

4. System Performance

Performance Measures have been mandated by federal transportation legislation known as MAP-21 and the FAST Act (23 CFR § 490). Performance measures for the federal-aid highway program are intended to assess the following:

- Highway Safety Improvement Program (§§ 490.201 - 490.213)
- Pavement Condition (§§ 490.301 - 490.319)
- Bridge Condition (§§ 490.401 - 490.413)
- Performance of the National Highway System (§§ 490.501 - 490.513)
- Freight Movement on the Interstate System (§§ 490.601 - 490.613)
- Congestion Mitigation and Air Quality Improvement Program - Traffic Congestion (§§ 490.701 - 490.713)
- the Congestion Mitigation and Air Quality Improvement Program - On-Road Mobile Source Emissions (§§ 490.801 - 490.)

The FHWA final rule for Performance Measures became effective June 27, 2016. This rule established the statewide and metropolitan transportation process to support these performance measures.

Performance measures for public transit are intended to assess the following:

- Transit Asset Management (49 CFR §§ 625.1 – 625.55)

The FTA final rule for transit asset management performance measures became effective October 1, 2016.

These measures are not a one-size-fits-all MPO criteria. Each MPO has its own needs and the use of these performance measures can only be one part of the solution to improve the transportation network. The MPO will continue to work with FHWA and FTA to meet the performance measures.

Additional information is needed for the CCMPO to be able to describe how the LRTP project list will be fiscally constrained and meet the performance measure targets. Long-range transportation plans adopted after May 20, 2019, must comply with the Final Planning Rule. In order to meet this federal goal, the CCMPO is proposing a series of steps in the LRTP Action Plan to work toward implementation of the national performance measures.

The performance-based elements of the LRTP must include a commitment that the Transportation Improvement Program (TIP) demonstrates consistency with the Long-Range Transportation Plan, as well as other performance management plans including state and transit asset management plans and the Strategic Highway Safety Plan.

Projects included in the TIP must be consistent with and reflect the LRTP's investment priorities. The TIP should also provide a description of how programmed projects will work toward achievement of the performance targets established in the LRTP and link the performance targets with investment priorities.

PM-1: Safety Measures

The FAST Act continues MAP-21's emphasis on the safety of the traveling public as one of the highest priorities at the federal level. The federal safety focus is implemented through state and local safety performance goals.

The safety performance measures, also referred to as PM-1, support the Highway Safety Improvement Program (HSIP) and apply to all public roads. There are five required safety performance measures, listed in Table 13. PennDOT has established statewide safety targets in its Strategic Highway Safety Plan (2017). The goal is to reduce fatalities and serious injuries annually by 1 percent. Future LRTP updates will evaluate Centre County according to these safety performance measures.

Table 13: Centre County Safety Performance Measures (PM-1)

Performance Measure	Baseline 2014-2018	Target 2016-2020	Target 2021-2045
Number of Fatalities	15.2	14.9	1% reduction every rolling 5-year period
Fatality Rate*	1.096	1.049	1% reduction every rolling 5-year period
Number of Serious Injuries	44.0	54.8	1% reduction every rolling 5-year period
Serious Injury Rate	3.173	3.857	1% reduction every rolling 5-year period
Number of Non-Motorized Fatalities & Serious Injuries	9.4	13.7	1% reduction every rolling 5-year period

*per 100 million vehicle-miles traveled (VMT)

Note: Five-year rolling averages are used to more accurately reflect overall trends

The CCMPO also gives high priority to safety and has emphasized the continued need for safety improvements across all modes. The CCMPO frequently discusses and identifies safety as its highest priority criterion when evaluating and selecting future transportation infrastructure projects for inclusion on the LRTP.

Figure 27 and Figure 28 provide the most recent Centre County roadway injury and fatality data available as well as target reductions for future years. Of course, even one injury or fatality is too many.

Figure 27: Serious Injuries

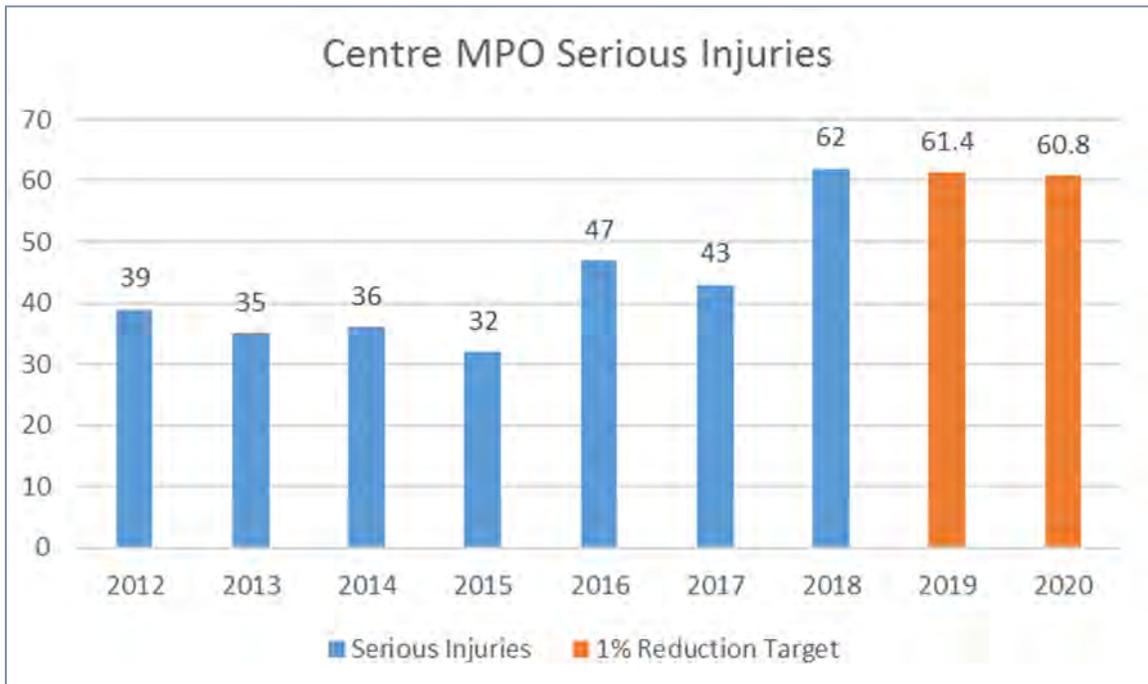
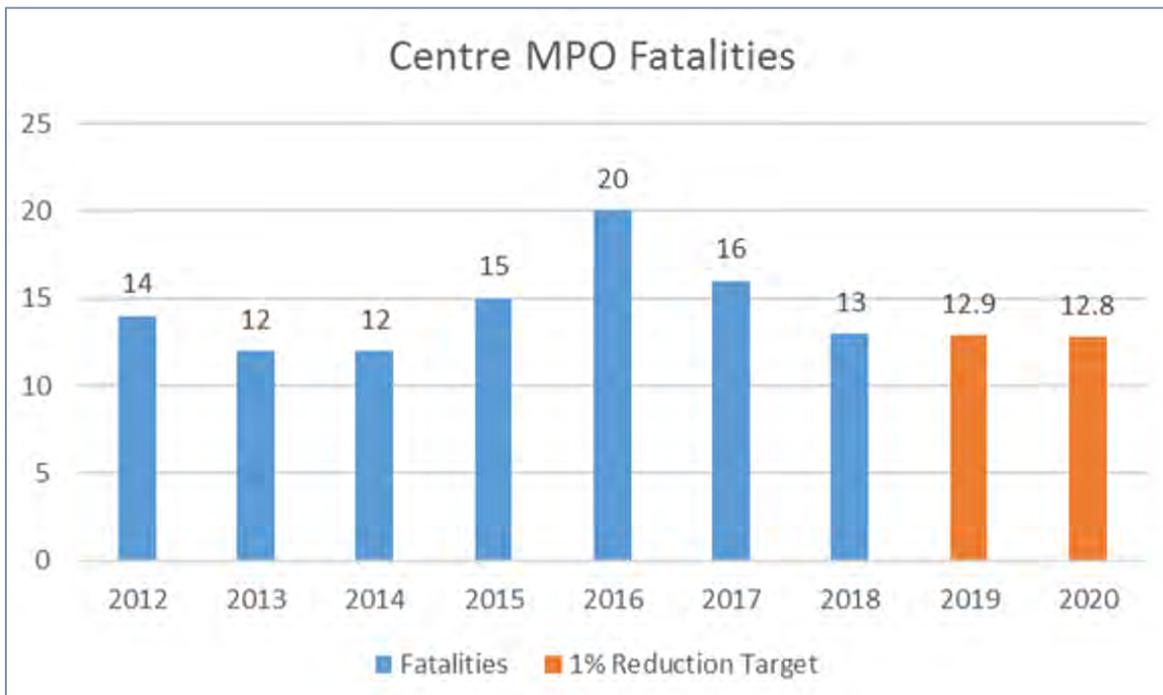


Figure 28: Roadway Fatalities



Safety needs are identified through PennDOT’s annual Highway Safety Improvement Program (HSIP) review process, using the crash data and other resources such as the statewide Intersection Safety Implementation and Roadway Departure Implementation Plans. In Centre County there are 17 intersections and 20 roadway segments that are areas of concern, with higher-than-average

crash rates and crash severity. Figure 29 maps crash locations from 2015 to 2019 and indicates the type of crash.

The CCMPO is cognizant of statewide safety improvement targets, and will continue to coordinate with PennDOT annually to review areas of safety concern, identify priorities for safety funding, and discuss the scope of potential improvements that could be addressed by PennDOT maintenance efforts or included on the LRTP and Centre County TIP. In addition, the CCMPO and PennDOT staffs work directly with municipal officials to address safety concerns identified within their jurisdictions.

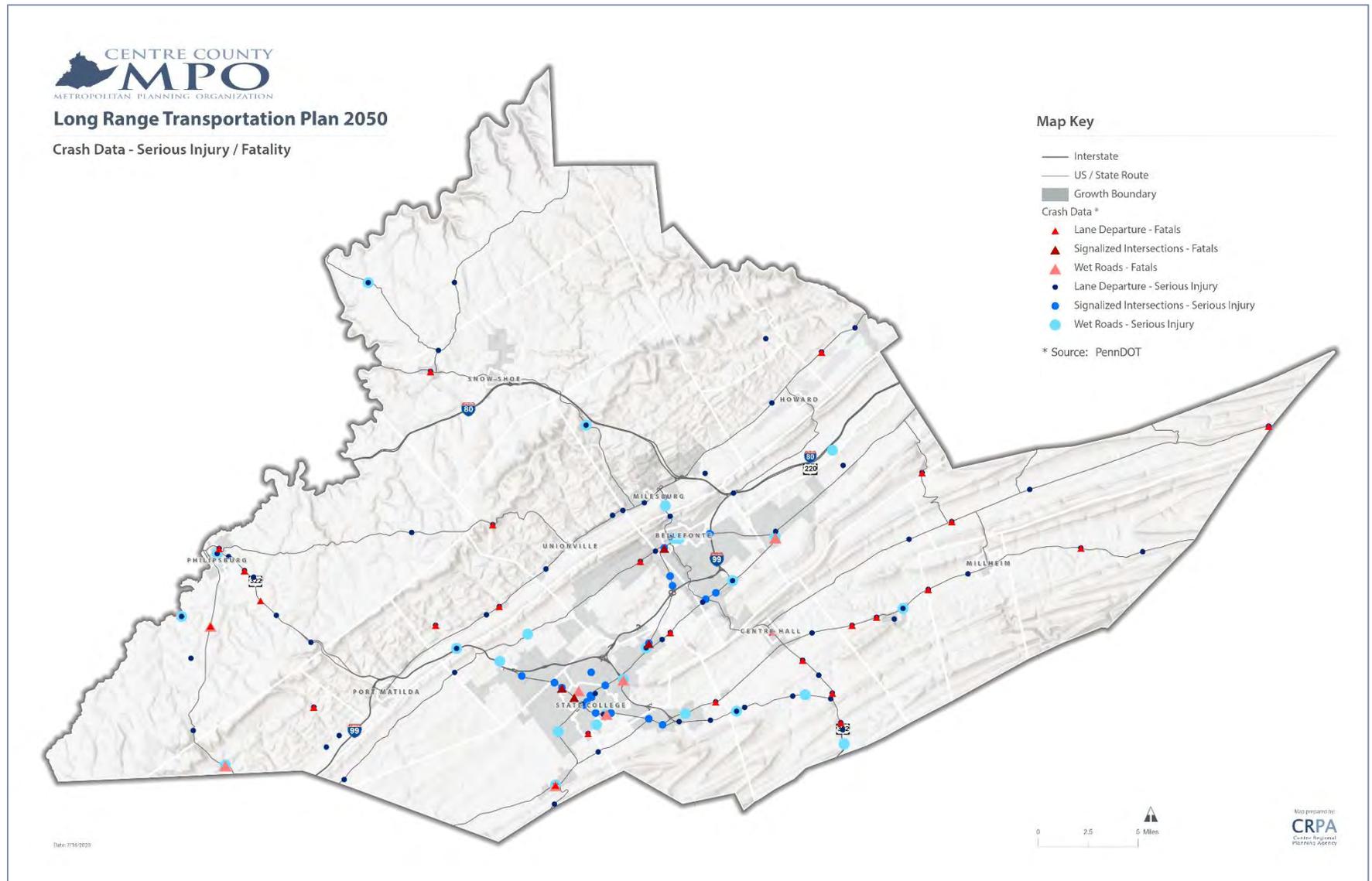
Fourteen (14) of the 21 projects included on the fiscally constrained highway project list for the LRTP are specifically focused on improving safety at intersections or along corridors, with a total estimated investment of almost \$57 million. A Safety line item is included in all four time periods of the LRTP beyond the initial period (2021-2024 TIP), with a total estimated investment of \$37 million for projects that will be identified through the annual review process. Two other major highway projects that are either programmed or advancing into the planning phase are also expected to significantly improve safety.

PennDOT and municipalities are also advancing safety improvements to roadway systems that are not financed through the Centre County TIP, but are supported by the CCMPO. For example, PennDOT has installed cable median barriers along many sections of limited-access highways, and has also targeted funding to improving the visibility of existing traffic signals. Municipalities have upgraded traffic signals to improve turn-lane phasing, and have addressed intersection sight distance issues by removing vegetation and physical obstructions, and improving the roadway alignment. These types of improvements are anticipated to continue outside of the CCMPO's funding role and will help meet the safety performance measure targets.

PennDOT, the CCMPO, municipalities and local stakeholders have also continued to advance infrastructure and programmatic efforts to address safety for nonmotorized travel. Examples include:

- Signal, crosswalk, and sidewalk improvements to improve safety for pedestrians and bicyclists.
- Education programs and bike light giveaways sponsored by Penn State University and the CentreBike bicycle advocacy group.
- Elements of driver training curriculum at the State College Area School District that focus on Pennsylvania's law requiring drivers to provide 4 feet of clearance when passing bicyclists.
- Public relations activities focused on educating residents and vehicle operators about Pennsylvania's 4-foot bicycle passing law, including posting messages on dynamic message signs in various roadway locations, and exterior advertising on CATA transit buses.
- Training sessions with CATA bus operators relative to interactions with pedestrians and bicyclists.

Figure 29: Crash Locations and Type, 2015–2019



PM-2: System Condition Measures

Federal roadway pavement and bridge performance measures targets apply only to roadways and bridges on the designated National Highway Performance Program (NHPP), also known as the National Highway System (NHS). The federal roadway pavement and bridge performance measures are known as PM2 performance measures.

Roadway pavement performance measures and targets are based on FHWA standards and address cracking, rutting, and faulting of road surfaces. PennDOT's Transportation Asset Management Plan (TAMP) was prepared in 2019 to guide investments needed to maintain roadways and bridges in a desired state of good repair. Highway and bridge condition performance targets are established in the TAMP; Centre County has supported the statewide targets for NHS roadways and bridges, shown in Table 14.

Table 14: Statewide System Condition Measures (PM-2)

Performance Measure	2017 Baseline	2019 Target	2021 Target
NHS Interstate Pavements			
Percentage in Good Condition	67.2%	N/A	60.0%
Percentage in Poor Condition	0.4%	N/A	2.0%
NHS Non-Interstate Pavements			
Percentage in Good Condition	36.8%	35.0%	33.0%
Percentage in Poor Condition	2.3%	4.0%	5.0%
NHS Bridges			
Percentage in Good Condition	25.6%	25.8%	26.0%
Percentage in Poor Condition	5.5%	5.6%	6.0%

Pavement Condition

PennDOT's Pavement Asset Management System (PAMS) analyzes pavement condition data to guide prioritization of roadway projects. Because PAMS is in the early stages of implementation at the time of this plan's preparation, reporting on pavement condition is based on the International Roughness Index (IRI) and Overall Pavement Index (OPI.)

The PennDOT 2018 Annual Performance Measures report indicates lower (better) IRI values for NHS Interstate and NHS non-Interstate roadways in Centre County compared to the entire PennDOT Engineering District 2-0 area. The remaining non-NHS roadways in Centre County exhibit similar IRI values compared to the same types of roads in all of District 2-0. This may be an area of improvement that is needed in Centre County, given that the majority of road segment miles in the county are on non-NHS routes. PennDOT also monitors segment-miles where the pavement has not been repaved or replaced according to optimum maintenance cycles. Of the road segment miles with out-of-cycle pavement in Centre County, the majority of Interstate miles exhibit Excellent or Good OPI ratings. However, on non-Interstate roads, the majority of miles with out-of-cycle pavement exhibit Fair or Poor OPI ratings (indicated in red text) as shown on Table 15.

Table 15: Poor IRI/OPI by Business Plan Network

Centre County Pavement Miles				
	NHS Non-Interstate Segment-Miles (BPN2)		Non-NHS >= 2,000 ADT Segment-Miles (BPN3)	
Segment-Miles	149.32		142.03	
Centre County Poor IRI/OPI, 2019				
	NHS Non-Interstate % of Segment-Miles with Poor IRI	NHS Non-Interstate % of Segment-Miles with Poor OPI	Non-NHS >= 2,000 ADT % of Segment-Miles with Poor IRI	Non-NHS >= 2,000 ADT % of Segment-Miles with Poor OPI
Poor Miles	6.00	14.02	0.20	1.32
Percentage of Segment-Miles Currently Poor	4.02%	9.39%	0.14%	0.93%
Target percentage	12.5%	7.8%	13.8%	7.1%
Centre County Poor IRI/OPI - 2021 TIP Projects				
	NHS Non-Interstate % of Segment-Miles with Poor IRI	NHS Non-Interstate % of Segment-Miles with Poor OPI	Non-NHS >= 2,000 ADT % of Segment-Miles with Poor IRI	Non-NHS >= 2,000 ADT % of Segment-Miles with Poor OPI
Miles Scheduled for Improvement	3.41	8.50	0.00	0.65
Miles Not Scheduled	2.60	5.52	0.20	0.67
Percentage of Poor Segment-Miles Not Scheduled for Improvement	1.7%	3.7%	0.1%	0.5%
Target percentage	12.5%	7.8%	13.8%	7.1%

Centre County does very well when it comes to pavement condition as it relates to the federal requirements. Based on the data available from PennDOT, an additional 2.5 miles of NHS Non-Interstate roadway miles need to be improved to meet state and federal condition thresholds. Because roadway condition continues to deteriorate over time, the CCMPO will continue working with PennDOT to plan and program timely roadway paving projects in an effort to maintain its NHS roadways in a state of good repair.

Two major pavement and drainage projects on State Route 3014 (Business Route 322), Atherton Street, will result in significant improvement to the pavement condition on the NHS, with a total estimated investment of more than \$25 million. A Betterment/Pavement Restoration line item is included in all four time periods of the LRTP beyond the initial period (2021-2024 TIP), with a total

estimated investment of more than \$51 million for projects that will be identified using PennDOT's PAMS and a periodic review process.

In addition to PennDOT roadways, a few Centre County roads functionally classified as Minor Arterials and Urban Collectors are owned and maintained by municipal governments, and are part of the Local Federal Aid (LFA) System. Similar to PennDOT, some municipalities employ pavement condition rating systems and plan for periodic repaving and reconstruction based on conditions and desired maintenance cycles. Planned projects are frequently identified in municipal Capital Improvement Program (CIP) documents. However, the completion of repaving and reconstruction projects for these roadways depends on the availability of funding through the municipality or the Pennsylvania Liquid Fuels program, both of which are limited. State College Borough and Ferguson and Patton townships have recently completed repaving projects on several important LFA System Minor Arterial and Urban Collector roadways, including Valley Vista Drive and Science Park Road, Blue Course Drive, and Easterly Parkway.

However, in many municipalities, pavement improvement projects may be deferred until sufficient funding is available. It should be noted that municipalities that do not employ pavement condition rating systems do plan for periodic repaving and reconstruction based on conditions in the field. Work will need to be done in the future to encourage these municipalities to implement a process to use scarce resources to maintain pavement.

Bridge Condition

Bridge performance measures apply to all mainline Interstate Highway System and Non-Interstate NHS bridges regardless of ownership or maintenance responsibility. Almost all of the roads functionally classified as Interstate, Other Freeways and Expressways, Other Principal Arterials, and Minor Arterials in Centre County (and their bridges) are owned and maintained by PennDOT. These roads typically carry the highest vehicular traffic volumes.

In general, FHWA's performance measures relate to the percentage of bridges rated "Poor" by count and by deck area. If any of the components of a structure qualify as poor, the structure is rated as poor.

Bridges deteriorate over time due to normal use, overloading, harsh climatic conditions, severe flooding, and erosion. Bridges must be maintained to preserve the intended load-carrying capacity and to ensure the safety of the traveling public.

The National Bridge Inspection Standards (NBIS) require all roadway bridges 20 feet in length and longer to be inspected on a regular, periodic schedule. In addition, PennDOT also conducts a regular inspection program for all state bridges between 8 feet and 20 feet in length.

The PennDOT 2018 Annual Performance Measures report indicates that approximately 55 percent of NHS bridges in Centre County are in Good condition, and less than 3 percent of NHS bridges are in Poor condition. Both values compare favorably with the 2019 and 2021 statewide targets supported by the CCMPO.

PennDOT's Bridge Asset Management System (BAMS) is now being implemented to analyze bridge condition data to guide prioritization of bridge projects. Because BAMS is in the early stages of implementation at the time of this plan's preparation, state bridge priorities in the LRTP are based on a priority list of state bridges in Centre County that was developed by PennDOT District 2-0.

Thirty state bridge projects are included on the fiscally constrained project list for the LRTP, with a total estimated investment of almost \$59 million. A State Bridge line item is included in the last two

time periods of the LRTP, with a total estimated investment of more than \$45 million for projects that will be identified through PennDOT's BAMS and a periodic review process.

Lowest Life-Cycle Cost

Lowest Life-Cycle Cost (LLCC) is an asset management approach mandated as part of MAP 21 and the FAST Act to manage the National Highway System. According to a [PennDOT fact sheet](#), lowest life-cycle cost “is a process designed to maximize the life of an asset at the lowest cost through a risk-based prioritization of preservation, rehabilitation, and reconstruction. It promotes the right treatment at the right time with an emphasis on preservation rather than focusing too heavily on assets in poor condition (e.g., worst-first).” The intent is to save money by investing in timely maintenance in order to delay or prevent the need for more costly reconstruction projects.

PennDOT's 2019 Transportation Asset Management Plan (TAMP) commits Pennsylvania to transitioning to an LLCC asset management approach. PennDOT's Pavement Asset Management System (PAMS) and Bridge Asset Management System (BAMS) are tools developed over recent years to support project prioritization. MPOs and RPOs in coordination with their PennDOT District representative review candidate project lists generated by PAMS and BAMS and use their local knowledge and professional judgment to refine those lists to extend the life of bridges and pavement and optimize the use of increasingly limited funds. PAMS and BAMS continue to be upgraded to better support LLCC project prioritization and to be directly usable by MPOs and RPOs. PennDOT and the CCMPO are committed to transitioning to LLCC-based project prioritization going forward.

PennDOT's asset management focus is currently the NHS system, which is subject to federal condition thresholds. However, PennDOT and the CCMPO acknowledge that prioritizing limited funding to maintaining NHS facilities will come at the expense of the rest of the highway network, which is also essential. The CCMPO understands that in the short term a balance will need to be struck to maintain the entire network until more direction is provided either by reauthorization of the federal transportation bill or additional direction provided by PennDOT or FHWA.

PM-3: System Performance Measures

The PM-3 system performance measures that are applicable to Centre County are focused on travel time reliability and apply only to roadways on the NHS. PennDOT identified and evaluated data and tools used to produce the baseline PM-3 performance measures. Because there is limited historical information and there is a need for additional research to understand the variances and factors influencing the travel time performance measures, PennDOT's travel time performance targets are conservative and may be more appropriately referred to as benchmarks.

Within Centre County, PM-3 performance measures include:

- Percentage of person-miles traveled on the Interstate System that are reliable
- Percentage of person-miles traveled on the non-Interstate NHS that are reliable

Level of Travel Time Reliability (LOTTR) is defined as the ratio of the 80th percentile travel time of a reporting segment to a "normal" travel time (50th percentile), using data from FHWA's free National Performance Management Research Data Set (NPMRDS) or equivalent. Data are collected in 15-minute segments during all time periods other than 8 p.m.-6 a.m. local time. The measures are the percentage of person-miles traveled on the relevant NHS areas that are reliable.

- Truck Travel Time Reliability Index – Interstate System only

Truck Travel Time Reliability (TTTR) Index. Reporting is divided into five periods: morning peak (6-10 a.m.), midday (10 a.m.-4 p.m.) and afternoon peak (4-8 p.m.) Mondays through Fridays; weekends (6 a.m.-8 p.m.); and overnights for all days (8 p.m.-6 a.m.). The TTTR ratio will be generated by dividing the 95th percentile time by the normal time (50th percentile) for each segment. Then, the TTTR Index will be generated by multiplying each segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of Interstate.

PennDOT's targets, which were formally supported by the CCMPO, are illustrated in the following table.

Table 16: System Reliability Measures (PM-3)

Performance Measure	2017 Baseline*	2019 Target	2021 Target
Interstate Reliability	89.8%	89.8%	89.8%
NHS Non-Interstate Reliability	87.4%	n/a	87.4%
Truck Reliability Index	1.34	1.34	1.34

*Estimated using RITIS data extract from May 8, 2018

PennDOT has been tracking the measures since 2018. States are permitted to adjust their four-year targets at the midterm of the performance period, representing data through 2019 in a report due to FHWA by October 1, 2020. More information about the travel time reliability performance of the NHS in Centre County is anticipated to become available at that time.

The LRTP project list includes one project on an Interstate NHS route that is expected to result in significant improvements in travel time reliability. The I-80/I-99 High Speed Interchange (Exit 161) project, which is being advanced through PennDOT's statewide Interstate Management (IM) TIP, will significantly reduce travel delay on I-99 northbound approaching I-80 Exit 161, and on I-80 eastbound and westbound approaching Exit 161. Approximately \$127 million is allocated for this project, which is scheduled to be completed in late 2025 or early 2026.

The project list in the plan also includes the preliminary engineering (PE) and final design phases of the State College Area Connector (SCAC) project, which is in the general area of the Route 322/144/45 corridors in southcentral Centre County. There are existing and projected needs associated with safety and travel time performance on corridors in this area. Both Route 322 and Route 144 are NHS routes. No specific alternative improvements have been developed for the SCAC project at this time. The commitment of funding for the PE phase will result in the documentation of a specific "purpose and need" statement(s) for the project, and the development and evaluation of an alternative improvement(s). The commitment of funds for the preliminary

engineering work may lead to the future investment of federal and state funds that contribute to meeting the PM-3 performance measure targets established by PennDOT and the CCMPO.

Other projects on NHS routes are included on the project list. Although these projects are primarily focused on safety and asset management, there is traffic signal upgrade project on SR 3014 Business Route 322 (Atherton Street), a non-Interstate NHS route, that would be focused on improving travel time reliability. In addition, the SR 3014 Section 153 and Section 154 drainage and pavement restoration projects may include traffic signal upgrades that will help address congestion resulting from special events and incidents, resulting in improved travel time reliability.

Transit Performance Measures

Both the Centre Area Transportation Authority (CATA) and the Centre County Office of Transportation Services (CCOT) are in full compliance with federal transit asset management (TAM) performance measure requirements. CATA has elected to prepare and update its own individual TAM plan on an annual basis, while the CCOT participates in a group plan under the auspices of the PennDOT Bureau of Public Transportation.

Both TAM-related performance measures and other performance metrics help to answer LRTP key questions – including those related to state of good repair, capacity, and mix of modes – support the several goals of the LRTP, and provide a mechanism by which to gauge the effectiveness of transit investment decisions and operational actions. An assessment of transit performance trends in several critical areas is shown below in Table 17.

Table 17: Transit Performance Measures

LRTP Key Questions	LRTP Goals								Performance Measures	Performance Values	
	1	2	3	4	5	6	7	8		2015	2019
2. Is the Centre County transportation system in a <u>state of good repair</u> ?		X							Average Fleet Age (CATA - Fixed Route)	7.0	10.0
									Average Fleet Age (CATA - Demand Responsive)	3.0	5.0
									Average Fleet Age (CATA - Vanpool)	5.1	5.2
									Average Fleet Age (CCOT)	3.5	4.0
									Asset Condition (CATA - Scale of 1 to 5)		3.9
									Asset Condition (CCOT - Scale of 1 to 5)		3.5
3. Does the Centre County transportation system have adequate <u>capacity</u> ?			X		X				Average Load Factor (CATA - Fixed Route)	10.2	9.5
									Average Load Factor (CATA - Demand Responsive)	1.0	0.9
									Average Load Factor (CATA - Vanpool)	8.2	8.1
									Average Load Factor (CCOT)	3.7	4.5
									Fleet Size (CATA - Fixed Route)	59	71
									Fleet Size (CATA - Demand Responsive)	9	11
									Fleet Size (CATA - Vanpool)	45	46
									Fleet Size (CCOT)	28	32
									Spare Ratio (CATA - Fixed Route)	0.0%	12.7%
									Spare Ratio (CATA - Demand Responsive)	0.0%	9.1%
								Spare Ratio (CATA - Vanpool)	0.0%	17.4%	
								Spare Ratio (CCOT)	21.7%	21.9%	
4. Does the Centre County transportation system have an <u>adequate mix of modes</u> ?				X	X				Average Daily Trips (CATA - Fixed Route)	25,434	22,502
									Average Daily Trips (CATA - Demand Responsive)	126	113
									Average Daily Trips (CATA - Vanpool)	728	569
									Average Daily Trips (CCOT)	295	215
									Number of Dedicated Park-and-Ride Spaces (Countywide)	0	0

The transit performance values for both 2015 and 2019 yield the following key findings:

- Average fleet age has risen slightly for all modes across both agencies, but – with the exception of the CATA vanpool fleet – is still well below the expected useful life in years for each vehicle type. Investments in replacement vehicles over the life of the LRTP are expected to bring or to keep these fleet ages down within an acceptable range.
- Data with respect to other capital assets for both agencies is only available for 2019, but indicates that – on balance – these assets are currently in better-than-average condition. Federal TAM requirements will help to ensure that asset condition continues to be periodically tracked over time.
- CATA's load factors have decreased a bit over time – owing at least in part to a decrease in ridership – while the CCOT's have risen slightly.
- By making prudent vehicle investments, both agencies have been successful in increasing both fleet size and spare ratio. FTA suggests a spare ratio of about 20% to protect service integrity against breakdowns and other incidents, and to allow vehicles to be pulled out of service for preventive maintenance. The CCOT meets spare ratio guidelines, while CATA has made especially notable progress towards meeting them.
- Centre County currently has no dedicated park-and-ride spaces, but two LRTP projects are intended to help address that need.

Additional information about transit safety performance measures is anticipated to become available in fall 2020. The next LRTP update will incorporate the latest information about transit safety performance measures.