2,545.00			57,010.23	,100.23
I-895 SOUTH AT EXIT 7 MD 2 POTEE ST (LONG TERM-CONTINUOUS 1/02/14-06/31/14)	161	0		Sat 4/12/2014 \$3,367,462.7 Fri Apr 11 2014: 1-695 Cost Per User \$0.09	107,675.02	6,721.70 \$3	,660,917.46
- Calvert (1)	0	0	\$8,668.00	Sun 4/13/2014 S2,548,281.1 Delay Per User 0.16m	83,927.57	8,015.17 \$2	,677,692.82
MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$8,668.00	Gaithersburger Total Delay 35070.24	01.53		240.250.22
	1	0	\$35,102.00		198,808.28 \$1	84,730.13 53	,309,250.33
MD 26 WEST AT MP 16.7	0	0	\$6,858.00	Washington 2007 June 4/15/2014 \$2,838,798.60 \$905,736.49	\$258,710.91 \$1	25,311.87 \$4	,128,557.87
MD 97 SOUTH/NORTH AT OLD HANOVER RD	0	0		Wed 4/16/2014 \$2,937,018.16 \$500,186.92	\$212,687.02 \$	\$3,203.90	,733,096.00
K MD 140 EAST PAST DEDE RD	0	0	-1 ₃ \$3,528.00				
KD 26 EAST/WEST BETWEEN MD 27 AND BUFFALO RD	1	0	ار \$7,660.00	220,077,788.75 \$4,729,538.59	\$1,867,770.87 \$6	40,749.82 G	Grand Total: 7 315 848 03
K MD 140 WEST PRIOR TO OLD WESTMINSTER PIKE	0	0	-1 ₃ \$8,676.00				
✓ Cecil (4)	20	0	\$16,022.00		(askend Lowert	Link	t No Data
🚯 US 40 WEST AT Thomas Hatem Memorial Bridge	0	0	\$1,670.00		LOWEST	nighest	ne no Data

User Delay Cost Information



	USER D	*			
		Total User Del	ay Cost 🔹		
	I-95	I-695	US-50	I-70	Daily Totals
Wed 4/09/2014	\$2,678,358.64	\$626,606.88	\$229,861.28	\$48,652.15	\$3,583,478.94
Thu 4/10/2014	\$1,239,852.54	\$1,050,702.81	\$301,406.33	\$77,104.65	\$2,669,066.33
Fri 4/11/2014	\$1,806,342.05	\$1,105,801.53	\$474,634.47	\$107,010.25	\$3,493,788.29
Sat 4/12/2014	\$3,367,462.7	Fri Apr 11 2014: I-695 Per User \$0.09	107,675.02	\$6,721.70	\$3,660,917.46
Sun 4/13/2014	\$2,548,281.1 Delay Total	PerUser 0.16m Delay 35070.24	83,927.57	\$8,015.17	\$2,677,692.82
Mon 4/14/2014	\$2,661,674.9 ^{Total}	User Delay Cost \$1,105,80	^{01.53} 198,868.28	\$184,730.13	\$3,369,250.33
Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$125,311.87	\$4,128,557.87
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03
		w	/eekend Lowest		Highest No Data

UDC Options and Corridor Selection





Work Zone Dashboard



QUEUE LENGTH (MI)

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USER DELAY COST (\$)

\$416,082.00 0 \$4,967.00 \$3,376.00 0

\$2,342.00 Δ

\$4,038.00 0 0 \$9,976.00 0 \$5,332.00 0 \$1,835.00 1.45 \$9,969.00 0 \$5,525.00 0 \$9,672.00 0 \$1,266.00 0 \$9,064.00 0 \$8,418.00 0 \$8,220.00 0 \$7,187.00 ____0 \$469.00 0.09 \$6,685.00

> 0 \$9,315.00 0 \$1,671.00 0 \$6,166.00

Daily Totals \$3,583,478.94

\$2,669,066.33 \$3,493,788.29

\$3,660,917.46

\$2,677,692.82

\$3,369,250.33

\$4,128,557.87

\$3,733,096.00

Grand Total: \$27,315,848.03

Highest

No Data

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Workzone Dashboard

CORRENT WORKZONES IN MARTEAND				TOF CRITICAL WORKZORES		
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (I
→ Maryland (91)	2044	3.02	\$462,013.00	▼ Major (91)		2.96
- Allegany (3)	0	0	\$13,314.00	AD 216 EAST/WEST BETWEEN I-95 AND US 29		
1-68 EAST AT PLEASANT VALLEY RD	0	•	-i \$8,013.00	(K) MD 26 WEST AT MP 16.7		
из 220 SOUTH SOUTH OF MP 12.75	0	0	⊣, \$1,376.00	MD 26 EAST AT DEER PARK RD		
1-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$3,925.00	MD 528 NORTH FROM 56TH ST TO 72ND ST		
- Anne Arundel (2)	0	0	\$13,240.00	(In the second s		
🚯 MD 198 EAST AT MD 295	0	0	-1, \$ 4,726.0 0	w US 15 NORTH AT AUBURN RD		
MD 2 NORTH AT MD 255	0	0	\$8,514.00	🚯 I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]		
- Baltimore (20)	197	0.37	\$101,808.00	I-95 OUTER LOOP AT ARDWICK ARDMORE RD		
K MD 26 EAST AT DEER PARK RD	0	•	-1, \$5,111.00	MD 191 EAST AT LELAND ST		
I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0	0	1, \$1,969.00	(k) 1-81 SOUTH FROM MP 0.84 TO MP 3.13		
4 1-695 INNER LOOP BETWEEN 1-895 AND 1-95	0	•	12 	US 40 EAST/WEST FROM WASHINGTON ST TO I-81		
MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0	0	ب \$5,717.00	🚯 I-695 INNER LOOP BETWEEN I-895 AND I-95		
US 40 WEST BETWEEN MOHRS LA AND REAMES RD	0	0	-1, \$8,830.00	MD 79 SOUTH/NORTH BETWEEN MD 17 AND MD 180	t t t	
1-895 NORTH PAST 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83	0	-1 ₂ \$3,804.00	MD 4 NORTH AT BRISCOE TURN RD	-	
🚸 1-895 SOUTH PRIOR TO EXIT 4 MD 295 BALTIMORE WASHINGTON PARKWAY (LONG-TERM & CONTINUOUS)	113	•	4,489.00	1-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)		
MD 145 EAST FROM OLD YORK RD TO FOX RUN CT	0		-1 \$1,271.00	MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA		
MD 45 SOUTH BETWEEN PADONIA RD AND TIMONIUM RD	0		-1, \$277.00	MD 193 SOUTH/NORTH AT CAPITAL BELTWAY		
1-83 NORTH AT EXIT 27 MD 137 MT CARMEL RD	0	0	\$6,547.00	US 40 EAST/WEST BETWEEN I-70 AND BLENTLINGER RD		
🚸 US 1 NORTH BETWEEN FORGE RD AND PERRY HALL RD	0	0	-1 \$5,404.00	🚸 MD 136 SOUTH/NORTH AT KERR RD	↓ ↓ ↑ ↑	
1-70 EAST BETWEEN ROLLING RD AND COOKS LA	0		55,649.00	🚯 1-895 NORTH AT POTEE ST ON POTEE ST		
(MM69.8-69.0) I-95 SOUTH PRIOR TO EXIT 67 MD 43 WHITE MARSH BLVD (MM69.8-69.0)	0			WORKZONE LOCATIONS	RIDOR AND DAY OF WEEK	
MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0	0.31		Total User I	Delay Cost 👻	
1-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0		57,797.00	→ Workzones	115-50	1-70
MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$3,476.00	Dynamic Message Signs		
MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$4,924.00	✓ Probe Speed Data Wed 4/09/2014 \$2,678,358.64 \$626,606.88	\$229,861.28 \$	48,652.15
🚸 1-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE BELTWAY	1	0	⊣ ₆ \$8,981.00	Speed Thu 4/10/2014 \$1,239,852.54 \$1,050,702.81	\$301,406.33 \$	\$77,104.65
MD 45 SOUTH FROM WINDWOOD RD TO DUNKIRK RD	0	0.06	⊣ ₃ \$9,879.00	Comparative Average Congestion	\$474 634 47 \$	107 010 25
1-695 INNER LOOP AT EXIT 13 MD 144 FREDERICK RD	0	0	⊣ ₅ \$7,790.00	Frederick • Congestion	34/4,034.4/	107,010.23
→ Baltimore City (5)	178	0	\$27,750.00	Sat 4/12/2014 \$3,367,462.75 \$179,057.99	\$107,675.02	\$6,721.70
1-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	17	0	⊣ <mark>1</mark> \$6,833.00	5 Sun 4/13/2014 \$2,548,281.10 \$37,468.98	\$83,927.57	\$8,015.17
1-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	0	0	⊣ \$8,463.00		£100.040.20 £	184 720 42
1-895 NORTH AT POTEE ST ON POTEE ST	0	0	⊣ ₂ \$2,659.00		\$198,808.28 \$1	184,730.13
1-695 INNER LOOP PAST EXIT 1 MD 173 HAWKINS POINT RD	0	0	⊣ \$7,959.00	Bowe 550 Tue 4/15/2014 \$2,838,798.60 \$905,736.49	\$258,710.91 \$1	125,311.87
1-895 SOUTH AT EXIT 7 MD 2 POTEE ST (LONG TERM-CONTINUOUS 1/02/14-06/31/14)	161	0	⊣ ₅ \$1,836.00	Wed 4/16/2014 \$2,937,018.16 \$500,186.92	\$212,687.02 \$	\$83,203.90
- Calvert (2)	0	0	\$10,262.00			
K MD 4 NORTH AT BRISCOE TURN RD	0	0	\$4,844.00	20,077,788.75 \$4,729,538.59	\$1,867,770.87 \$	640,749.82
K MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$5,418.00			14
	1	0	\$29,218.00		Weekend Lowest	Lin
🚯 MD 26 WEST AT MP 16.7	0	0	\$1,174.00	and the second s	LUWESL	nıg

Map Layers and Options





Individual Work Zone Profile

Planned Closure @ I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD

Started: Thu, Apr 24, 2014 at 09:24:56 AM

Work Zone Performance Monitoring



Settings and Map







Lane Profile



COMPARISON TO HISTORIC AVERAGE			
↓ SOUTH ↓	t NORTH t		
-12 MPH (-20%)	-1 MPH (-2%)	12 m	
-13 MPH (-21%)	-2 MPH (-3%)		
-12 MPH (-20%)	-2 MPH (-3%)	9 m	
+5 MPH (10%)	-2 MPH (-4%)	6 m	
-2 MPH (-4%)	+11 MPH;(22%)		
-6 MPH (<mark>-</mark> 10%)	0 MPH (0%)	3 m	
-13 MPH (-25%)	+2 MPH (4%)		
-14 MPH (-30%)	+3 MPH (8%)		
-2 MPH (-4%)	+14 MPH (27%)		
SPEEL LIMIT 40			
0 · · · · · · · · · · · · · · · · · · ·	-2 MPH (-5%)		
Segment	t Speeds		





Bottlenecks & Nearby Events

Individual Work Zone Profile

20 MPH

18 MPH

Planned Closure @ US 29 SOUTH AT INDUSTRIAL PKWY



Work Zone Performance Monitoring







Performance Charts



Started: Thu, Apr 17, 2014 at 09:16:31 AM













	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/17/2014	\$11.52	\$183.00	\$9,306.97	\$16,405.23	\$2,958.90	\$67.58	\$28,933.20
Fri 4/18/2014	\$6.17	\$29.46	\$82.00	\$221.35	\$127.06	\$50.00	\$516.04
Sat 4/19/2014	\$27.17	\$7.65	\$3.12	\$22.42	\$17.28	\$46.01	\$123.66
Sun 4/20/2014	\$39.81	\$24.66	\$0.00	\$6.13	\$26.78	\$18.42	\$115.80
Mon 4/21/2014	\$2.46	\$48.75	\$788.33	\$103.20	\$899.54	\$131.35	\$1,973.63
Tue 4/22/2014	\$25.38	\$264.46	\$1,819.65	\$8,771.39	\$2,675.70	\$189.00	\$13,745.58
Wed 4/23/2014	\$20.52	\$477.24	\$12,525.82	\$13,993.07	\$16,213.27	\$80.23	\$43,310.14
Hourly Totals	\$133.04	\$1,035.22	\$24,525.89	\$39,522.78	\$22,918.53	\$582.59	Grand Total: \$88,718.06
						Weekend Lowest	Highest No Data

Work Zone Alerts



	CREATE AN ALERT FOR THIS WORK ZONE
Fill out	each section to set up an alert for this work zone.
1. Aler	t me if
	 An accident happens near this work zone. There is a bottleneck that's head or queue includes this work zone. Speeds in the work zone fall below or exceed a certain range.
2. Aler	t me by
	 Send me an email Send me a text message
3. Aler	t me when
	US/Eastern Time period
	Select days of week
	Select hours of day 12 AM 6 AM 12 PM 6 PM 12 AM
	6:00 AM 5:00 PM
	Create alert

Work Zone Alerts



CREATE AN ALERT FOR THIS WORK ZONE X					
Fill out each section to set up an alert for this work zone.					
1. Alert me if					
 An accident happens near this work zone. Within 1.5 and mile(s) upstream or 0.5 and mile(s) downstream There is a bottleneck that's head or queue includes this work zone. Keep in mind the formula for determining bottleneck conditions. 					
Alert me only when the queue upstream from the work zone exceeds 1.5 = mile(s)					
Speeds in the work zone fall below or exceed a certain range. When speeds fall below 35 mph					
When speeds rise above 65 🗘 mph					
Alert me when speed is out of range for longer than 5 🖨 minute(s)					
Alert me when speed returns within range for longer than 5 👘 minute(s)					
2. Alert me by					
Send me an email Alert will be sent to your account email: <i>ivanovn@umd.edu</i>					
Send me a text message					
Enter your phone number 3014053626 Verizon Wireless Verify					
3. Alert me when					
Time zone					
US/Eastern 💌					
Time period					
1. Sun 🖌 Yue Wed Yr Sat Hours of day: 6:00 AM to 5:00 PM 🖉 🗙					
Calact dawr of wook					
Create alert					

Next Steps



I-95 Corridor Coalition Expansion

- I-95 CC awarded \$300,000 to deploy to as many agencies as possible.
- Backend re-architecture for scalability across 17 states.
- Data collection to support the application.

Improvements

- Increased spatial granularity of probe vehicle data.
- Multiple probe vehicle data providers.





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