MCRPC Mercer County Regional Planning Commission

Mercer County
Congestion Management Processes

2018 County-Wide Summary Report

Revised: August 9, 2018

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LIST OF EXHIBITS

INTRODUCTION AND BACKGROUND

This *2018 County-Wide Summary Report* for the *Mercer County Congestion Management Processes* (CMP) program reflects current travel time performance and monitoring updates for designated corridors throughout Mercer County, Pennsylvania. The Mercer County CMP was initially adopted by the Shenango Valley Area Transportation System Metropolitan Planning Organization (SVATS-MPO) in 2010 and was last updated in 2013. Its purpose is to measure, compile, compare, and monitor relevant congestion-related data for designated travel corridors on Mercer County's CMP network (*Exhibit 1*) via periodic updates conducted by the Mercer County Regional Planning Commission (MCRPC). These updates track the state of congestion over time and provide valuable real-world data to SVATS-MPO members, PennDOT, and other planning partners or stakeholders to help inform various aspects of their overall transportation planning and decision-making processes. Such efforts also comply with applicable Federal requirements stemming from Mercer County's relationship to a broader Transportation Management Area (TMA) that spans Youngstown, Warren, and Boardman, Ohio, based on CMP perspectives defined by the Federal Highway Administration (FHWA) as follows:

> *A congestion management process (CMP) is a systematic and regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet State and local needs. A CMP is required in metropolitan areas with population exceeding 200,000, known as Transportation Management Areas (TMAs). Federal requirements state that in all TMAs, the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process; however, Federal regulations are not prescriptive regarding the methods and approaches that must be used to implement a CMP.*[1]

2018 DATA UPDATES

This 2018 update presents new travel time, delay, and reliability data (where available) for 19 of Mercer County's 24 CMP corridors, summarized in the following:

- **Mercer County CMP Network Map** (*Exhibit 1*) – a graphical display and location map of all corridors currently being monitored as part of the official CMP network.
- **Travel Time and Delay Graphs** (*Exhibits 2-3*) – graphical summaries of the latest available travel time and delay data for each corridor, typically shown for the peak (highest delay) travel direction for the weekday AM and/or PM travel periods.
- **Travel Time, Delay, and Reliability Trends** (*Exhibit 4*) – tabulated summary of corridor monitoring data, including comparisons of 2018 data to previous years (2009, 2013, or 2016) with insights into delay or reliability trends based on annual changes.

[1] USDOT, FHWA. https://ops.fhwa.dot.gov/plan4ops/focus_areas/cmp.htm. Last Modified 6/15/18. Accessed 7/11/2018.

Exhibit 1: Mercer County CMP Network Map

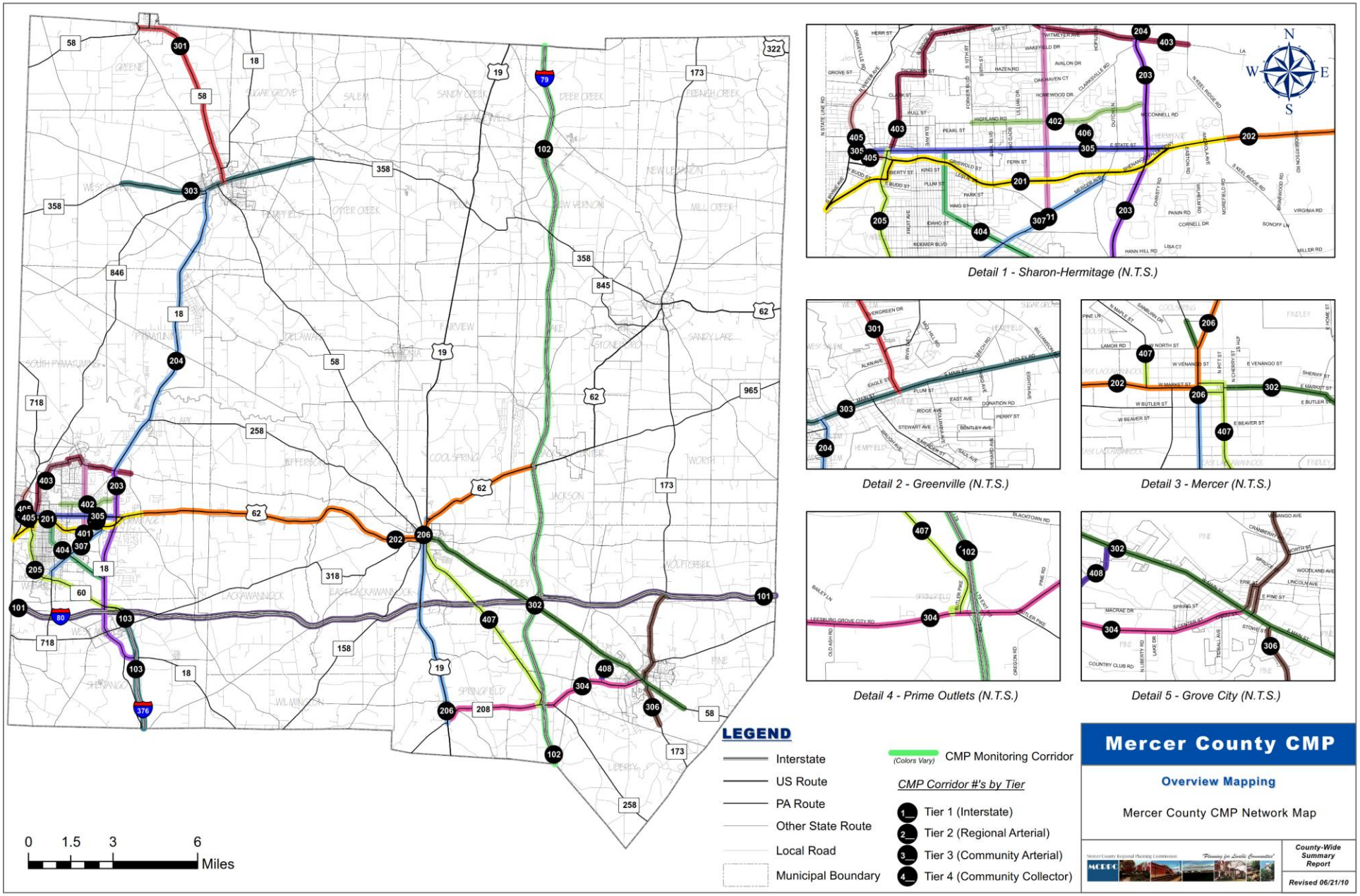
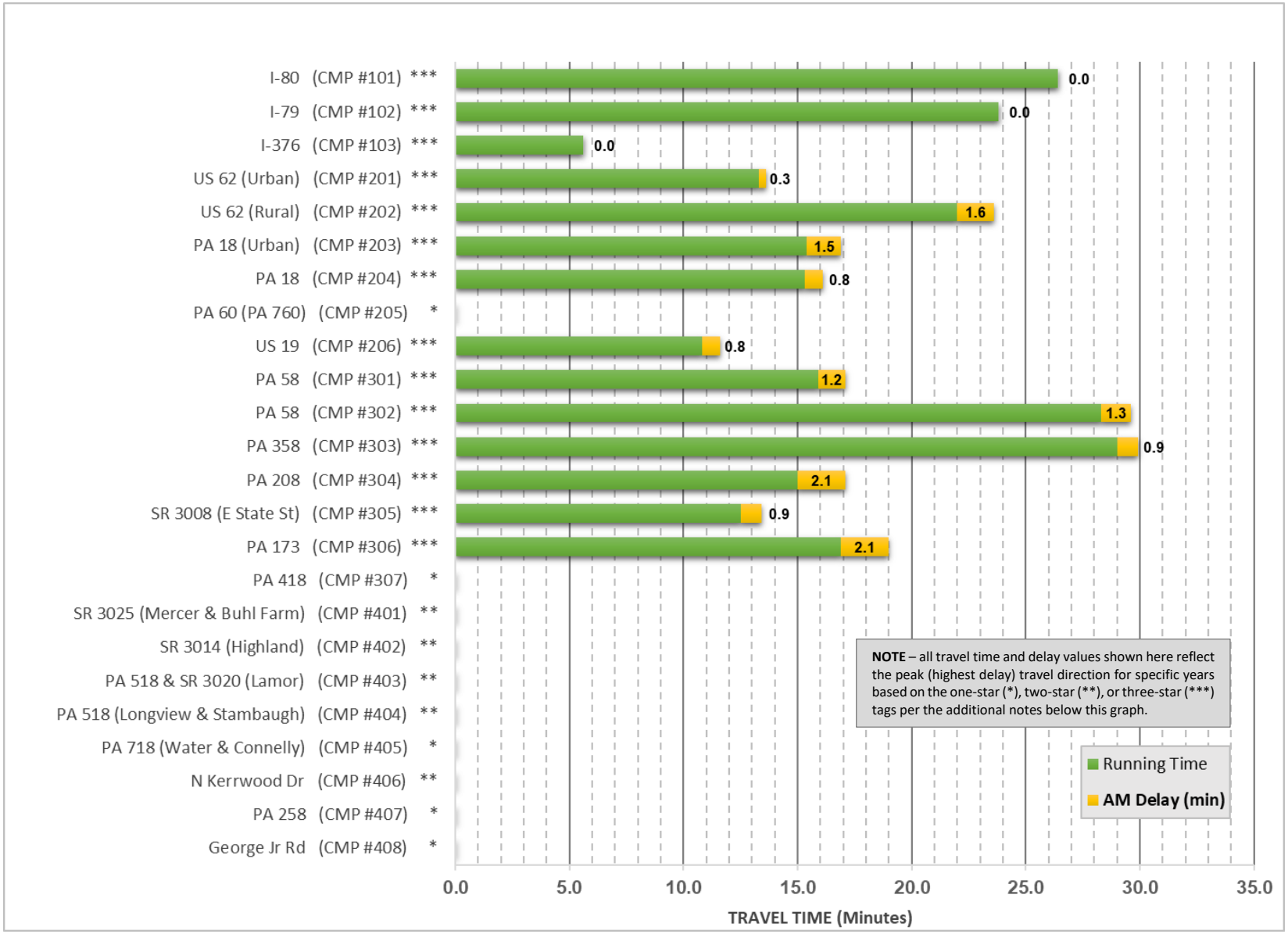
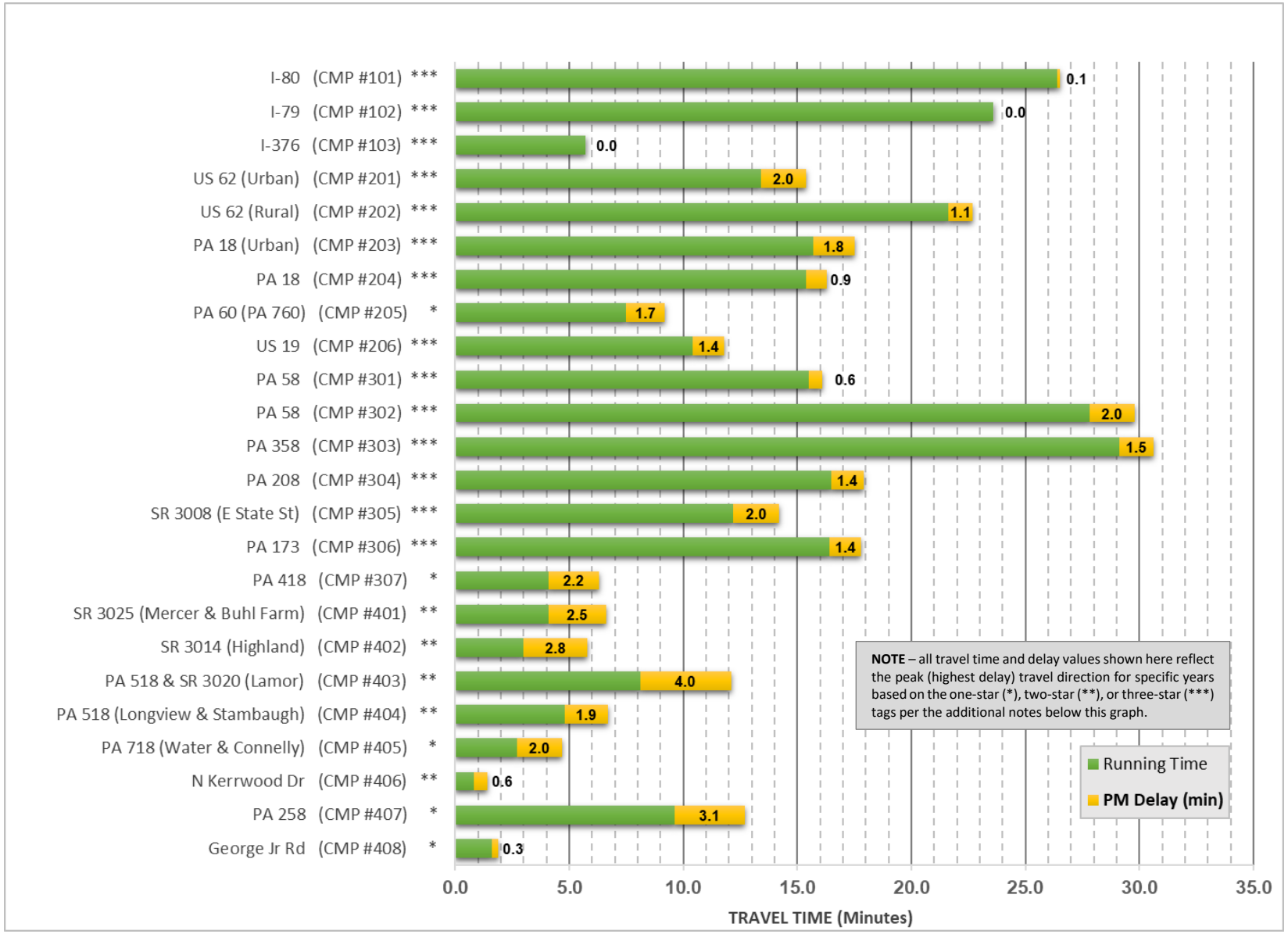


Exhibit 2: Travel Time and Delay Graph (Weekday AM Peak)



(*) one-star data indicates 2009 GPS-based travel times derived from limited PM peak period observations (not available for AM peak).
(**) two-star data indicates 2018 GPS-based travel times derived from limited PM peak period observations (not available for AM peak).
(***) three-star data indicates 2018 INRIX-based travel times derived from multiple weekday averages for the AM and PM peak periods.

Exhibit 3: Travel Time and Delay Graph (Weekday PM Peak)



(*) one-star data indicates 2009 GPS-based travel times derived from limited PM peak period observations (not available for AM peak).
(**) two-star data indicates 2018 GPS-based travel times derived from limited PM peak period observations (not available for AM peak).
(***) three-star data indicates 2018 INRIX-based travel times derived from multiple weekday averages for the AM and PM peak periods.

Exhibit 4: Travel Time, Delay, and Reliability Trends

CMP Corridor / Location / Description					CMP Data for Last Available Update							CMP Data for Current (2018) Update							CMP Trend Summary			
#	Route	Primary Area	Length *(mi)*	Source *(Note 1)*	Data Year	Travel Time *(min)*		Delay *(min)*		Buffer Index *(%)*		Data Year	Travel Time *(min)*		Delay *(min)*		Buffer Index *(%)*		Annual Change in Delay *(min)*		Annual Change in Buffer Index *(%)*	
						AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
101	I-80	Countywide	27.8	***	**2016**	27.4	31.4	0.7	4.7	7%	44%	**2018**	26.4	26.5	-0.2	0.1	2%	17%	*-0.5*	*-2.3*	*-3%*	*-14%*
102	I-79	Countywide	26.1	***	**2016**	24.1	24.0	-0.2	-0.3	3%	3%	**2018**	23.8	23.6	-0.5	-0.6	1%	2%	*-0.2*	*-0.2*	*-1%*	*-1%*
103	I-376	South of I-80 to Lawrence Co.	4.3	***	**2016**	5.7	5.6	-0.1	-0.1	5%	6%	**2018**	5.6	5.7	0.0	-0.1	15%	10%	0.1	*0.0*	5%	2%
201	US 62 (Urban)	Sharon & Hermitage	5.2	***	**2016**	13.4	14.4	0.6	1.3	32%	60%	**2018**	13.6	15.4	0.3	2.0	33%	57%	*-0.2*	0.4	1%	*-2%*
202	US 62 (Rural)	Hermitage to Jackson Twp	15.7	***	**2016**	21.8	22.2	0.4	0.6	11%	15%	**2018**	23.6	22.7	1.6	1.1	22%	28%	**0.6**	0.3	**6%**	**7%**
203	PA 18 (Urban)	Hermitage	7.4	***	**2016**	17.0	17.6	1.2	1.7	35%	58%	**2018**	16.9	17.5	1.5	1.8	42%	49%	0.2	0.1	4%	*-5%*
204	PA 18	Hermitage to Greenville	10.9	***	**2016**	15.8	16.1	0.2	1.0	24%	47%	**2018**	16.1	16.3	0.8	0.9	38%	43%	0.3	*-0.1*	**7%**	*-2%*
205	PA 60 (PA 760)	North of I-80	5.6	*	**2009**	-	9.2	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-
206	US 19	Springfield Twp to Mercer	7.5	***	**2016**	10.5	11.2	0.3	0.7	18%	19%	**2018**	11.6	11.8	0.8	1.4	28%	43%	0.3	0.4	5%	**12%**
301	PA 58	Greenville to Jamestown	6.9	***	**2016**	16.2	16.1	0.9	0.8	20%	25%	**2018**	17.1	16.1	1.2	0.6	19%	15%	0.2	*-0.1*	*-1%*	*-5%*
302	PA 58	Mercer to Grove City	11.6	***	**2016**	28.4	28.5	0.6	0.8	12%	11%	**2018**	29.6	29.8	1.3	2.0	13%	17%	0.4	**0.6**	1%	3%
303	PA 358	Greenville	16.7	***	**2016**	29.1	30.0	0.6	1.1	9%	14%	**2018**	29.9	30.6	0.9	1.5	21%	24%	0.2	0.2	**6%**	5%
304	PA 208	Springfield Twp to Grove City	7.5	***	**2016**	16.6	16.8	0.4	0.8	12%	22%	**2018**	17.1	17.9	2.1	1.4	61%	45%	**0.9**	0.3	**25%**	**12%**
305	SR 3008 (E State St)	Sharon & Hermitage	3.6	***	**2016**	-	-	-	-	-	-	**2018**	13.4	14.2	0.9	2.0	18%	24%	-	-	-	-
306	PA 173	Grove City	5.1	***	**2016**	16.5	16.5	0.4	0.5	8%	10%	**2018**	19.0	17.8	2.1	1.4	40%	22%	**0.9**	0.5	**16%**	**6%**
307	PA 418	Wheatland to Hermitage	2.8	*	**2009**	-	6.3	-	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-
401	SR 3025 (Mercer & Buhl Farm)	Hermitage to Sharpsville	2.8	**	**2013**	-	7.3	-	3.2	-	-	**2018**	-	6.6	-	2.5	-	-	-	*-0.1*	-	-
402	SR 3014 (Highland)	Sharon & Hermitage	2.0	**	**2013**	-	5.6	-	2.5	-	-	**2018**	-	5.8	-	2.8	-	-	-	0.1	-	-
403	PA 518 & SR 3020 (Lamor)	Sharpsville	5.3	**	**2013**	-	12.4	-	4.3	-	-	**2018**	-	12.1	-	4.0	-	-	-	*-0.1*	-	-
404	PA 518 (Longview & Stambaugh)	Sharon & Hermitage	3.2	**	**2013**	-	7.5	-	2.6	-	-	**2018**	-	6.7	-	1.9	-	-	-	*-0.1*	-	-
405	PA 718 (Water & Connelly)	Sharon	1.4	*	**2013**	-	4.7	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
406	N Kerrwood Dr	Hermitage	0.4	**	**2013**	-	1.5	-	0.6	-	-	**2018**	-	1.4	-	0.6	-	-	-	*0.0*	-	-
407	PA 258	Prime Outlets to Mercer	8.1	*	**2009**	-	12.7	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-
408	George Jr Rd	Grove City	1.0	*	**2009**	-	1.9	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-

Table Note 1:

(*) one-star data derived from the initial 2009 GPS-based travel time runs for the weekday PM peak period only; no subsequent updates or comparison data available at this time.

(**) two-star data and comparisons derived from 2013 and 2018 GPS-based travel time runs for the weekday PM peak period only.

(***) three-star data and comparisons derived from 2016 and 2018 INRIX-based data for the weekday AM and PM peak periods.

Table Note 2:

CMP Trend Summary data in *green italic text* indicate a general improvement based a reduction in annual delay (implying less delay) and/or a reduction in buffer index (implying more reliable or predictable travel)

CMP Trend Summary data in **red bold text** indicate a general degradation based on an increase in annual delay (> 30 seconds) and/or an increase in buffer index (> 5%)

New for this 2018 CMP update is the incorporation of INRIX speed and travel time database information, which taps into the concept of using Big Data resources as an alternative to gathering field-level measurements for each corridor. Data from previous CMP updates in 2009 and 2013 were collected exclusively by driving each corridor with the normal flow of traffic (i.e. the floating-car method) and using GPS receivers and laptop computers to record travel conditions during weekday PM peak period observations that were typically limited to just two to four trips in each direction during a single site visit. In contrast, the INRIX database provides a comprehensive historical log of speed and travel time data spanning multiple hours, days, and years, gathered over time from a variety of probe data sources and allowing for a much more robust analysis of travel conditions during specific time periods. Through collaboration and data-sharing agreements with the I-95 Corridor Coalition, MCRPC was able to access INRIX data via the *Regional Integrated Transportation Information System* (RITIS) and an online set of data and analysis tools in the corresponding Probe Data Analytics Suite.

Through these tools and given the current available INRIX data coverage in Mercer County, the 2018 CMP data updates proceeded as follows:

- **2016-2018 INRIX**: Tagged as three-star data **(***)** in the previous exhibits, 14 of 24 CMP corridors incorporated 2016 and 2018 INRIX data. The INRIX coverage allowed for the addition of weekday AM peak period data (averaged from 6:00-10:00 AM) alongside weekday PM peak period data (averaged from 3:00-7:00 PM). Averages were also typically compiled for a three-day period spanning April 24-26, 2018, and compared to corresponding historic data from April 26-28, 2016. One exception included Corridor #101 (I-80), which instead referenced 2018 average weekday data from the three previous weeks in April due to an unknown data anomaly (e.g. construction or other incident) that significantly skewed delay data in the last week of April.

- **2013-2018 GPS Data**: Tagged as two-star data **(**)** in the previous exhibits, 5 of 24 CMP corridors were updated manually using GPS-based travel runs for the weekday PM peak period only, similar to previous iterations of the CMP. New GPS-based data was collected during weekdays in June 2018 and compared to corresponding data that was collected for the same corridors during the 2013 CMP update.

- **2009-2013 GPS Data**: Tagged as one-star data (*) in the previous exhibits, 5 of 24 CMP corridors were not updated during this cycle. Potential reevaluations of each corridor have been deferred to help balance countywide interests and higher-priority corridors alongside data collection cost/schedule constraints. Data reported here for general comparison purposes reflects GPS-based travel times recorded in 2009 (for Corridor #205, 307, 407, and 408) or 2013 (for Corridor #405).

Based on the available data sources, specific performance measures incorporated into this 2018 update encompass the following:

- **Travel Time**: reflects the time required to traverse the corridor in one direction, including both the running time (i.e. the free flow time with no stops or delays) plus the delay (i.e. the time spent stopped or slowed throughout the trip) as shown in previous *Exhibits 2-3*.

- **Delay**: reflects the time spent stopped or slowed throughout the duration of a trip, estimated as follows:

  - For GPS-based travel time runs, delay is calculated as the time exceeding an ideal running time that assumes no stops and a free-flow travel speed (i.e. design speed) of typically five miles per hour above the posted speed limit.

  - For INRIX-based data, delay was derived using the INRIX-reported reference speeds, which approximate each route's free-flow speed over a long period of time during late night or early morning periods when little to no congestion is expected (although some stopping/slowing may still be accounted for due to traffic control devices). Reference speeds and corridor travel distance were combined to estimate typical free-flow travel times, and the difference between the INRIX-reported average travel time and the estimated free-flow travel time was reported as delay.

- **Buffer Index**: reflects travel time reliability (or predictability) along a corridor and is a new measure that was added to the CMP where INRIX data coverage was available. Travel time reliability, in general, provides an indication of how significantly or how frequently a route deviates from its average or expected travel time due to any number of factors that may affect daily trips (e.g. congestion, school peaks, holidays, weather, trucks, construction, crashes, etc.). The Buffer Index, specifically, reflects the extra time (or time cushion) that travelers must add to their average travel time when planning trips to ensure on-time arrival most of the time (derived from a comparison of 95th percentile travel times to average travel times).

  Consider, for example, a trip that averages 20 minutes. If the route has a buffer index of 10%, it implies that you should leave about 2 minutes early (10% x 20 minutes) to ensure you arrive on-time (i.e. budget 22 minutes to complete the 20-minute trip). In comparison, if the route has a buffer index of 50%, it implies that you should leave about 10 minutes early (50% x 20 minutes) to ensure you arrive on-time (i.e. budget 30 minutes to complete the 20-minute trip). The latter case has a higher buffer index, which equates to a less reliable (or less predictable) trip, requiring travelers to plan for extra time to account for this volatility.

2018 TRENDS/FINDINGS

Based on the 2018 data updates and revised performance measures, overall trends/findings (including comparisons highlighted in previous *Exhibit 4*) are summarized below.

Travel Time and Delay Perspectives

New travel time measurements typically show only nominal changes compared to previous years, reflecting generally stable traffic/travel conditions throughout the county since 2013 (for GPS-based corridor comparisons) or 2016 (for INRIX-based corridor comparisons). Details and variations include the following:

- Most corridors experienced equivalent annual changes of only ±30 seconds, as shown by the black or green/italicized results at the end of *Exhibit 4*.

- Four corridors, including Corridor #202 (US 62), #302 (PA 58), #304 (PA 208), and #306 (PA 173) showed an annual increase in delay of 30-60 seconds, as shown by the red/bold results at the end of *Exhibit 4*. No corridor, however, exceeded an increase of more than one minute per year.

- For Corridor #305 (SR 3008 / East State Street), INRIX data was not available prior to 2018, providing no basis for trend comparisons along what was previously identified as the CMP corridor having the highest delay on the network. For this reason, supplemental GPS-based travel runs were completed to conduct a limited comparison of 2018 PM peak period travel times to the previous 2013 data. Results indicate that travel along East State Street is stable to slightly improved based on 11.7 minutes of travel (5.6 minutes of delay) in 2018, compared to 12.1 minutes of travel (6.0 minutes of delay) in 2013. This sidebar comparison, however, is based on only a limited number of runs, and anecdotal insights confirm that micro-peaks (e.g. school dismissal traffic) may significantly affect travel times.

- The low order-of-magnitude of the overall travel time or delay changes could be attributed to variations in daily or seasonal trends (or travel reliability influences) just as easily as any congestion-based perspectives. Thus, in general, effectively no significant travel time or delay changes stand out in comparison to previous CMP updates.

Travel Reliability Perspectives

Where INRIX data was available, new reliability perspectives based on the Buffer Index mostly show stable conditions throughout the County based on changes from 2016 to 2018. Details and variations including the following:

- Buffer indices for most corridors show nominal changes of approximately ±5% or less per year, as shown by the black or green/italicized results at the end of *Exhibit 4*.

- Four corridors, including Corridor #202 (US 62), #204 (PA 18), #206 (US 19), and #303 (PA 358) showed annual Buffer Index increases ranging from 6% to 12% per year. Comparing the order-of-magnitude of these changes to their corresponding travel times, however, reveals that these results translate into budgeting only an extra 1-2 minutes (per year) into your trip to ensure on-time arrival most of the time.

- Two corridors, including Corridor #304 (PA 208) and #306 (PA 173), showed annual Buffer Index increases of up to 16-25% per year, which translate into budgeting an extra 3-4 minutes (per year) into your trip to ensure on-time arrival. These corridors also show the highest overall Buffer Indices on the CMP network, which in both cases occur during the weekday AM peak, compared to congestion throughout the county that is otherwise typically higher during the PM peak. Additional detailed studies would be needed to (1) confirm that the limited dataset comparisons from late April 2016 and 2018 do not reflect potential data anomalies; and then (2) explore corridor-specific conditions that may be contributing to the changing reliability. Based on qualitative CMP insights from 2009 plus anecdotal input from local officials, multiple factors might cumulatively influence travel conditions, potentially including school traffic, the Grove City GE plant, or truck/traffic diversions during I-80 construction.

As a general observation beyond the insights above, several of the CMP corridors show relatively high Buffer Indices of 40-50% or more. Corresponding travel times for those same corridors are generally in the 15-20 minute range, implying that users may need to plan for an extra 6-10 minute time cushion to ensure on-time arrivals for their trips. While the order-of-magnitude of that time cushion may not appear to be substantial on the surface, consider a daily 20-minute drive to work or school. An extra 10-minute time cushion for the drive alone (i.e. a Buffer Index of 50%) would increase the planning time to 30-minutes. However, it could also be argued that travelers typically need an additional 5-10 minutes before/after their direct drive time to also allow time to park, enter their building, settle into their office or classroom, etc., effectively increasing the total door-to-door planning time to about 40- minutes…or double the 20-minute drive originally considered. At that point, questions related to lost time, transportation costs, traveler convenience, or other quality of life issues may garner more interest than what the initial order-of-magnitude of the time cushion alone may allude to. As such, a more detailed future exploration into travel time reliability may be beneficial to clarify findings (including confirmation and/or adjustment based on any potential data anomalies that could be skewing the results) and consider reliability details that may be relevant to specific transportation patterns or needs in Mercer County.

PM Peak Period Total Delay Rankings

Among the multiple performance measures reviewed by the initial 2010 Mercer County CMP, Total Delay (measured in vehicle-hours for the PM peak period) was referenced as a primary factor. Total Delay balances a review of the measured travel delay alongside the estimated volume of traffic experiencing that delay. To provide similar perspectives and related corridor rankings, this 2018 update incorporated a review of Total Delay for every corridor on the current CMP network (*Exhibit 5*). The calculation methods for updating this measure varied depending on the delay data source (as depicted by the one, two, or three-star data notes in *Exhibit 5*); therefore, while generally valid for order-of-magnitude perspectives, direct comparisons of Total Delay or rankings across different sources should be used with caution. Traffic volumes for all corridors were consistently updated to 2018 based on the latest available traffic volume data reported by PennDOT's online *Traffic Information Repository* (TIRe) system.[2]

Summary perspectives based on Total Delay comparisons in *Exhibit 5* include the following:

- Consistent with previous CMP updates, Corridor #305 (SR 3008 / E State St) has the highest level of Total Delay (85 vehicle-hours) during the weekday PM peak.
- Three corridors yield Total Delay of 30-40 vehicle hours including Corridor #403 (PA 518), #401 (SR 3025), and #402 (SR 3014).
- Five corridors yield Total Delay of 20-30 vehicle-hours, including two that are also ranked as having the most variable (i.e. least reliable) travel conditions on the network, specifically along Corridor #201 (US 62, urban) and #203 (PA 18, urban).
- Six corridors yield 10-20 vehicle-hours, while nine remaining corridors – including all three major interstates in Mercer County – yield less than 10 vehicle-hours during the weekday PM peak.

Corridor/Segment-Specific Perspectives

Additional corridor and segment-specific congestion estimates are compiled in *Appendix A*, with congestion in this case quantitatively/qualitatively derived as a percentage of the corresponding free-flow speeds (for INRIX data) or design speed assumptions (for GPS-based data). Three-star data updates include INRIX-based Congestion Scan summaries from the Probe Data Analytics Suite, coupled with instructions for accessing additional Trend Map and Performance Chart tools online (*for agency reference; RITIS account access/log-in required*). Two-star data updates include speed display diagrams derived from the latest 2018 GPS-based travel time runs. Both sets of information provide a more detailed perspective of where delays occur along a corridor, while the INRIX-based resources also provide access to additional tools and metrics to help evaluate congestion variability beyond the PM peak period.

[2] PennDOT. https://www.dot7.state.pa.us/tire. Accessed July-August 2018.

Exhibit 5: PM Peak Period Total Delay Rankings

CMP Corridor			PM Peak Period Total Delay		Estimated Traffic Volume	PM Peak Period Average Delay	PM Peak Period Travel Time Reliability	
#	*Route*	*Source*	*Rank by Corridor*	*Vehicle-Hours of Delay*	*Vehicles per Day*	*Minutes*	*Rank by Corridor*	*% Buffer Index*
305	SR 3008 (E State St)	***	**1**	**85**	4,300 - 14,900	2.0	**7**	24%
403	PA 518 & SR 3020 (Lamor)	**	**2**	**35**	2,500 - 9,600	4.0	-	-
401	SR 3025 (Mercer & Buhl Farm)	**	**3**	**33**	5,700 - 11,400	2.5	-	-
402	SR 3014 (Highland)	**	**4**	**31**	5,800 - 11,200	2.8	-	-
201	US 62 (Urban)	***	**5**	**28**	10,000 - 15,200	2.0	**1**	57%
203	PA 18 (Urban)	***	**6**	**26**	3,200 - 20,500	1.8	**2**	49%
302	PA 58	***	**6**	**26**	4,800 - 16,300	2.0	**10**	17%
404	PA 518 (Longview & Stambaugh)	**	**6**	**26**	6,000 - 9,600	1.9	-	-
205	PA 60 (PA 760)	*	**9**	**22**	4,300 - 15,900	1.7	-	-
303	PA 358	***	**10**	**20**	3,100 - 11,200	1.5	**7**	24%
307	PA 418	*	**11**	**16**	2,900 - 8,400	2.2	-	-
405	PA 718 (Water & Connelly)	*	**12**	**14**	3,300 - 6,400	2.0	-	-
407	PA 258	*	**12**	**14**	2,300 - 7,100	3.1	-	-
202	US 62 (Rural)	***	**14**	**13**	3,500 - 9,300	1.1	**6**	28%
306	PA 173	***	**15**	**12**	3,200 - 8,200	1.4	**9**	22%
204	PA 18	***	**16**	**10**	12,000 - 14,000	0.9	**4**	43%
206	US 19	***	**17**	**9**	2,100 - 9,300	1.4	**4**	43%
101	I-80	***	**18**	**8**	26,300 - 30,500	0.1	**10**	17%
304	PA 208	***	**19**	**7**	6,100 - 12,100	1.4	**3**	45%
301	PA 58	***	**20**	**5**	2,400 - 3,900	0.6	**12**	15%
406	N Kerrwood Dr	**	**21**	**3**	9,500	0.6	-	-
408	George Jr Rd	*	**22**	**2**	4,400 - 4,900	0.3	-	-
103	I-376	***	**23**	**1**	13,600 - 14,700	0.0	**13**	10%
102	I-79	***	**24**	**0**	15,100 - 23,700	0.0	**14**	2%

Table Note 1:

(*) one-star data approximates total delay using 2009 GPS-based measurements x 2018 traffic volumes for the corresponding travel segment.

(**) two-star data approximates total delay using 2018 GPS-based measurements x 2018 traffic volumes for the corresponding travel segment.

(***) three-star data approximates total delay using 2018 INRIX averages by INRIX segment x 2018 traffic volumes for the nearest comparable travel segment.

SUMMARY AND FUTURE CONSIDERATIONS

The 2018 CMP update builds onto the previous 2013 update and was the first time the Mercer County CMP explored conversion from individual GPS-based travel time runs to Big Data concepts via INRIX data, RITIS, and the Probe Data Analytics Suite. Corresponding data updates are summarized throughout previous *Exhibits 2-4*. Summary trends highlighted generally stable conditions relative to travel time and delay, coupled with minor changes (and potential future areas to explore) relative to travel reliability.

Based on this update and the experience of converting to INRIX data usage, several potential refinements and/or opportunities could be considered as part of future, more comprehensive CMP updates or other applicable planning efforts by MCRPC:

- **CMP Network Refinements**: Revisiting and refining the overall Mercer County CMP network, corridors, and specific corridor segments/limits may be beneficial to maximize the efficient use of INRIX data and/or minimize the more labor-intensive field data collection efforts required by GPS-based travel runs. The initial conversion to INRIX data often resulted in minor adjustments to corridor segments or limits (relative to former GPS-based setups). For some existing CMP corridors, INRIX data coverage was also available on a broader (and in some cases countywide) basis than what is included on the current CMP network.

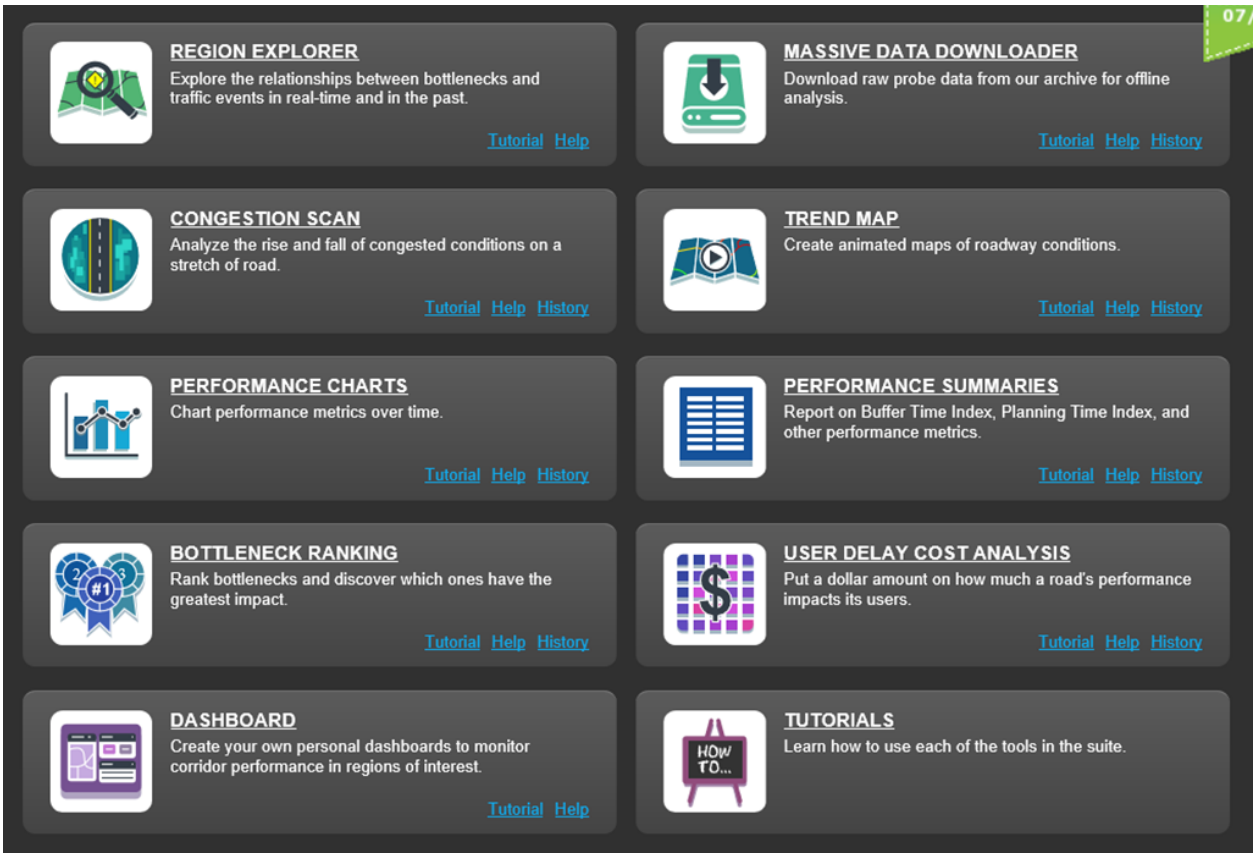
- **INRIX Timeframe Coverage**: The inclusion of INRIX data in the 2018 CMP update provided a much more robust set of travel time resources and average perspectives compared to a limited set of GPS-based travel runs. However, the specific data reference timeframe for the initial INRIX conversion, which focused on one week of data in April 2018 with four-hour AM/PM peak period windows, could/should be refined to further capitalize on the available INRIX resources and provide a more comprehensive picture of travel conditions. Future updates could, for example, broaden coverage to include average data spanning multiple weeks, months, or an entire year; or expand to consider weekday versus weekend patterns. Considerations could also narrow coverage to focus on tighter peak period windows including, for example, specific school peaks versus commuter peaks.

- **INRIX Network Coverage**: The 2018 updates focused on CMP corridor coverage that was readily available through the Probe Data Analytics Suite. Future efforts could explore customized data procurement (and related costs) directly from INRIX to potentially expand coverage to local arterial or collector routes that may not currently be included in the online tools, i.e. the one-star (*) and two-star (**) routes in the previous *Exhibits 2-4*.

- **Travel Time Reliability Perspectives**: As noted previously, a more detailed future exploration into travel time reliability may be beneficial to clarify trends and/or issues that may be relevant to the specific transportation patterns or needs in Mercer County.

- **Probe Data Analytics Suite Applications**: As a future CMP enhancement or in support of general transportation planning efforts in Mercer County, opportunities to further reference or apply tools from the Probe Data Analytics Suite could be explored. Each tool provides a unique analysis or visualization perspective that can support a deeper understanding of congestion-related trend, time period, or location details. Available tools are summarized below in *Exhibit 6*, while various samples are displayed in *Exhibits 7-11*.

Exhibit 6: Probe Data Analytics Suite – Analysis & Visualization Tools Summary



Source (Exhibits 5-10): Online screenshots from Probe Data Analytics Suite. https://pda.ritis.org/suite/.

Exhibit 7: Probe Data Analytics Suite – Sample Congestion Scan

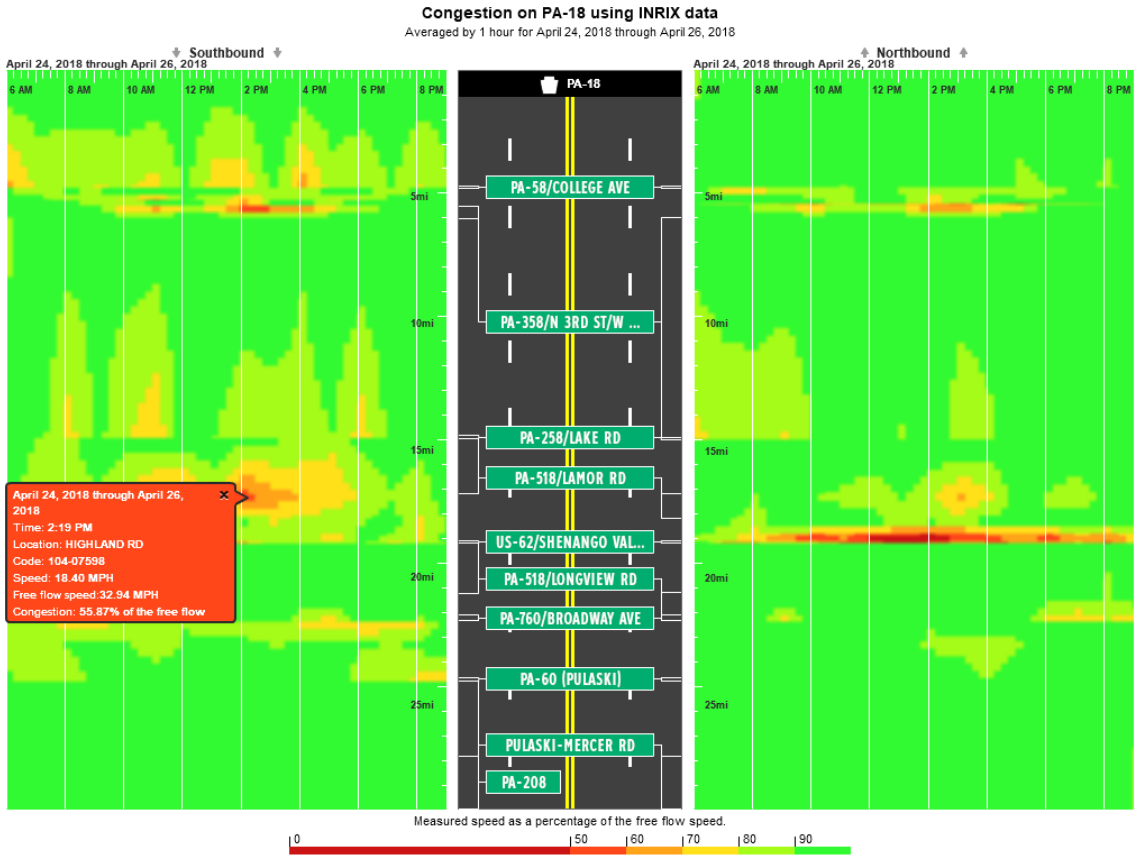


Exhibit 8: Probe Data Analytics Suite – Sample Congestion Trend Map

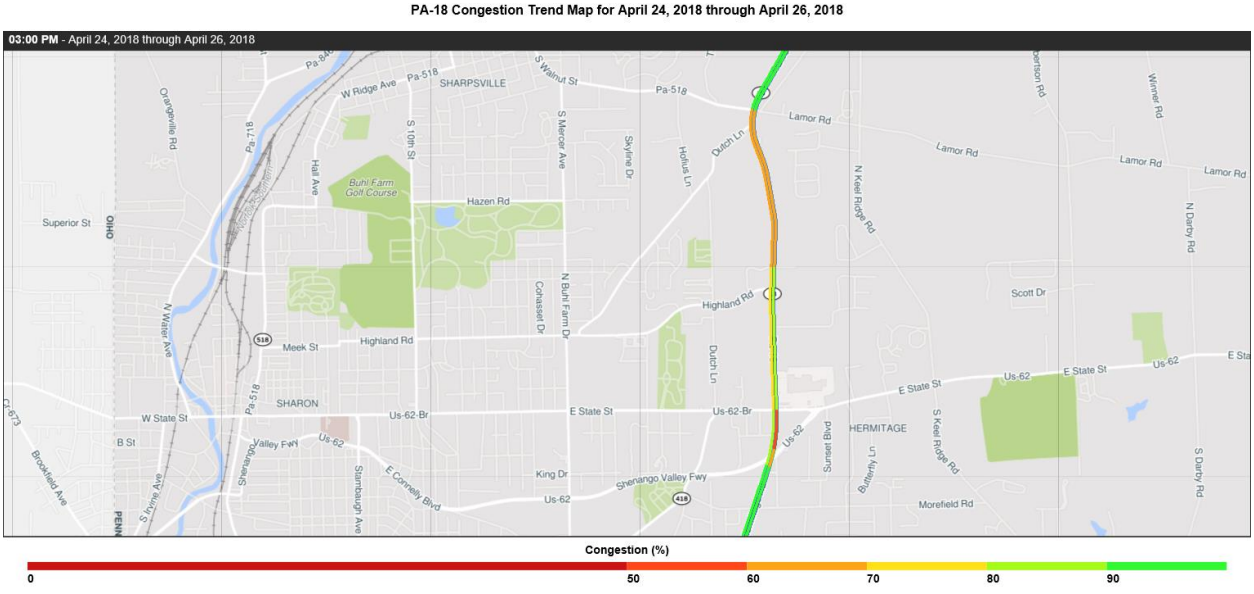


Exhibit 9: Probe Data Analytics Suite – Sample Performance Summary

PA-18 Northbound using INRIX data

April 24, 2018 through April 26, 2018

	Speed (mph)		Buffer time (minutes)		Buffer index		Planning time (minutes)		Planning time index		Travel time (minutes)		Travel time index		
	6 AM - to - 10 AM	3 PM - to - 7 PM	6 AM - to - 10 AM	3 PM - to - 7 PM	6 AM - to - 10 AM	3 PM - to - 7 PM	6 AM - to - 10 AM	3 PM - to - 7 PM	6 AM - to - 10 AM	3 PM - to - 7 PM	6 AM - to - 10 AM	3 PM - to - 7 PM	6 AM - to - 10 AM	3 PM - to - 7 PM	
Mon	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Mon
Tue	40.53	38.98	8.82	10.43	0.20	0.24	52.11	54.42	1.22	1.28	43.08	44.79	1.01	1.05	Tue
Wed	39.34	40.74	14.04	8.29	0.32	0.19	58.44	51.26	1.37	1.25	44.38	42.86	1.04	1.05	Wed
Thu	40.87	39.93	11.08	9.02	0.26	0.21	53.70	51.69	1.31	1.26	42.72	43.73	1.05	1.07	Thu
Fri	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Fri
Weekdays	40.24	39.87	11.41	9.96	0.26	0.23	54.84	53.17	1.31	1.28	43.39	43.80	1.03	1.06	Weekdays
Sat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Sat
Sun	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Sun
Weekends	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Weekends
AllDays	40.24	39.87	11.41	9.96	0.26	0.23	54.84	53.17	1.31	1.28	43.39	43.80	1.03	1.06	AllDays

Exhibit 10: Probe Data Analytics Suite – Sample Performance Chart

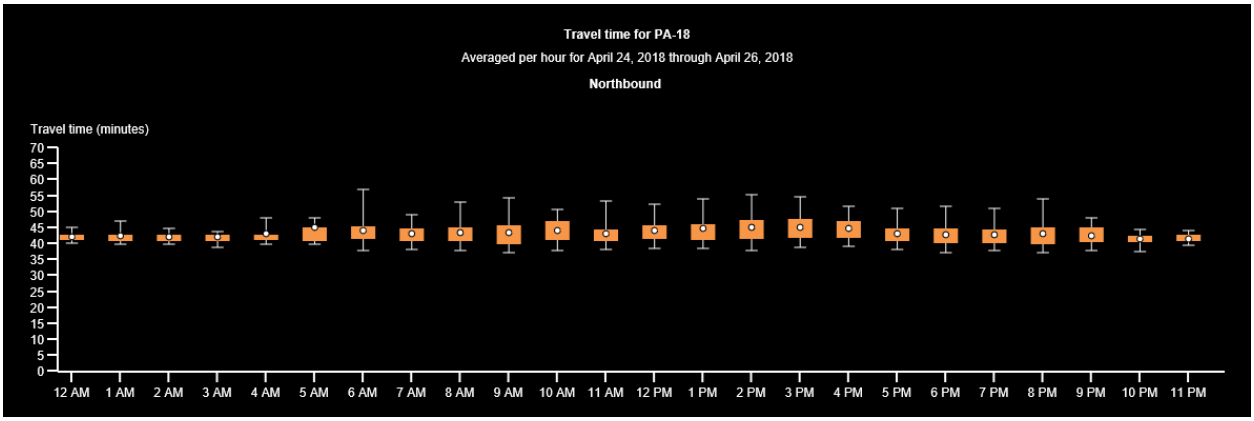
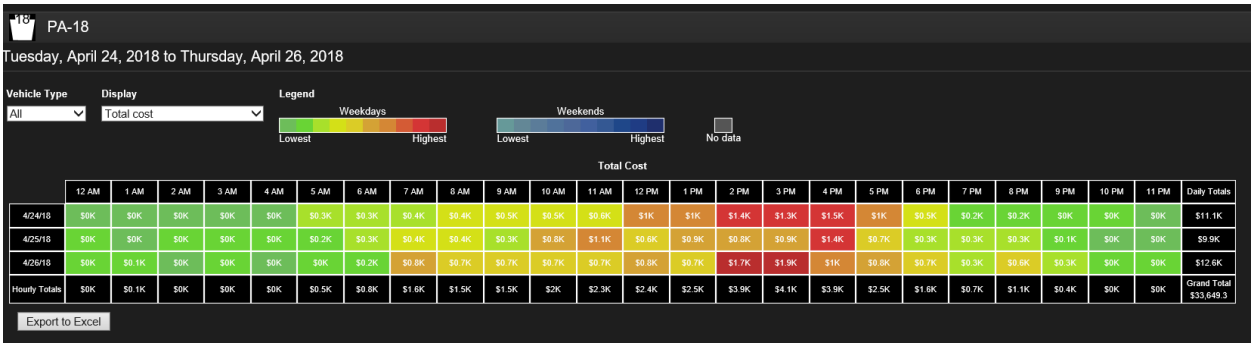


Exhibit 11: Probe Data Analytics Suite – Sample User Delay Cost Analysis



MCRPC Mercer County Regional Planning Commission

APPENDIX A

Corridor/Segment-Specific Congestion Estimates

Appendix A: Corridor/Segment-Specific Congestion Estimates

Appendix A compiles additional corridor and segment-specific congestion estimates, with congestion in this case quantitatively/qualitatively derived as a percentage of the corresponding free-flow speeds (for INRIX data) or design speed assumptions (for GPS-based data).

INRIX-Based Congestion Data

Three-star data updates include INRIX-based Congestion Scan summaries from the Probe Data Analytics Suite. These updates include the following corridors:

- CMP #101 (I-80) [CLICK HERE for CMP #101 Online]
- CMP #102 (I-79) [CLICK HERE for CMP #102 Online]
- CMP #103 (I-376) [CLICK HERE for CMP #103 Online]
- CMP #201/202 (US 62) [CLICK HERE for CMP #201/202 Online]
- CMP #203/204 (PA 18) [CLICK HERE for CMP #203/204 Online]
- CMP #206 (US 19) [CLICK HERE for CMP #206 Online]
- CMP #301/302 (PA 58) [CLICK HERE for CMP #301/302 Online]
- CMP #303 (PA 358) [CLICK HERE for CMP #303 Online]
- CMP #304 (PA 208) [CLICK HERE for CMP #304 Online]
- CMP #305 (SR 3008 / E State St / US 62 Bus) [CLICK HERE for CMP #305 Online]
- CMP #306 (PA 173) [CLICK HERE for CMP #306 Online]

While static exhibits are included on the following pages, the corresponding hyperlinks may also be used to access live files online (*for agency reference; RITIS account access/log-in required*). Via the online resources, the Congestion Scan maps can be viewed dynamically for a specific area or time of interest and can serve as a hub to access additional tools/metrics within the Probe Data Analytics Suite. Recommended tools and usage details include the following:

- **Congestion Scan** – this tool visualizes the rise and fall of speed or congestion along a corridor throughout various hours of the day. Tool options include the following:
  - Select [**Data Type**: *Congestion*] to view hourly travel conditions as a percentage of free-flow speed by segment.
  - Select [**Color Thresholds**] to slide/modify the five boundary values and visualize bottleneck areas (e.g. assume an interval of 10% and set the thresholds to 55%, 65%, 75%, 85%, and 95% of free flow speed).
  - Select [**Open with…**] at the upper right corner of the page to use the Congestion Scan tool as a hub to access Trend Maps or Performance Charts.
  - Select [**Save as**] at the upper right corner of the page to export data details to an Excel (*.xml) file or screenshot (*.png).

  - Select [**Share**] at the upper right corner of the page to create a customized hyperlink for data presentation.

- **Trend Map** – this tool creates an animated map of roadway conditions along a corridor throughout various hours of the day.

  - Select [**Congestion**] or [**Speed**] in the upper left-corner of the trend map.

  - Select [**Color Thresholds**] to slide/modify the five boundary values and visualize bottleneck areas similar to the Congestion Scan options.

  - Play or scroll the slider at the bottom of the screen to visualize a specific hour of the day, and zoom the map in/out to view detailed areas.

  - Select [**Save as**] at the upper right corner of the page to export screenshots (*.png) or recorded animations (*.mp4).

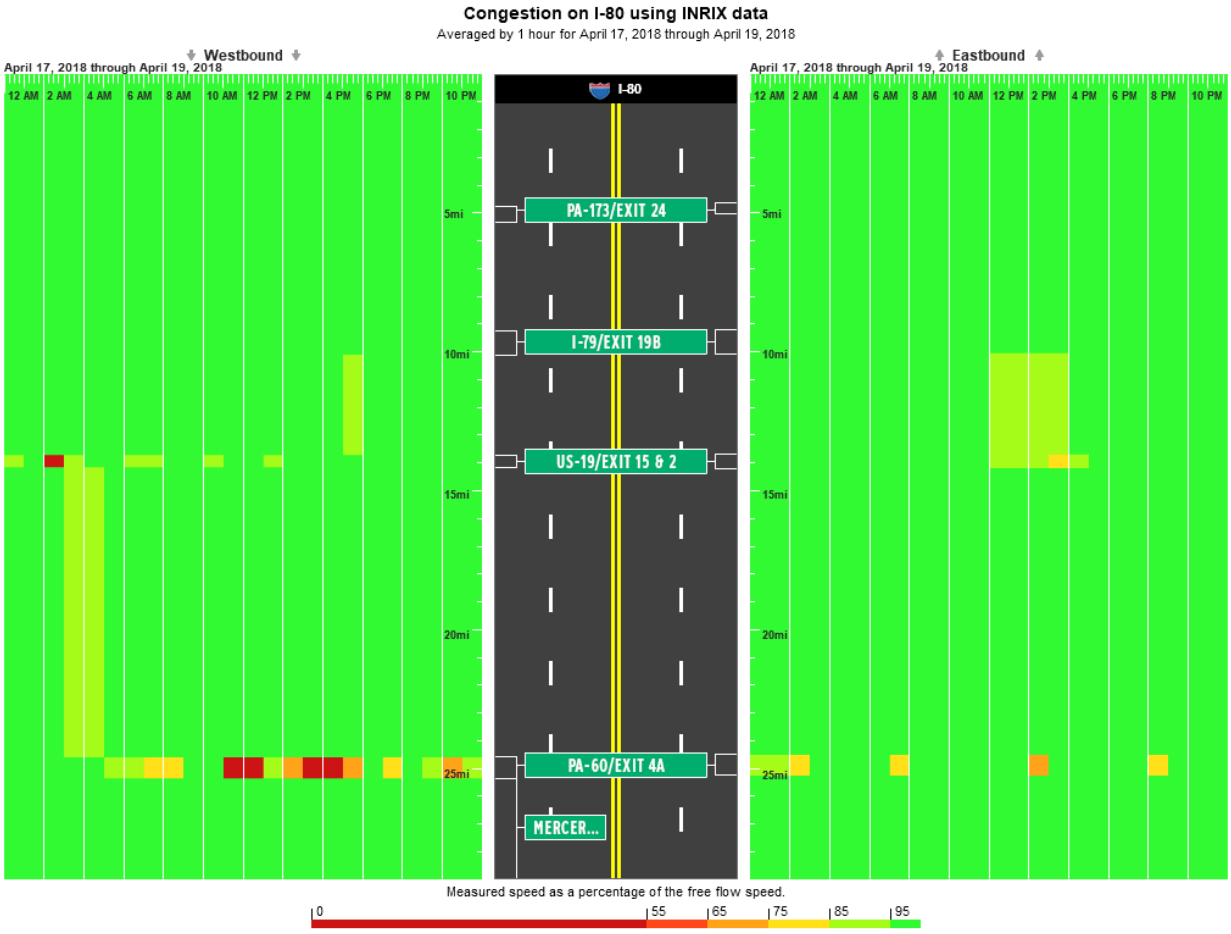
  - Select [**Share**] at the upper right corner of the page to generate an HTML snippet that may be used to embed video images into a webpage.

- **Performance Charts** – this tool summarizes various performance metrics along a corridor over time.

  - Select [**Type**: *Candlestick*] and [**Metric**: *Speed*, *Congestion*, or *Buffer Index*] to quickly visualize the variability in corridor-wide average travel conditions throughout each hour of the day.

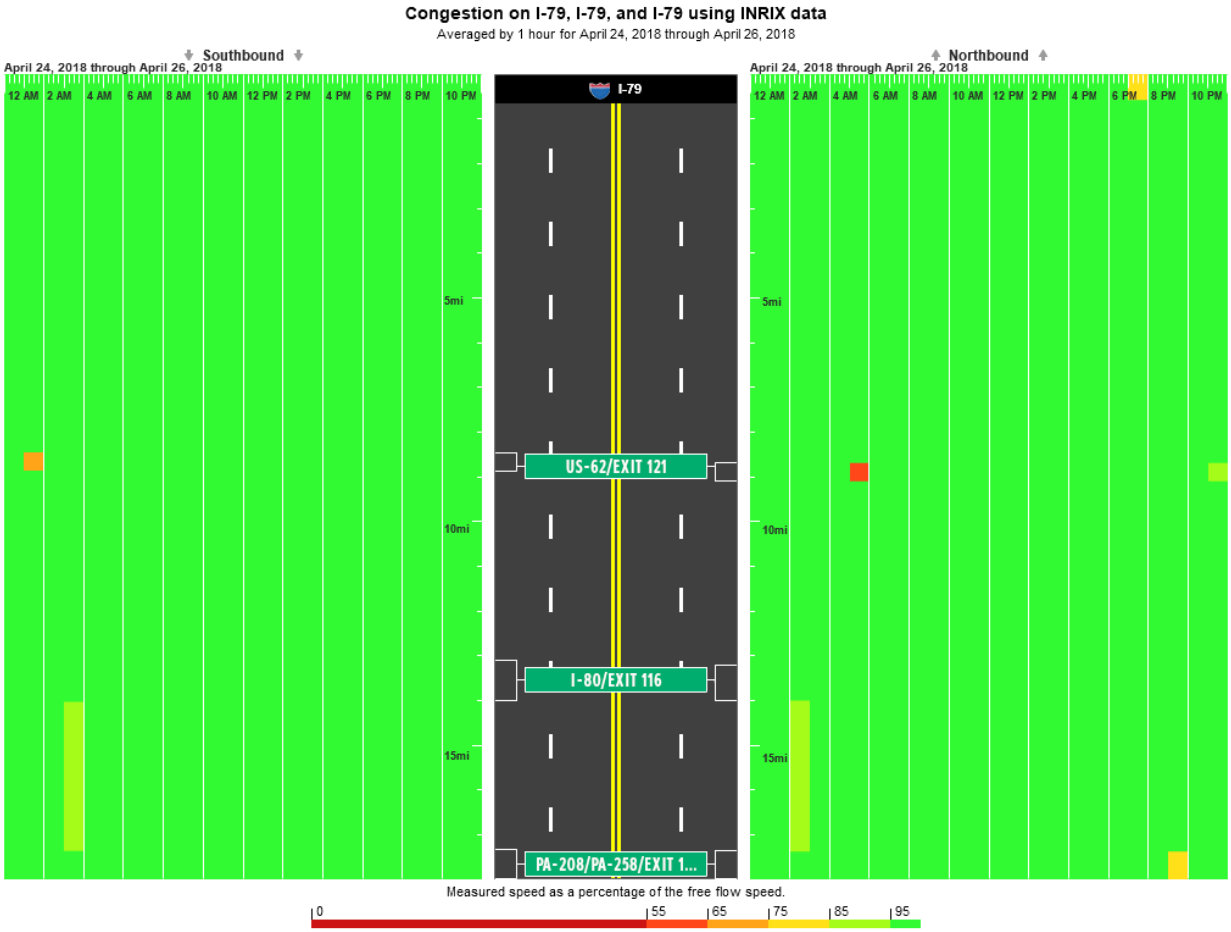
CMP #101 (I-80)

[CLICK HERE for CMP #101 Online]



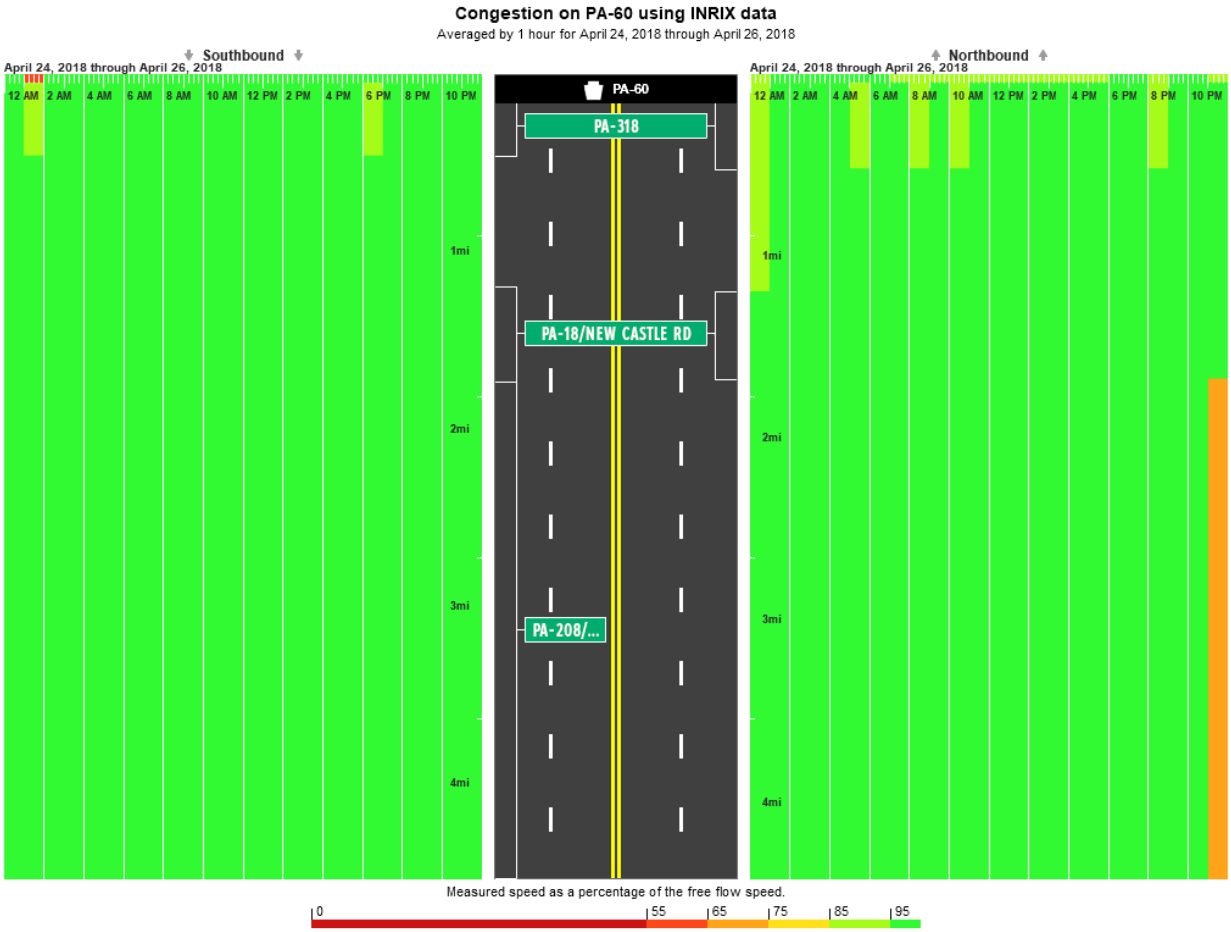
CMP #102 (I-79)

[CLICK HERE for CMP #102 Online]



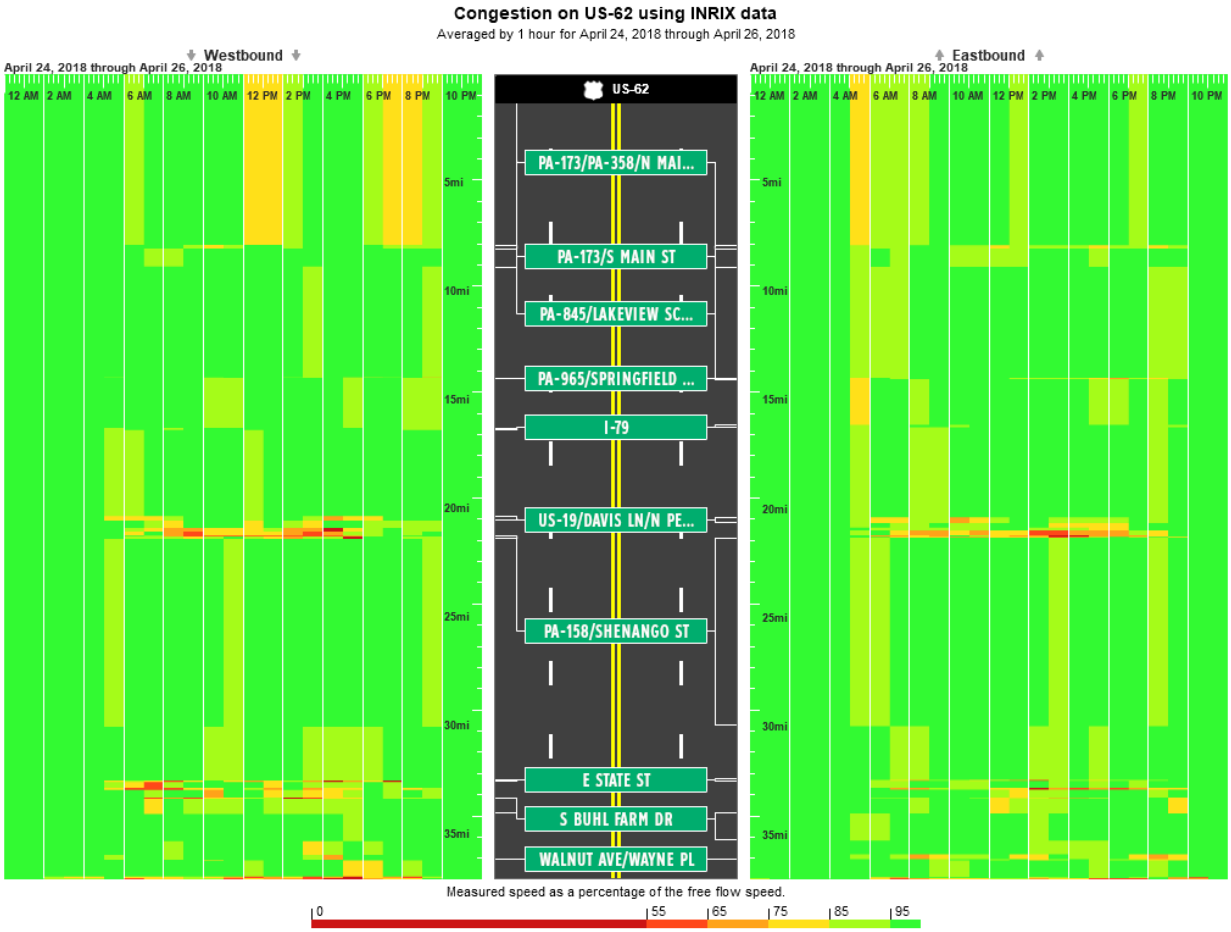
CMP #103 (I-376)

[CLICK HERE for CMP #103 Online]



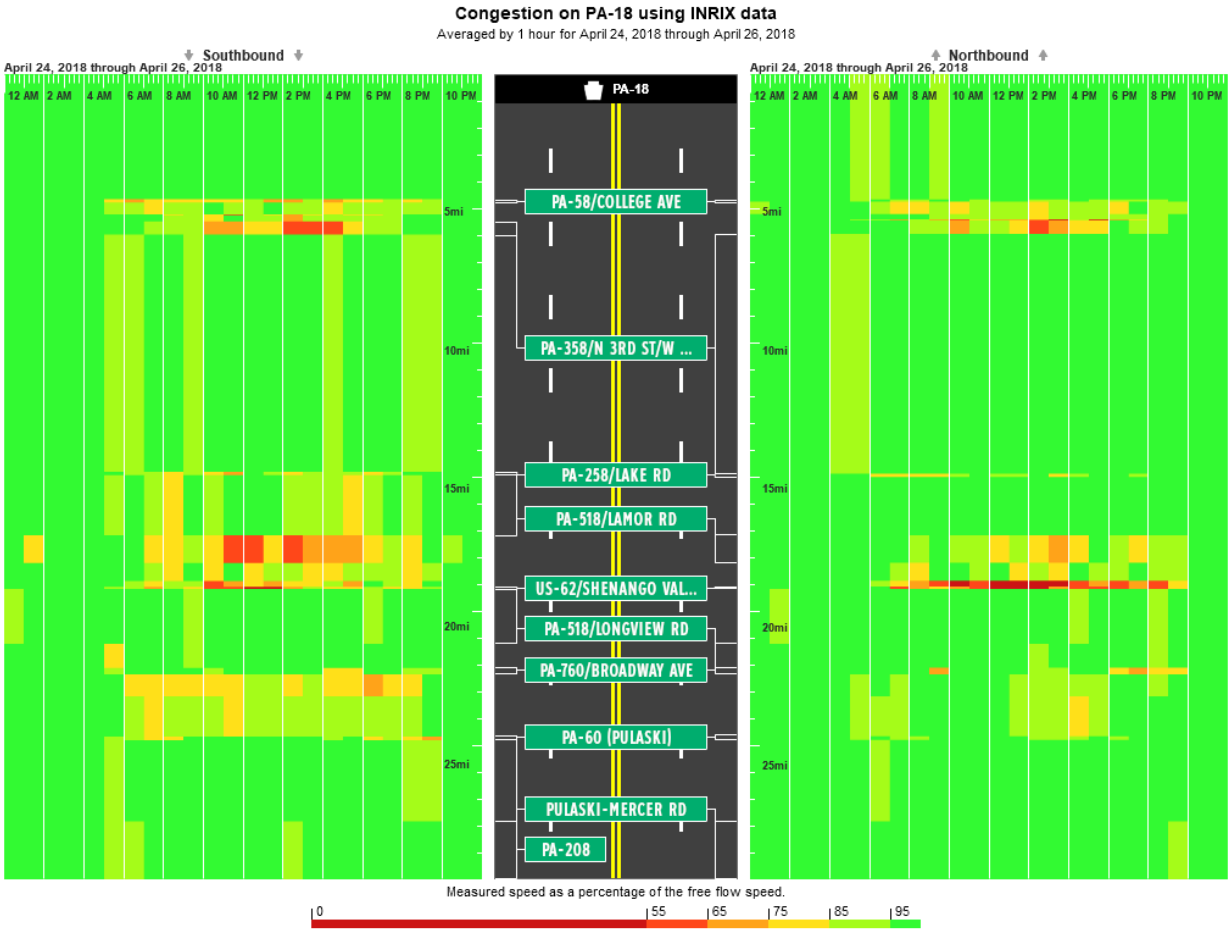
CMP #201/202 (US 62)

[CLICK HERE for CMP #201/202 Online]



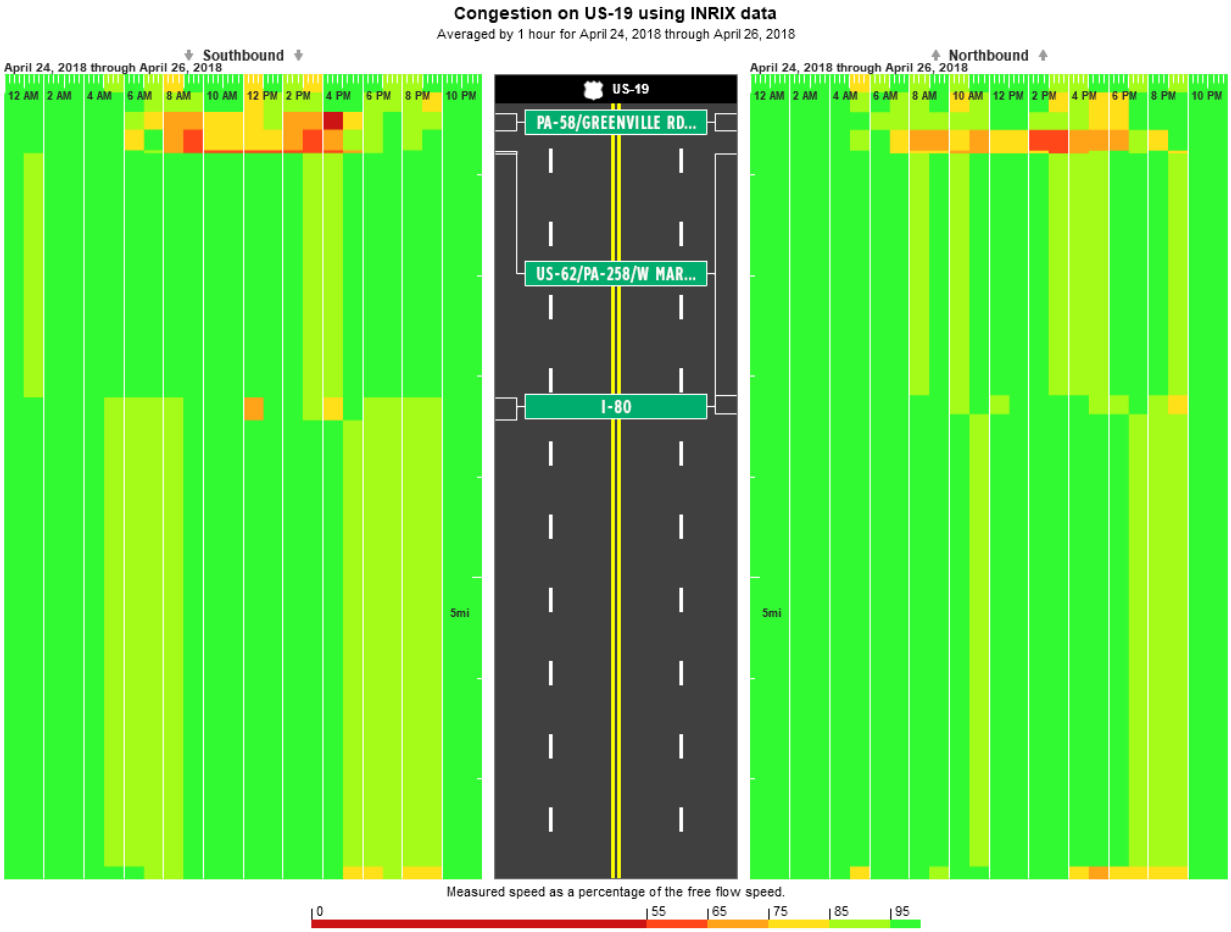
CMP # 203/204 (PA 18)

[CLICK HERE for CMP #203/204 Online]



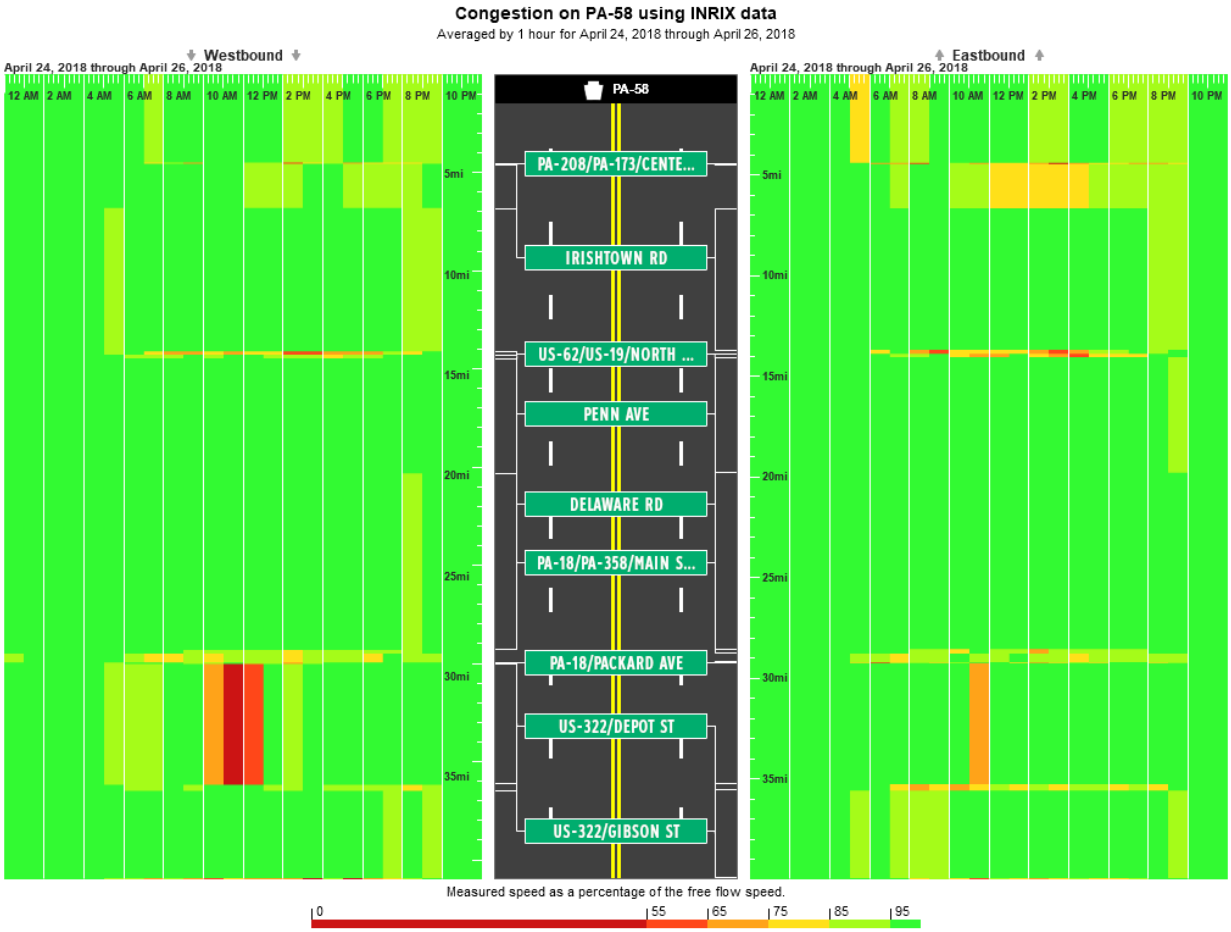
CMP #206 (US 19)

[CLICK HERE for CMP #206 Online]



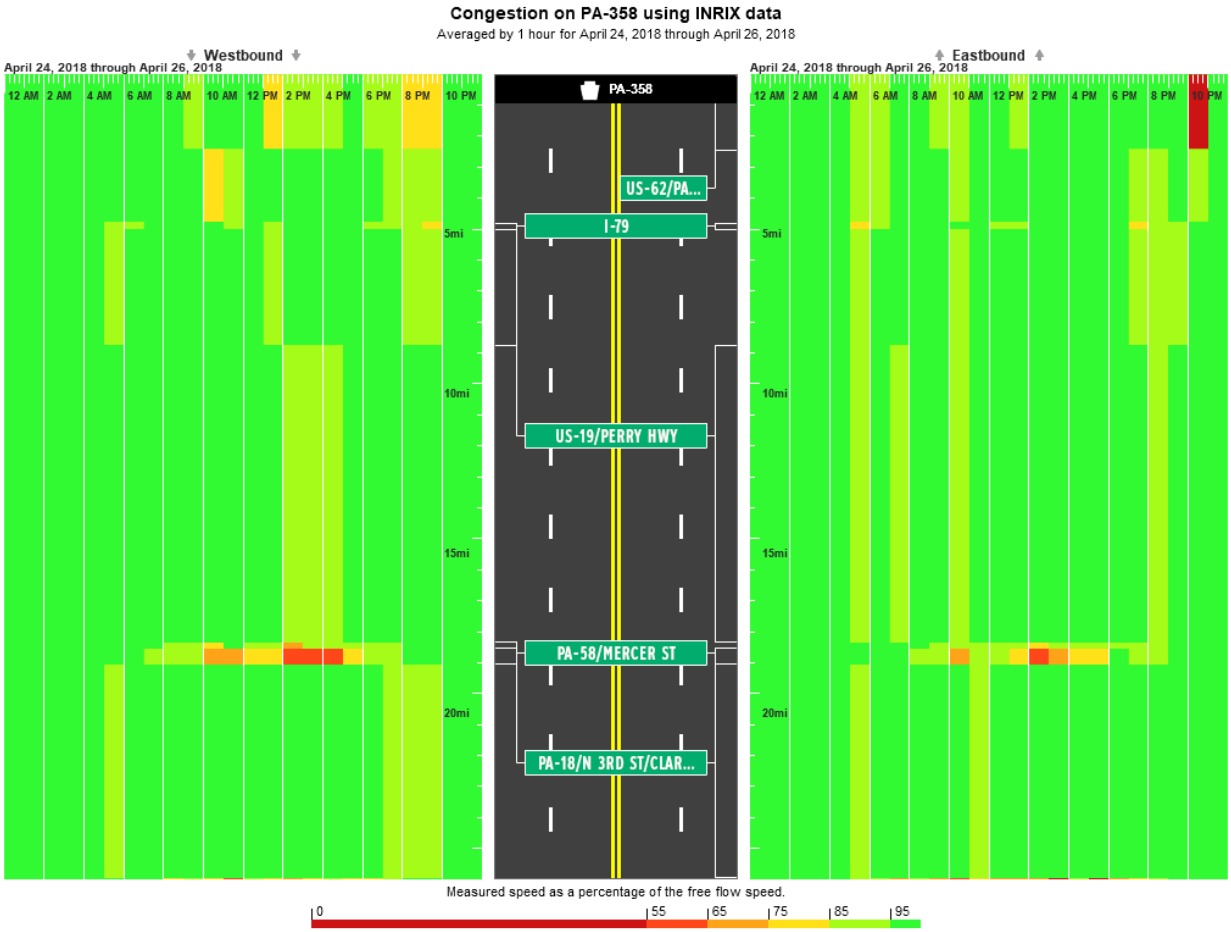
CMP #301/302 (PA 58)

[CLICK HERE for CMP #301/302 Online]



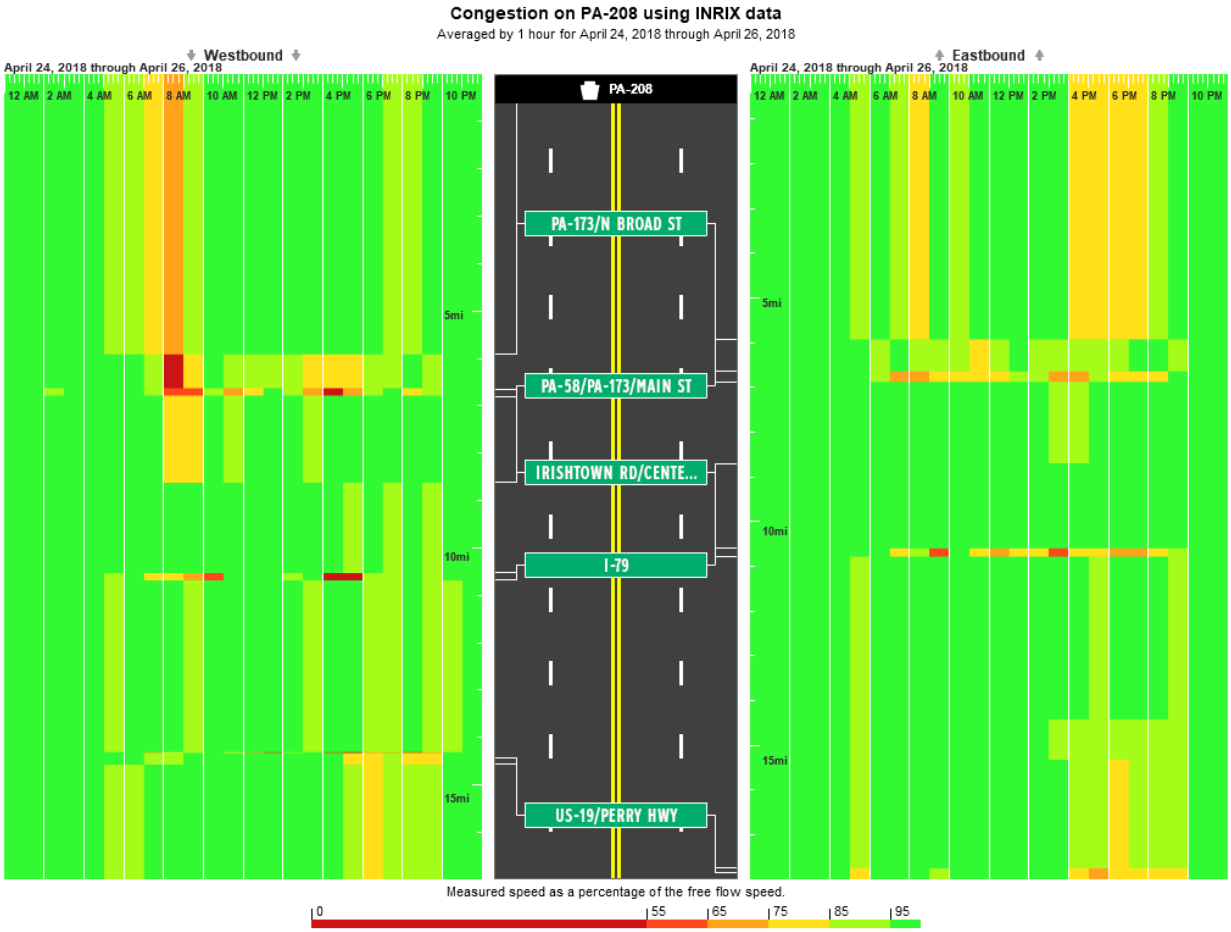
CMP #303 (PA 358)

[CLICK HERE for CMP #303 Online]



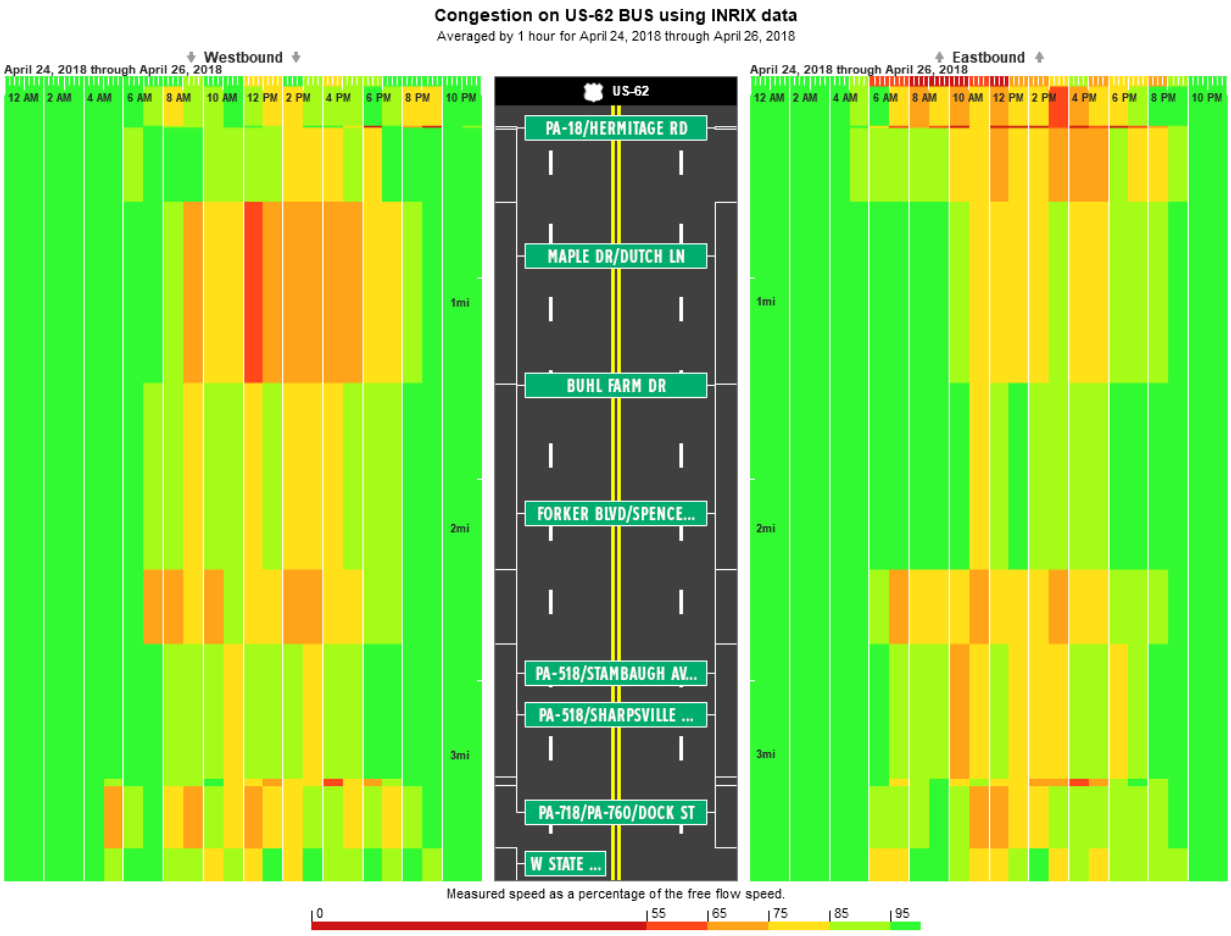
CMP #304 (PA 208)

[CLICK HERE for CMP #304 Online]



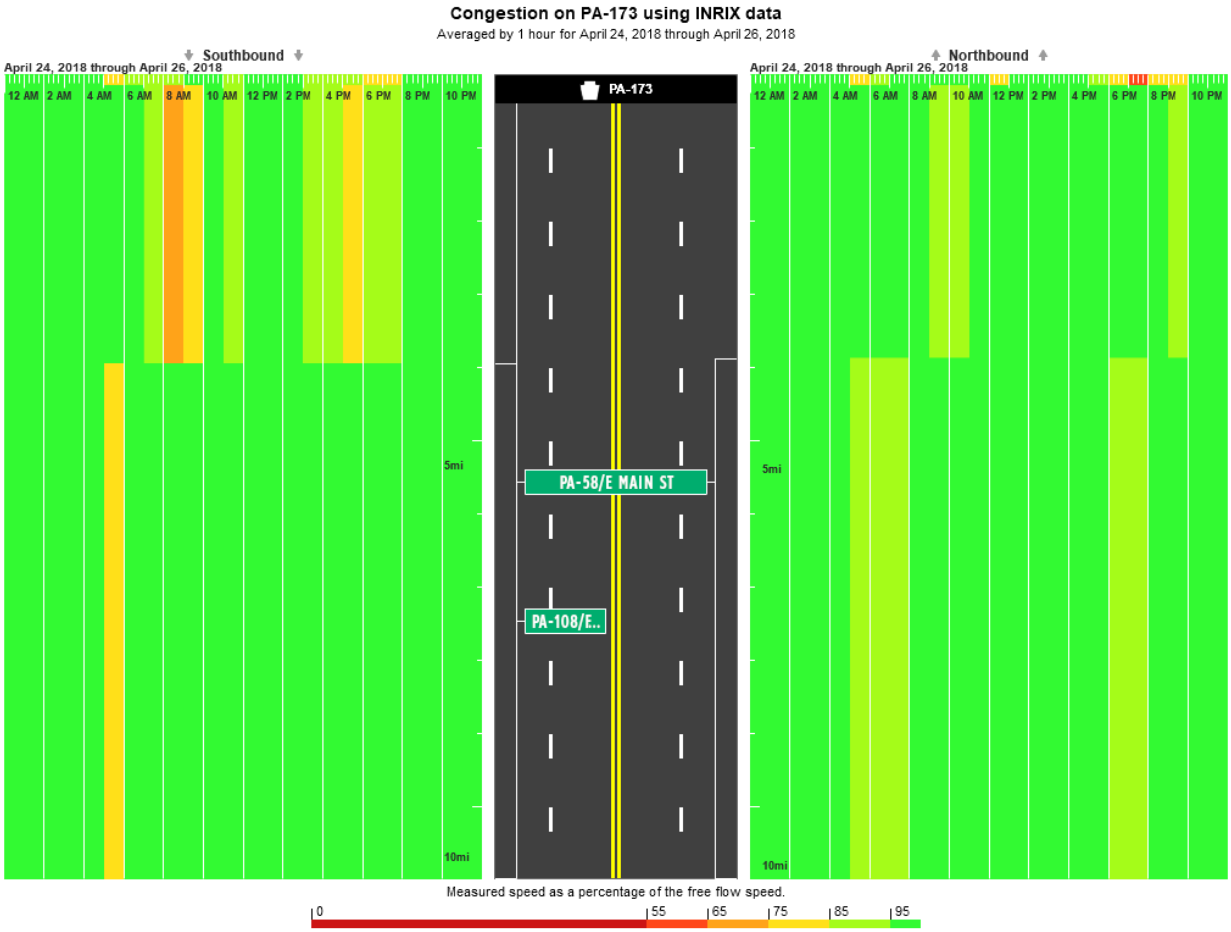
CMP #305 (SR 3008 / E State St / US 62 Bus)

[CLICK HERE for CMP #305 Online]



CMP #306 (PA 173)

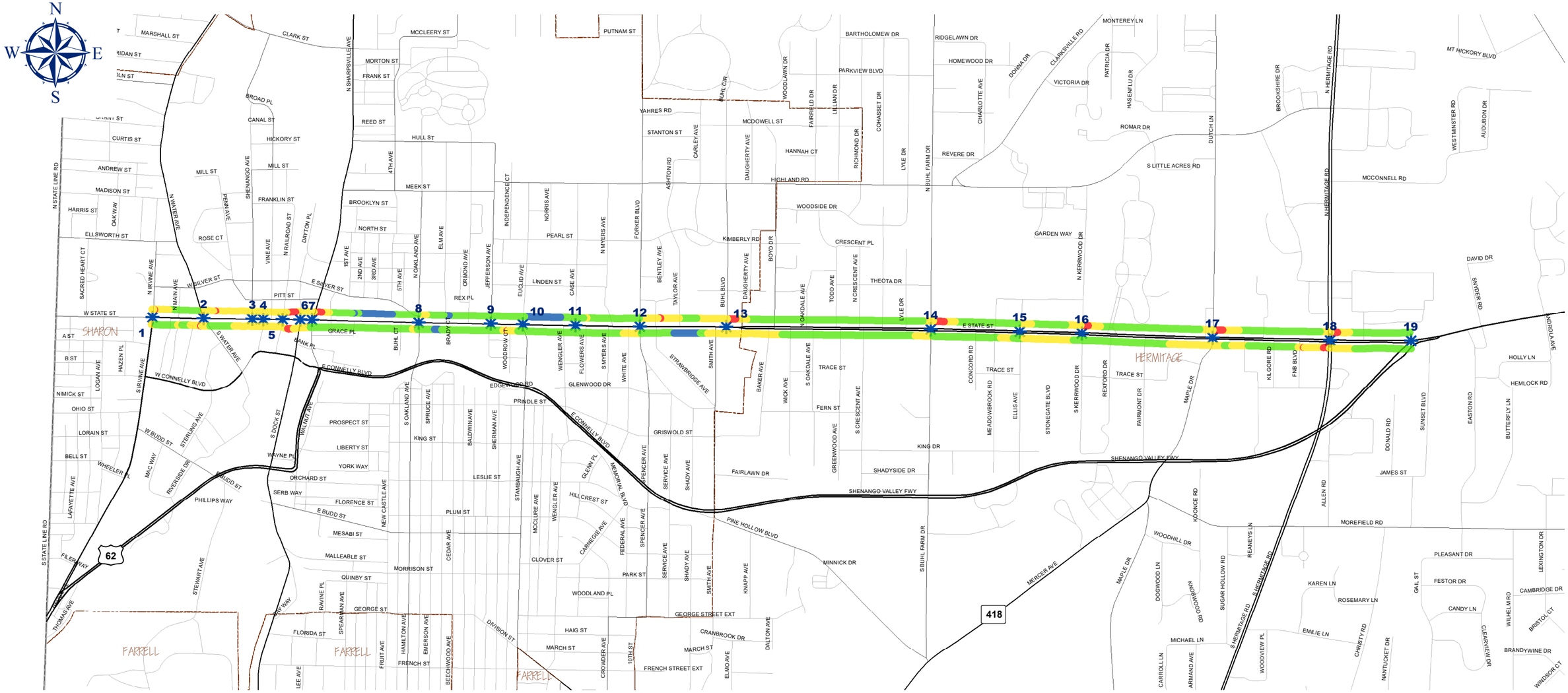
[CLICK HERE for CMP #306 Online]



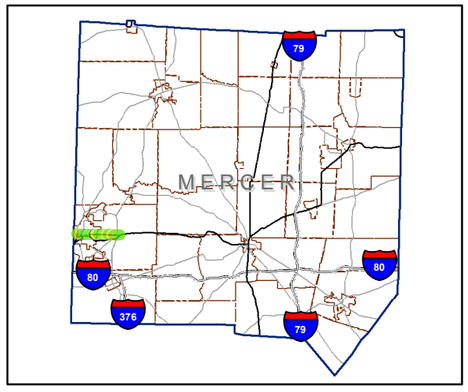
GPS-Based Congestion Data

Two-star data updates include speed display diagrams (on the following pages) derived from the latest 2018 GPS-based travel time runs. These updates include the following corridors:

- CMP #305 (SR 3008 / East State St / US 62 Business)
- CMP #401 (SR 3025 / Mercer Ave / Buhl Farm Rd)
- CMP #402 (SR 3014 / Highland Rd)
- CMP #403 (PA 518 & SR 3020 / Lamor Rd)
- CMP #404 (PA 518 / Longview Rd & Stambaugh Avenue)
- CMP #406 (North Kerrwood Drive)



LEGEND



Detail 1 - County Location (N.T.S.)

Speed-Based Congestion Estimate

- Slowed / Stopped (Significant Congestion)
- Slowed (Moderate Congestion)
- Free-Flowing (Minimal Congestion)
- Free-Flowing (No Congestion)

Corridor Nodes, SR 3008 @:

1. 1, Irvine Ave
2. 2, PA 718, Water Ave
3. 3, Shenango Ave
4. 4, Chestnut Ave
5. 5, Railroad St
6. 6, PA 60, Dock St
7. 7, PA 518, Sharpsville Ave
8. 8, Oakland Ave
9. 9, Jefferson Ave
10. 10, PA 518, Stambaugh Ave
11. 11, Case Ave
12. 12, Forker Blvd, Spencer Ave
13. 13, Buhl Blvd
14. 14, Buhl Farm Dr (SR 3025)
15. 15, Ellis Ave
16. 16, Kerrwood Dr
17. 17, Maple Dr / Dutch Ln (SR 3035)
18. 18, PA 18, Hermitage Rd
19. 19, US 62, Shenango Valley Fwy

0 750 1,500 3,000 Feet

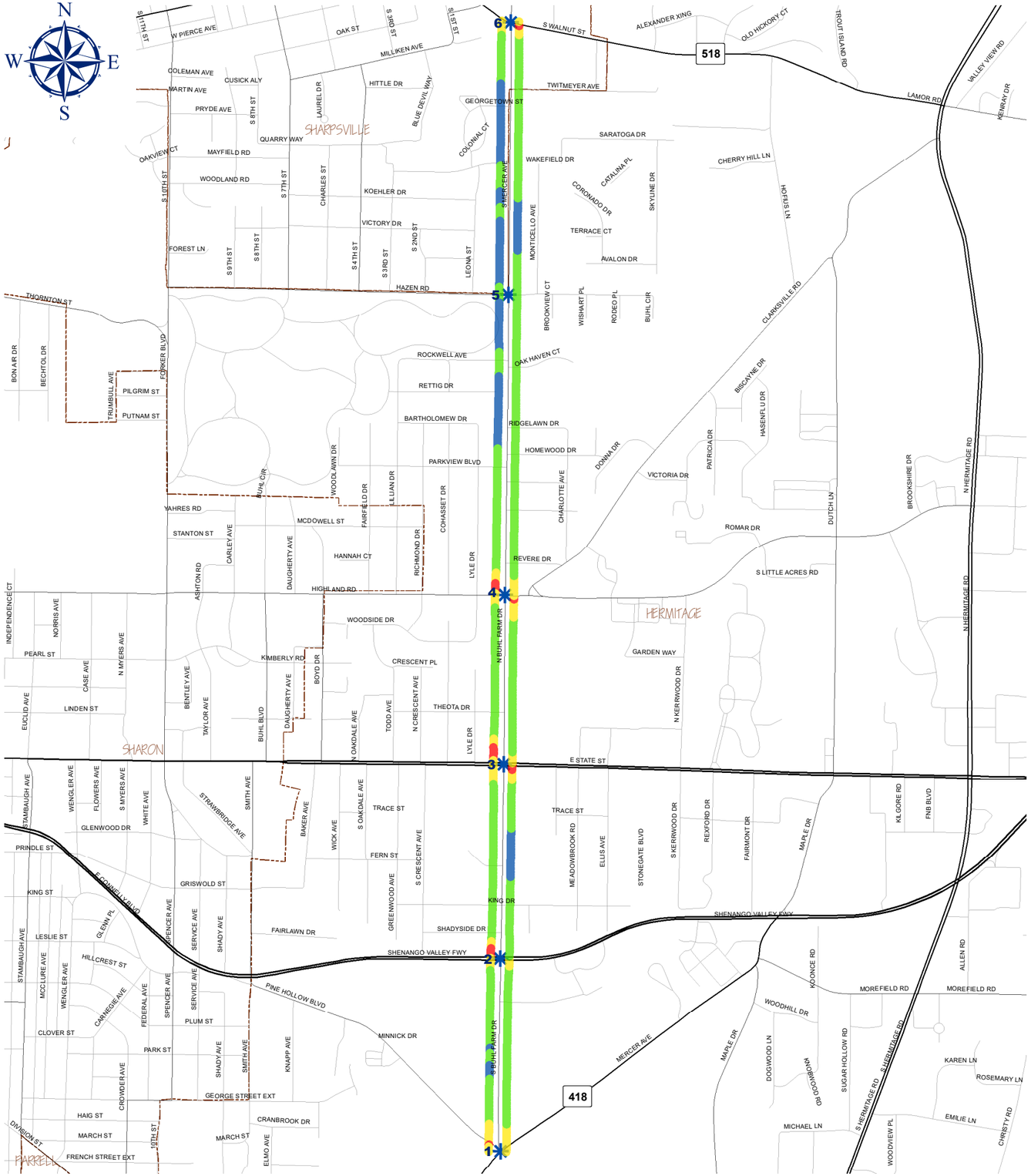
Mercer County CMP

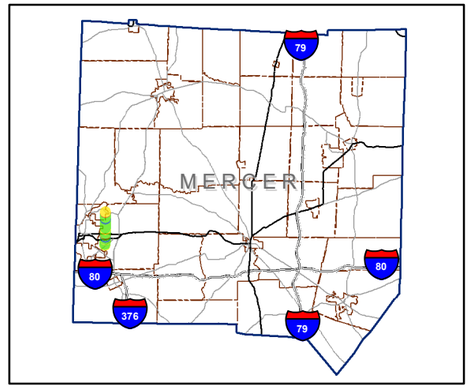
SR 3008 (E State St)

Speed Display Diagram for
Typical Weekday PM Peak

Corridor #305

Revised 08/08/18





Detail 1 - County Location (N.T.S.)

LEGEND

Speed-Based Congestion Estimate

- Slowed / Stopped (Significant Congestion)
- Slowed (Moderate Congestion)
- Free-Flowing (Minimal Congestion)
- Free-Flowing (No Congestion)

Corridor Nodes, SR 3025 @:

- 6, PA 518, Walnut St
- 5, Hazen Rd (SR 3016)
- 4, Highland Rd (SR 3014)
- 3, E State St (SR 3008)
- 2, US 62, Shenango Valley Fwy
- 1, PA 418, Mercer Ave

0 750 1,500 3,000 Feet

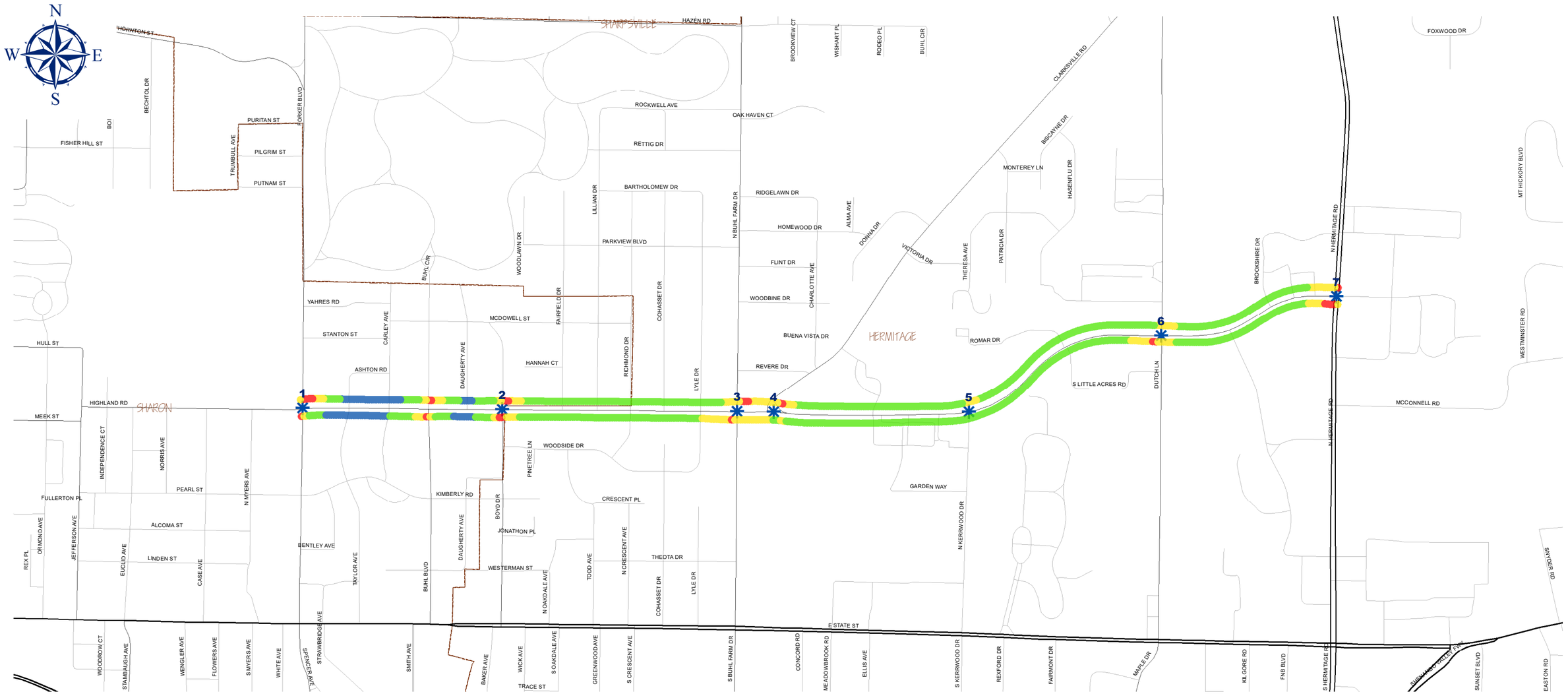
Mercer County CMP

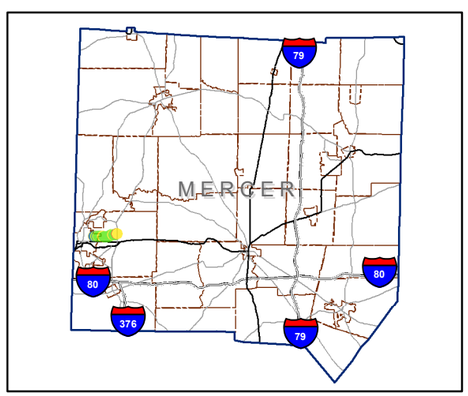
SR 3025 (Mercer Ave / Buhl Farm Dr)

Speed Display Diagram for
Typical Weekday PM Peak

Corridor #401

Revised 08/08/18





Detail 1 - County Location (N.T.S.)

LEGEND

Speed-Based Congestion Estimate

- Slowed / Stopped (Significant Congestion)
- Slowed (Moderate Congestion)
- Free-Flowing (Minimal Congestion)
- Free-Flowing (No Congestion)

Corridor Nodes, SR 3014 @:

1. 1, Forker Blvd (SR 3021)
2. 2, Boyd Dr
3. 3, N Buhl Farm Dr (SR 3025)
4. 4, Clarksville Rd (SR 3033)
5. 5, Kerrwood Dr
6. 6, Dutch Ln (SR 3035)
7. 7, PA 18, Hermitage Rd

0 500 1,000 2,000 Feet

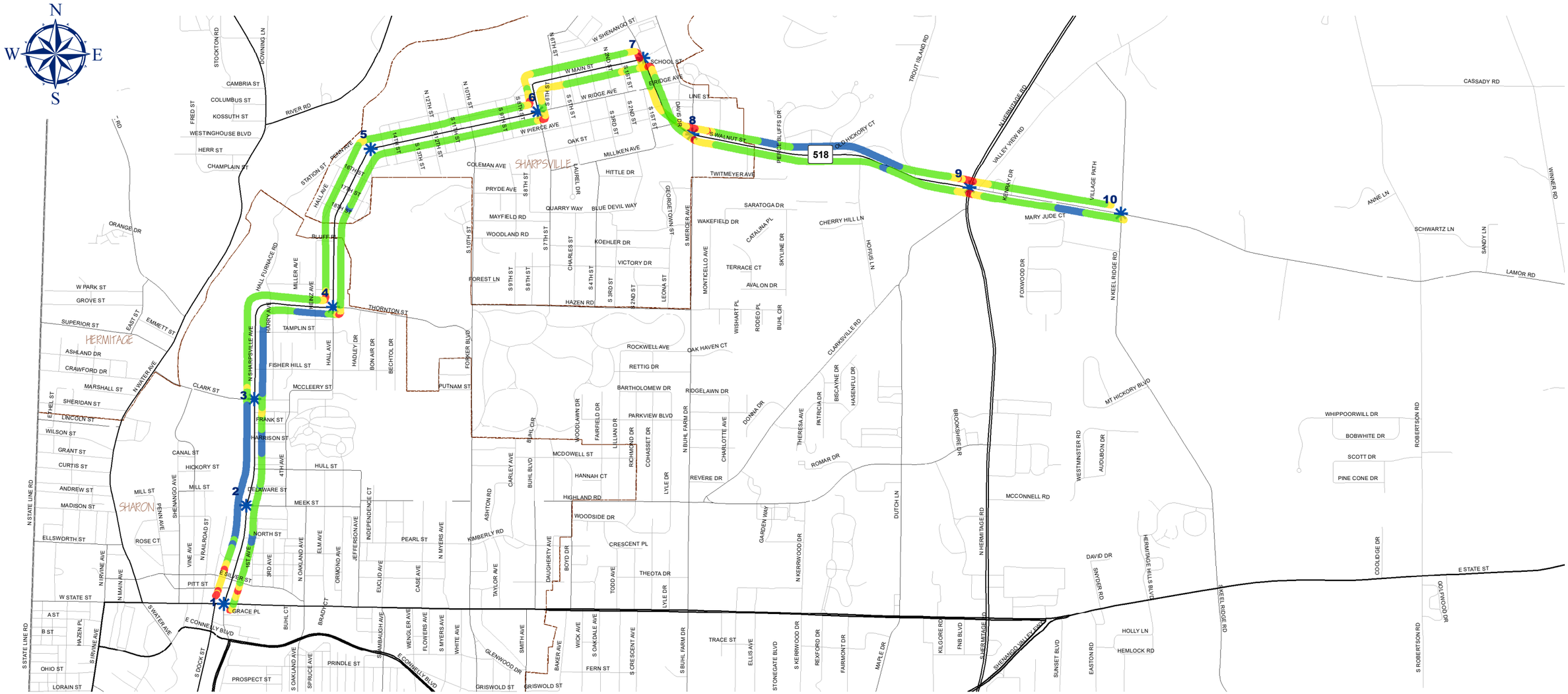
Mercer County CMP

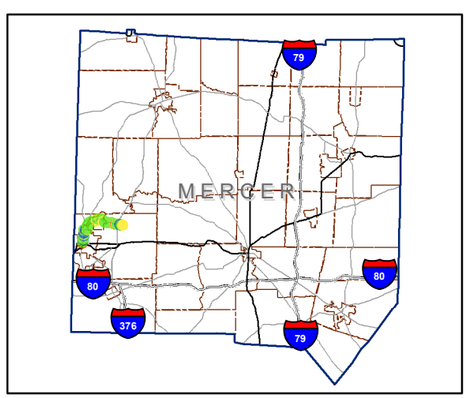
SR 3014 (Highland Rd)

Speed Display Diagram for
Typical Weekday PM Peak

Corridor #402

Revised 08/08/18





Detail 1 - County Location (N.T.S.)

LEGEND

Speed-Based Congestion Estimate

- Slowed / Stopped (Significant Congestion)
- Slowed (Moderate Congestion)
- Free-Flowing (Minimal Congestion)
- Free-Flowing (No Congestion)

Corridor Nodes, PA 518 / SR 3020 @:

1. 1, E State St (SR 3008)
2. 2, Meek St
3. 3, Clark St (SR 3012)
4. 4, Hall Ave, Thornton St
5. 5, Penn Ave, 15th St
6. 6, 7th St (SR 3023)
7. 7, Walnut St (SR 3018)
8. 8, Mercer Ave (SR 3025)
9. 9, PA 18, N Hermitage Rd
10. 10, N Keel Ridge Rd (SR 3011)

0 1,000 2,000 4,000 Feet

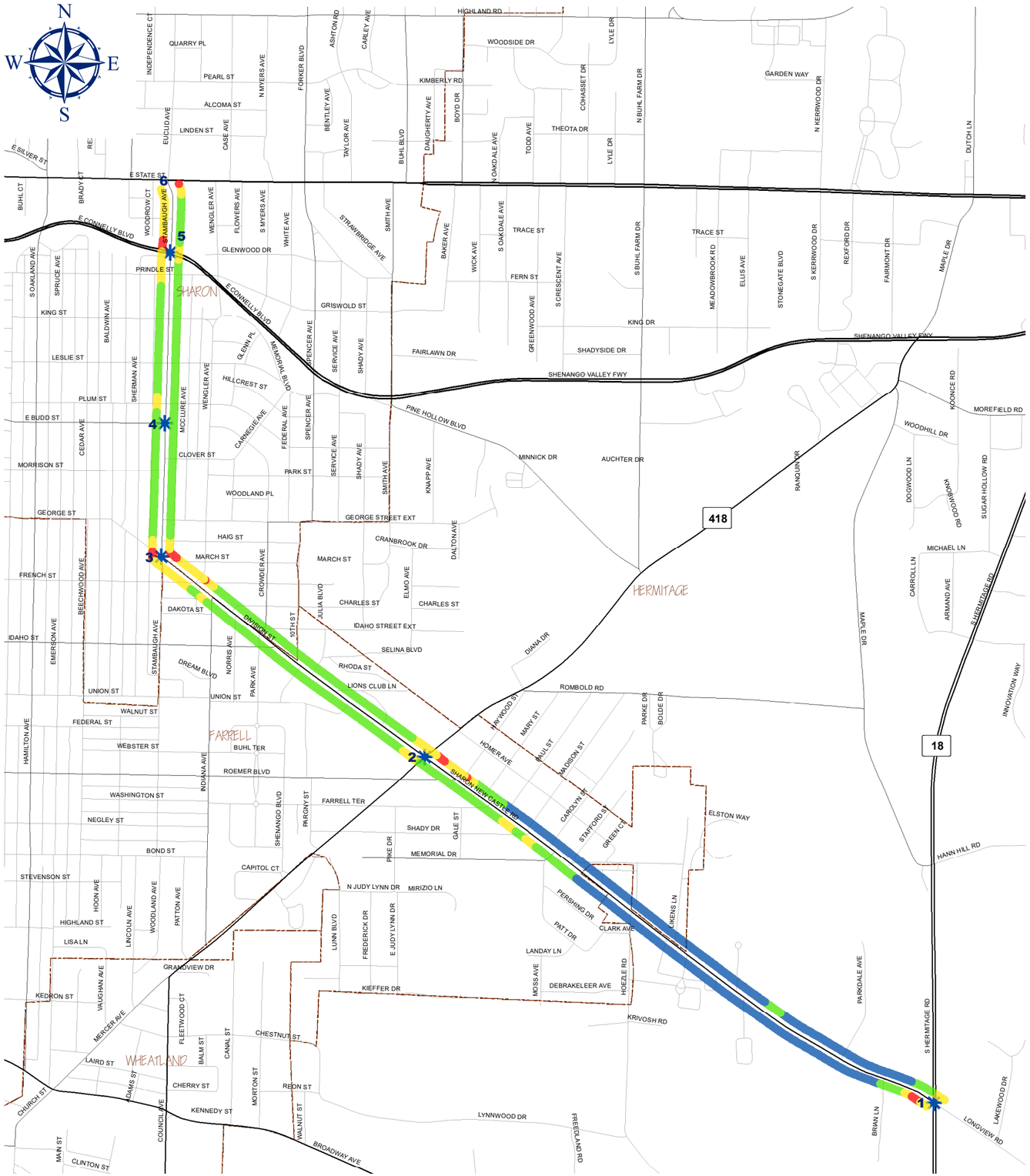
Mercer County CMP

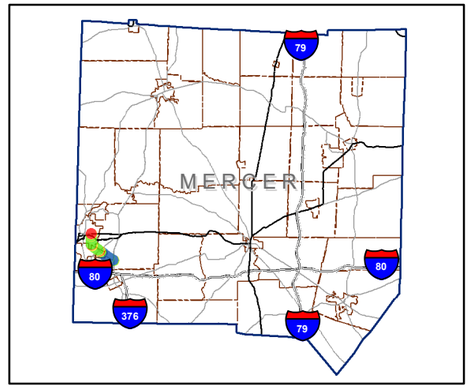
PA 518 & SR 3020 (Lamor Rd)

Speed Display Diagram for
Typical Weekday PM Peak

Corridor #403

Revised 08/08/18





Detail 1 - County Location (N.T.S.)

LEGEND

Speed-Based Congestion Estimate

- Slowed / Stopped (Significant Congestion)
- Slowed (Moderate Congestion)
- Free-Flowing (Minimal Congestion)
- Free-Flowing (No Congestion)

Corridor Nodes, PA 518 @:

- ✱ 6, E State St (SR 3008), Euclid Ave
- ✱ 5, US 62, E Connelly Blvd
- ✱ 4, E Budd St
- ✱ 3, Stambaugh Ave, Division St
- ✱ 2, PA 418, Mercer Ave
- ✱ 1, PA 18, S Hermitage Rd

0 750 1,500 3,000 Feet

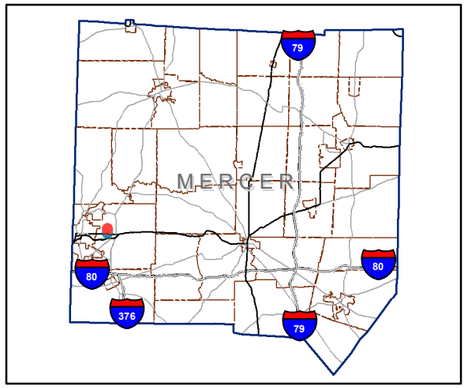
Mercer County CMP

PA 518 (Longview Rd / Stambaugh Ave)

Speed Display Diagram for
Typical Weekday PM Peak

Corridor #404

Revised 08/08/18



Detail 1 - County Location (N.T.S.)

LEGEND

Speed-Based Congestion Estimate

- Slowed / Stopped (Significant Congestion)
- Slowed (Moderate Congestion)
- Free-Flowing (Minimal Congestion)
- Free-Flowing (No Congestion)

Corridor Nodes, N Kerrwood Dr @:

- 3, Highland Rd (SR 3014)
- 2, Hermitage Towne Plaza
- 1, E State St (SR 3008)

0 250 500 1,000 Feet

Mercer County CMP

N Kerrwood Dr (Hermitage)

Speed Display Diagram for
Typical Weekday PM Peak

Corridor #406

Revised 08/08/18

MCRPC Mercer County Regional Planning Commission