6.0 | The Existing Transportation System

PLANNING FOR THE FUTURE TRANSPORTATION SYSTEM AND ITS IMPROVEMENTS BEGINS WITH EVALUATING THE EXISTING TRANSPORTATION SYSTEM.

This chapter identifies the conditions and characteristics of the existing transportation system.

6.1 | Roadways and Bridges

The region's roadways and bridges are used by personal motor vehicles, public and private transportation providers, bicyclists, and freight trucks. This places great importance on the region's roadways and bridges.

For households in smaller urbanized areas, like Clarksville, traveling by motor vehicle is the primary means of transportation.

This means that the condition of the MPO's roadways and bridges affect the overwhelming majority of household travel. The needs of bicyclists, public transit, and freight will also be discussed in greater detail later in this chapter.

BASED ON THE 2016 ACS 5-YEAR ESTIMATES, THIS METHOD OF TRAVEL ACCOUNTS FOR OVER 91 PERCENT OF COMMUTING WITHIN THE MPA'S TWO COUNTIES.

THE ROADWAY NETWORK

Several federal and state highways serve the study area and constitute its main roadway network. The most significant of these facilities are described in Table 6.1.

TABLE 6.1 MAJOR ROADWAYS

ROADWAY	DESCRIPTION
I-24	I-24 begins at an intersection I-75 in Chattanooga, TN and travels northwest to I-57 near Pulleys Mill, IL. It travels through the study area from southeast to northwest on the northern side of the study area.
US 41A	US 41A proceeds from southeast to northwest through the study area and is an alternate route to US 41. This highway begins in Nashville, TN and ends in Hopkinsville, KY.
US 79	US 79 begins at an I-35 in Round Rock, TX and travels north to US 68 in Russellville, KY. It travels through the study area from southwest to northeast on the northern side of the study area
TN 12	TN 12 begins in Nashville at its intersection with US 41 and proceeds through the study area from southeast to northwest, ending at the Kentucky State Line. This route runs concurrently with a portion of US 41A in the study area.
TN 13	TN 13 begins at the Alabama State Line at the end of AL 17 and proceeds through the study area from southwest to northeast, ending at the Kentucky State Line. This route runs concurrently with portions of US 41A and US 79 in the study area.
TN 48	TN 48 begins at TN 13 in Wayne Country and travels from south to north through the study area to its end at the Kentucky State Line.

Roadways by Functional Classification

Each type of roadway serves a function in the overall roadway network. Roadways are divided into functional classes based on their intended balance of mobility (speed) and access to adjacent land. Their designs vary in accordance with this functional classification.

Interstates: Interstates are the highest classification of Arterials and were designed and constructed with mobility and long-distance travel in mind. These facilities are divided highways with full control of access and grade separations at all intersections. The controlled access character of interstates results in high-lane capacities, which are three times greater than the individual lane capacities of urban arterial streets.

Other Freeways and Expressways: These roadways have directional travel lanes, and are usually separated by some type of physical barrier. Usually, their access and egress points are limited to on- and off-ramp locations, or a very limited number of at-grade intersections. This category of roadway is designed and constructed to maximize their mobility function, and abutting land uses are not directly served by them.

Arterials: These facilities are important components of the overall transportation system. They serve as feeders to interstates and expressways, and as principal travel ways between major land use concentrations within the MPA. Arterials are typically divided facilities (undivided where right-of-way limitations exist) with relatively high traffic volumes and traffic signals at major intersections. The primary function of arterials is to move traffic; they are the main means of local travel. A secondary function of arterials is land access. Principal Arterials often serve major centers of metropolitan areas and longer trips. Minor Arterials provide service for trips of moderate length and are often smaller facilities. Minor Arterials also offer connectivity to the higher Arterial system.

Collectors: These facilities provide both land service and traffic movement functions. Collectors serve as intermediate feeders between arterials and local streets and primarily accommodate short distance trips. Since collector streets are not intended to accommodate long through trips, they are generally not continuous for any great length. Generally, Major Collector routes are longer, have lower driveway densities, higher speed limits, and larger traffic volumes than Minor Collectors.

Local Streets: The sole function of these facilities is to provide access to immediately adjacent land. Within the local street classification, three subclasses are established to indicate the type of area served: residential, industrial, and commercial. These streets are not included in the computer network, except those that provide connectivity in the model network and improve the reliability of the model.

More information, including how urban and rural facilities differ from each other, can be found at: https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section03.cfm

Figure 6.1 illustrates the functional classification of the Clarksville MPA's roadways. Table 6.2 summarizes this information by centerline miles and lane miles.

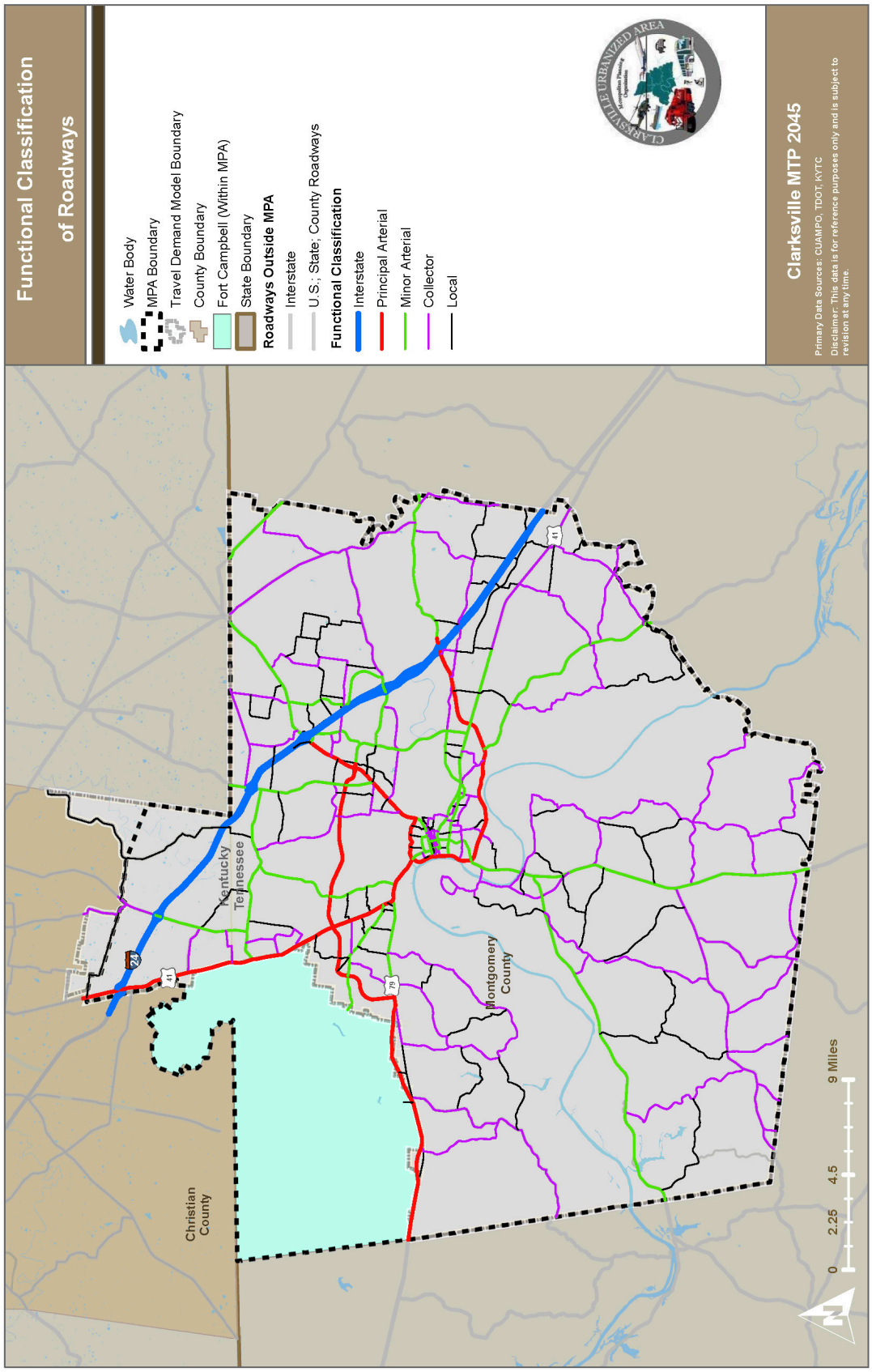


FIGURE 6.1 FUNCTIONAL CLASSIFICATION OF ROADWAYS

Table 6.2 Roadway Model Network Lane Mileage by Functional Class

Functional Class	Centerline Miles		Lane Miles	
	Miles	Percent	Miles	Percent
Interstate	25.6	6.11%	103.8	9.59%
Principal Arterial	54.5	13.01%	229.8	21.22%
Minor Arterial	115.7	27.63%	298.2	27.54%
Collector	223.0	53.25%	451.1	41.66%
Total	**418.8**	**100.00%**	**1082.9**	**100.00%**

Note: Does not include local roads

Source: Clarksville Regional Travel Demand Model

Roadways by Maintenance Responsibility

Within the MPA, excluding Fort Campbell, just over 55 percent of roadways in the model network are maintained by state agencies. These results are shown in Table 6.3 and illustrated in Figure 6.2. All of the principal arterials and many of the minor arterials are state or federal highways and are state-maintained roadways. The majority of the roadways classified functionally as local are maintained by a county or municipal agency. Most collectors within the MPA are also maintained by a county or municipal agency.

Table 6.3 Roadway Network Centerline Mileage by Maintenance Responsibility

Functional Class	Centerline Miles		Lane Miles	
	Miles	Percent	Miles	Percent
State	243.7	55.4%	710.5	62.7%
County or Municipality	196.0	44.6%	422.7	37.3%
Total	**439.7**	**100.0%**	**1,133.2**	**100.0%**

Note: Excludes local roads

Source: Clarksville Regional Travel Demand Model, HPMS

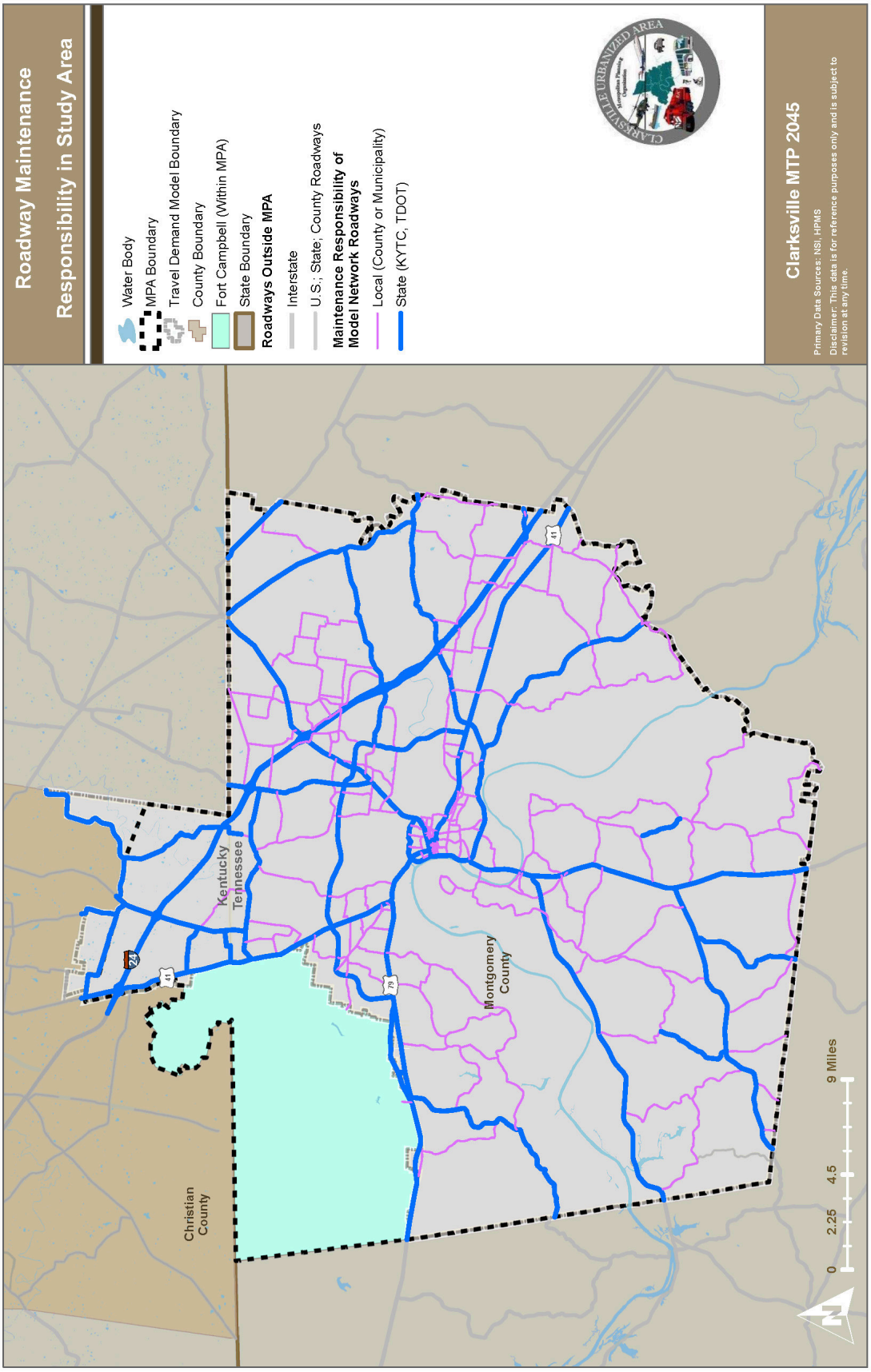


FIGURE 6.2 ROADWAY MAINTENANCE RESPONSIBILITY IN MPA

Pavement Conditions

Maintaining sufficient pavement conditions ensures that roadways operate at their full capacity. Good pavement conditions provide roadway users with safe, comfortable travel experiences, while minimizing vehicle wear and tear.

Roadway projects that improve or maintain pavement conditions help to maintain roadway safety, one of the project scoring criteria discussed in Chapter 10.

Results from the public participation survey showed that road and bridge conditions were one of the public's top priorities. In a funding allocation exercise where the public was asked to allocate future transportation dollars by improvement type, the public allocated about 30 percent of all funding to maintaining roads through regular maintenance or due to safety concerns with the current roadway surfaces. On average, the public rated their current satisfaction with road and bridge conditions as fair to poor.

Pavement Conditions on National Highway System

Pavement condition ratings for the **MPA's** roadways were obtained from data submitted by KYTC and TDOT to the FHWA. This data is found in the Highway Performance Monitoring System (HPMS). The HPMS is a national level highway information system that includes data on the:

- extent,
- condition,
- performance, and
- use and operating characteristics of the nation's highways.

The HPMS data is sample dataset that is collected across the entire federal-aid eligible system for interstate, arterial, and collector networks. The pavement condition in the HPMS is based on the International Roughness Index (IRI), cracking, rutting, and faulting. The monitoring of pavement condition performance is a requirement of the FAST Act. All pavements on the Interstate or NHS will be classified as either in good, fair, or poor condition.

THE PERFORMANCE MEASURES ESTABLISHED BY THE FHWA ARE:

- Percentage of pavements of the Interstate System in Good condition
- Percentage of pavements of the Interstate System in in Poor condition
- Percentage of pavements of the non-Interstate NHS in Good condition
- Percentage of pavements of the non-Interstate NHS in Poor condition

Table 6.4 shows the percentage of the Clarksville MPA's Interstate and NHS roadways that are currently in good, fair, or poor condition based on the HPMS data available. The data was provided in roadway increments that are one-tenth of a mile long.

ALL OF THE INTERSTATE ROADWAYS IN THE MPA ARE IN FAIR CONDITION OR BETTER.

LESS THAN ONE PERCENT OF THE NON-INTERSTATE NHS ROADWAYS IN THE MPA ARE IN POOR CONDITION.

Figure 6.3 displays the available pavement condition data for the MPA. The figure shows that the worst pavement conditions are on US 79 from McClure Street to Rossview Road. Conditions on US 41A from US 79 to the Tennessee/Kentucky State Line should also be monitored.

Table 6.4 Pavement Condition for Roadways

Pavement Condition	Interstate NHS Routes			Non-Interstate NHS Routes		
	MPA Percent	TN Baseline Percent	KY Baseline Percent*	MPA Percent	TN Baseline Percent	KY Baseline Percent
Good	98.80%	75.60%	66.20%	53.40%	44.80%	78.90%
Fair	1.20%	24.26%	33.80%	46.20%	51.96%	16.80%
Poor	0.00%	0.14%	0.00%	0.40%	3.24%	4.30%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**
*Note- Kentucky Baseline values were unavailable at the time of the report.						

Source: KYTC, TDOT

Pavement Condition Targets

The pavement condition performance measures were finalized by the FHWA with an effective date of May 20, 2017. This requires the states to set their targets by May 20, 2018 and report them to the FHWA in the Baseline Performance Period Report by October 1, 2018. These targets are to be reported every 4 years afterwards. Each state is required to establish 2-year and 4-year targets for non-Interstate NHS routes, and 4-year targets for Interstate routes for the first performance period (2018-2022). The CUAMPO may either support the targets established by KYTC and TDOT or establish their own. The MPO is required to establish 4-year targets for both non-Interstate NHS and Interstate routes. For the 2045 MTP, the CUAMPO has chosen to support the state targets established by KYTC and TDOT. Table 6.5 displays the TDOT and KYTC 2-year and 4-year pavement condition targets.

Table 6.5 TDOT and KYTC Pavement Condition Targets

Percent of Pavement Condition	Interstate NHS Routes		Non-Interstate NHS Routes	
	2-year Target	4-year Target	2-year Target	4-year Target
Tennessee				
Good	N/A	60.0%	42.0%	40.0%
Poor	N/A	1.0%	4.0%	4.0%
Kentucky				
Good	N/A	50.0%	35.0%	35.0%
Poor	N/A	3.0%	6.0%	6.0%

Source: KYTC, TDOT

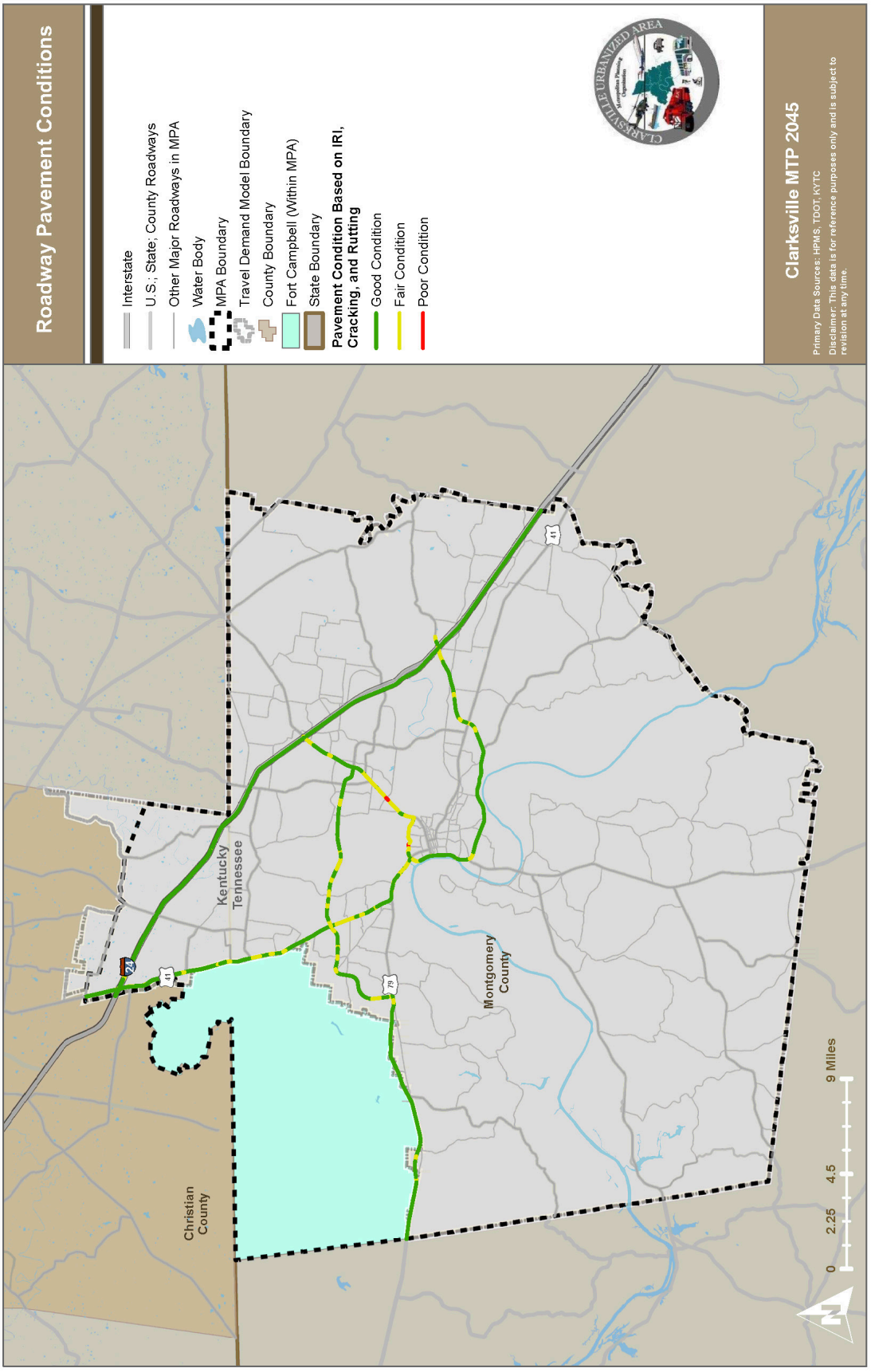


FIGURE 6.3 ROADWAY PAVEMENT CONDITIONS

Bridge Conditions

Bridges are a critical part of the overall transportation network. They serve as important connections over waterways, provide grade separation between roadways and other transportation facilities, and connect transportation facilities to each other. Bridges must be maintained and upgraded as needed in order to ensure that they are not safety or environmental hazards, bottlenecks, or limitations to freight movement.

As previously mentioned, results from the public outreach survey showed that the public places a high priority on maintaining the current transportation system and increasing its safety. In a funding allocation exercise where the public was asked to allocate future transportation dollars by improvement type, the public allocated 13 percent of all funding to maintaining roads, which includes bridges. A further 17 percent was allocated to project types that would increase roadway safety through wider lanes and shoulders. This indicates the need to maintain roadways that are necessary, but include safety issues that outweigh maintenance needs at this time. On average, the public rated their current satisfaction with road and bridge conditions as fair to poor.

There are nearly 200 bridges within, or in close proximity, to the Clarksville MPA.

Most of these cross waterways. However, there are many structures crossing over other roadways and railroads. One bridge in the MPA, the Port Royal Road Bridge, is listed on the NRHP.

Bridge Conditions and Scoring

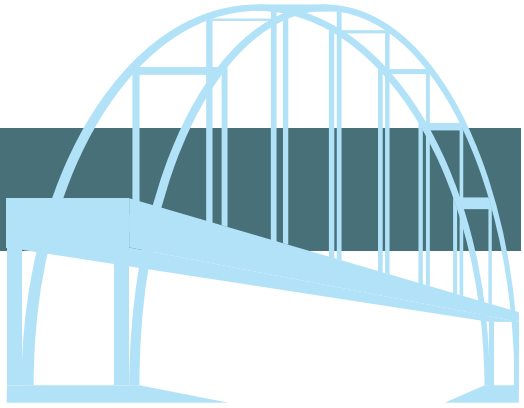
The National Bridge Inventory (NBI) provides bridge conditions for all bridges in the United States with public roads passing above or below them. This source also defines bridges to include bridge-length culverts. The FAST Act requires the performance monitoring of bridge conditions by the states and MPOs.

THE PERFORMANCE MEASURES ESTABLISHED BY THE FHWA ARE:

The percentage of NHS bridges classified as being in good condition.

The percentage of NHS bridges classified as being in poor condition.

The condition of the bridge is determined by the lowest rating of deck, superstructure, substructure, or culvert. If the lowest rating of these categories is greater than or equal to seven (7), the bridge is classified as good. If the score of the bridge is less than or equal to four (4), the classification is poor.



THERE ARE 16 BRIDGES IN THE CLARKSVILLE MPA THAT ARE DEFINED AS POOR BY THE FHWA STANDARDS.

Table 6.6 displays the available bridge condition data for the MPA. All of the bridges on the NHS system in the MPA are in fair or good condition.

Figure 6.4 shows the locations of the bridges within the MPA, except for Fort Campbell, and their condition. None of the bridges in poor condition are on NHS routes.

TABLE 6.6 BRIDGES BY CONDITION

Pavement Condition	NHS Bridges			Non-NHS Bridges		
	MPA Percent	TN Baseline Percent	KY Baseline Percent*	MPA Percent	TN Baseline Percent	KY Baseline Percent
Good	57.90%	39.50%	34.80%	37.50%	N/A	N/A
Fair	42.10%	55.60%	61.40%	51.50%	N/A	N/A
Poor	0.00%	4.90%	3.80%	11.00%	N/A	N/A
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**0.00%**	**0.00%**

Source: KYTC, TDOT, National Bridge Inventory

Structurally Deficient and Functionally Obsolete Bridges

All bridges that were constructed more than ten (10) years ago are evaluated to determine if they are either "structurally deficient" or "functionally obsolete." However, neither of these designations necessarily means that a bridge is unsafe.

Structural deficiency is characterized by deteriorated conditions of significant bridge elements and potentially reduced load-carrying capacity. A structurally deficient bridge typically requires significant maintenance and repair to remain in service. These bridges would eventually require major rehabilitation or replacement to address the underlying deficiency.

A bridge is considered functionally obsolete when it does not meet current design standards (for criteria such as lane width). This can occur when either the volume of traffic carried by the bridge exceeds the level anticipated when the bridge was constructed and/or the relevant design standards have been revised. Addressing functional obsolescence may require the widening or replacement of the structure.

There are 15 structurally deficient bridges in the Clarksville MPA, none of which are on the NHS. There are also an additional 10 functionally obsolete bridges in the MPA, none of which are on the NHS.

In addition to the two bridge condition performance measures which MPOs must track, all states must ensure that no more than ten (10) percent of the total deck area of NHS bridges in the state is classified as structurally deficient.

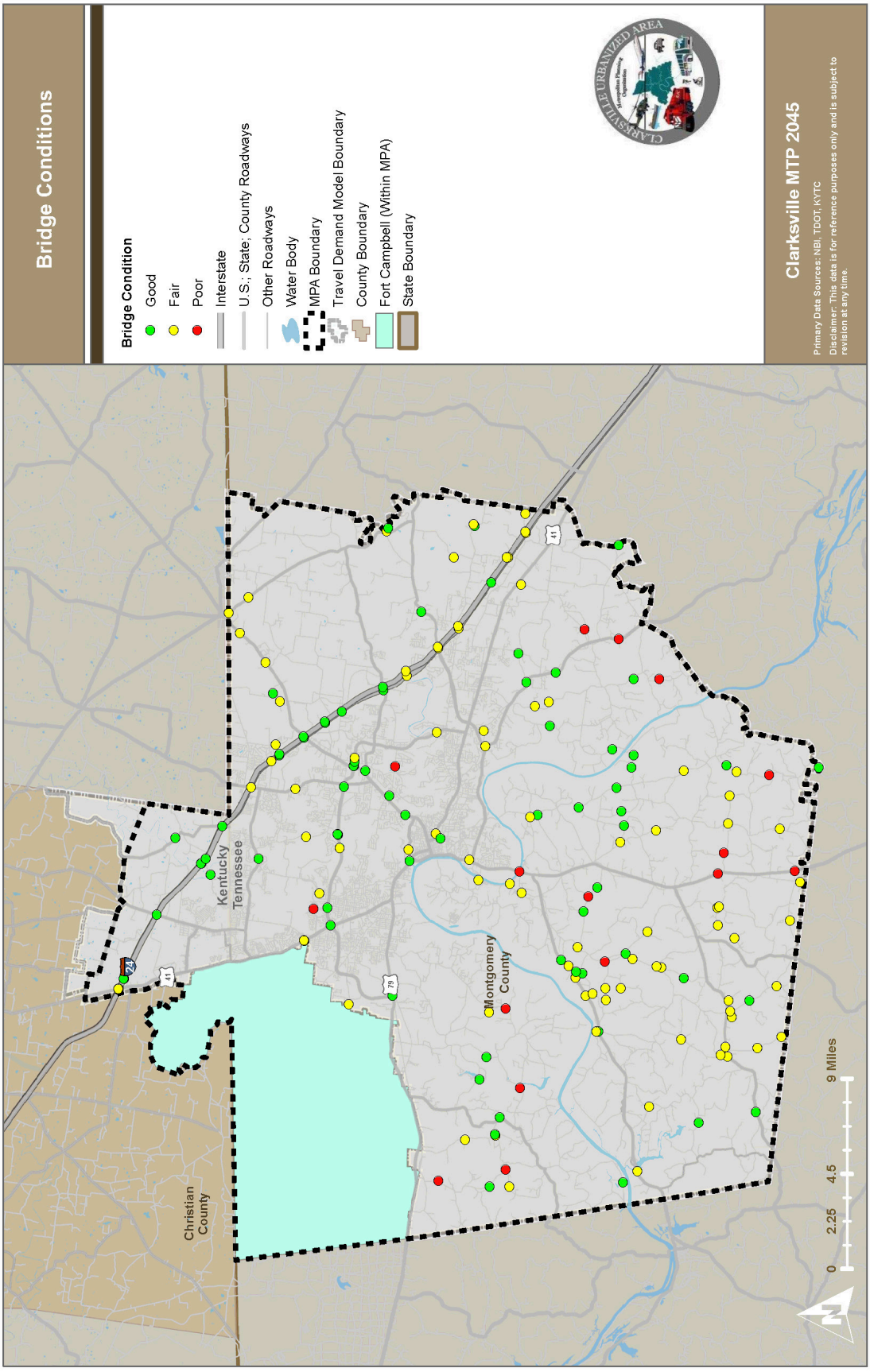


FIGURE 6.4 BRIDGE CONDITIONS

Bridge Condition Targets

Like the pavement condition performance measures, the bridge condition performance measures were finalized by the FHWA with an effective date of May 20, 2017. This requires the states to set their targets by May 20, 2018, and report them to the FHWA in the Baseline Performance Period Report by October 1, 2018. These targets are to be reported every 4 years afterwards. Each state is required to establish 2-year and 4-year targets. The MPO may either support the targets established by KYTC and TDOT or establish their own. The MPO is required to establish 4-year targets for the bridge performance measures. For the 2045 MTP, the CUAMPO has chosen to support the state targets established by KYTC and TDOT. Table 6.7 displays the TDOT and KYTC 2-year and 4-year bridge condition targets.

TABLE 6.7 TDOT AND KYTC BRIDGE CONDITION TARGETS

PERCENT OF BRIDGE CONDITION	NHS ROUTES	
	2-YEAR TARGET	4-YEAR TARGET
Tennessee		
Good	36.0%	36.0%
Poor	6.0%	6.0%
Kentucky		
Good	35.0%	35.0%
Poor	3.7%	3.2%

Source: KYTC, TDOT

Level of Service (LOS) Analysis

The HCM defines the concept of LOS as a qualitative measure describing operational conditions within a traffic stream for a specific time period. These conditions are generally described in terms of factors such as:

- speed and travel time
- freedom to maneuver
- traffic interruptions
- comfort
- convenience
- safety

Six (6) levels of service have been defined for each type of facility, and given letter designations, from A to F. Level of service A represents the best operating conditions, while level of service F represents the worst operating conditions. For urban areas such as the Clarksville MPA, the goal of many state and local governments is to reach an overall level of service D. The CUAMPO has adopted this goal. Figure 6.5 displays the different LOS categories and provides a brief description of each.

The LOS is often determined based on the volume-to-capacity ratio (V/C) of a roadway. The V/C is the relationship of the roadway's volume compared to its maximum capacity. Roadway capacities are a function of several factors, including roadway functional classification, number of lanes, travel speeds, and percent of truck traffic. Table 6.8 displays the V/C thresholds based on roadway functional classification and location.

Table 6.8 V/C Ratios by Functional Classification

Urban					
Level of Service	Interstates	Principal Arterials	Minor Arterials	Collectors	Local
A	0.30	0.30	0.30	0.30	0.30
B	0.50	0.50	0.50	0.50	0.50
C	0.70	0.70	0.70	0.65	0.65
D	0.90	0.85	0.85	0.80	0.80
E	1.00	1.00	1.00	1.00	1.00
F	>1.00	>1.00	>1.00	>1.00	>1.00

Rural						
Level of Service	Interstates	Principal Arterials	Minor Arterials	Major Collectors	Minor Collectors	Local
A	0.30	0.30	0.30	0.35	0.35	0.35
B	0.45	0.50	0.50	0.55	0.55	0.55
C	0.70	0.70	0.70	0.75	0.75	0.75
D	0.90	0.85	0.85	0.85	0.85	0.85
E	1.00	1.00	1.00	1.00	1.00	1.00
F	>1.00	>1.00	>1.00	>1.00	>1.00	>1.00

FIGURE 6.5 LEVEL OF SERVICE

	**A**	Free flow operations. Vehicles are almost completely unimpeded in their ability to maneuver with the traffic stream. The general level of physical and psychological comfort provided to the driver is high.
	**B**	Reasonable free flow operations. The ability to maneuver with the traffic stream is only slightly restricted and the general level of physical and psychological comfort provided to the driver is high.
	**C**	Flow with speeds at or near free flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more vigilance on the part of the driver. The driver notices an increase in tension.
	**D**	Speeds decline with increasing traffic. Freedom to maneuver within the traffic stream is more noticeably limited. The driver experiences reduced physical and psychological comfort levels.
	**E**	At lower boundary, the facility is at capacity. Operations are volatile because there are virtually no gaps in the traffic stream. There is little room to maneuver. The driver experiences poor levels of physical and psychological comfort.
	**F**	Breakdowns in traffic flow. The number of vehicles entering the highway section exceeds the capacity or ability of the highway to accommodate that number of vehicles. There is little room to maneuver. The driver experiences poor levels of physical and psychological comfort.

Traffic, Congestion, and Reliability

The number of daily trips estimated by the Travel Demand Model, by trip purpose, in 2016 is summarized in Table 6.9. Nearly seven (7) percent of vehicle trips pass through the MPA. Internal commercial and freight vehicle trips (e.g., truck, taxi, etc.) account for about one in seven vehicle trips. The majority of vehicle trips in the MPA (57 percent) begin or end at home.

Table 6.9 Daily Vehicle Trips by Purpose, 2016

Trip Purpose	Vehicle Trips	Percent
Home-Based Work	111,652	21.16%
Home-Based Other	190,402	36.09%
Non-Home Based	113,353	21.48%
Commercial Vehicle	63,214	11.98%
Freight	12,366	2.34%
External-External	36,673	6.95%
Total	**527,659**	**100.00%**

Source: Clarksville Travel Demand Model, NSI

Table 6.10 shows how these trips are distributed onto the modeled transportation network. Most of the delay (nearly 61 percent) is estimated to occur on the principal and minor arterials. This coincides with where the most vehicle miles traveled and vehicle hours travelled occur. There is comparatively little delay estimated to occur on collectors. This is in large part due to travel on these roadways accounting for only 12 percent of vehicle miles traveled and 13 percent of vehicle hours traveled.

Table 6.10 Roadway System Travel Characteristics, 2016

	Daily Vehicle Miles Traveled (VMT)		Daily Vehicle Hours Traveled (VHT)		Daily Vehicle Hours Per Day (VHD)	
Functional Class	Number	Percent	Number	Percent	Number	Percent
Interstate	1,210,751	28.35%	33,294	24.48%	13,832	29.61%
Principal Arterial	1,258,285	29.46%	40,998	30.15%	14,181	30.36%
Minor Arterial	1,272,585	29.80%	43,326	31.86%	14,131	30.25%
Collector	528,892	12.38%	18,375	13.51%	4,564	9.77%
Total	**4,270,513**	**100.00%**	**135,993**	**100.00%**	**46,708**	**100.00%**

Source: Clarksville Travel Demand Model, NSI

Figure 6.6 confirms that vehicular traffic in the Clarksville MPA is greatest on I-24, US 41A, and US 79/SR-13, and SR-374 from US 41A to US 79. These areas have estimated average daily volumes exceeding 30,000 vehicles.

Figure 6.7 shows the LOS for the major roadways in the Clarksville MPA. Currently, there are 20 roadway segments in the MPA (summarized in Table 6.11) that experience a LOS of F. Most of these segments are near the intersections of roadways and/or at interstate interchanges with high traffic volumes. This suggests that peak period congestion is currently an issue in the Clarksville MPA.

Table 6.11 Roadway Corridors with Volumes Exceeding Capacity, 2016

Roadway	From/To	Length (miles)
US 41A/US 79	0.30 miles west of Peacher's Mill Road to US 79/Kraft Street	1.50
US 41A/Madison Street	10th Street to 0.23 miles east	0.23
US 41A Bypass	Old Ashland City Road to SR-12	0.45
US 79/SR-13	Kraft Street to Old Trenton Road	0.73
US 79/SR-13	I-24 Ramps	0.27
US 79/SR-13	Jim Johnson Rd to 1.63 miles east	1.63
SR-13/SR-48	Old Hwy 48 to US 41A Bypass	4.93
SR-374/Richview Road	0.38 miles west of Ted Crozier Boulevard to SR-237	1.00
SR-374/Richview Road	0.32 miles north of Dunbar Cave Road to Memorial Drive	2.32
SR-48/Trenton Road	Needmore Road to 0.99 miles north	0.99
SR-48/Trenton Road	SR-236 to SR-249	0.62
SR-236/Tiny Town Road	Peacher's Mill Road to Needmore Road	0.69
Hornerger Lane	Franklin Street to SR-48	0.10
Zinc Plant Road	Briarwood Road to SR-13	0.97
Peacher's Mill Road	0.12 miles south of SR-374 to 0.56 miles south of SR-374	0.44
Needmore Lane	SR-48 to US 79	0.95
Old Trenton Road	W Dunbar Cave Road to Whitfield Road	0.39
Whitmore Road	0.25 miles south of SR-374 to Needmore Road	0.47
Dunbar Cave Road	US 79 to 0.32 miles east	0.32
Dunlop Lane	Ted Crozier Boulevard to International Boulevard	1.03

Source: Clarksville Travel Demand Model, NSI

While most of the region's roadways do not have daily volumes that exceed their daily capacities, there may still be congestion issues at specific times, notably peak periods. Travel time reliability addresses this issue by evaluating how travel times vary by time of day. For the purposes of the MTP, the travel time reliability analysis focused on peak periods. Reliability issues related to traffic incidents, construction, special events, or other events would require a more detailed analysis.

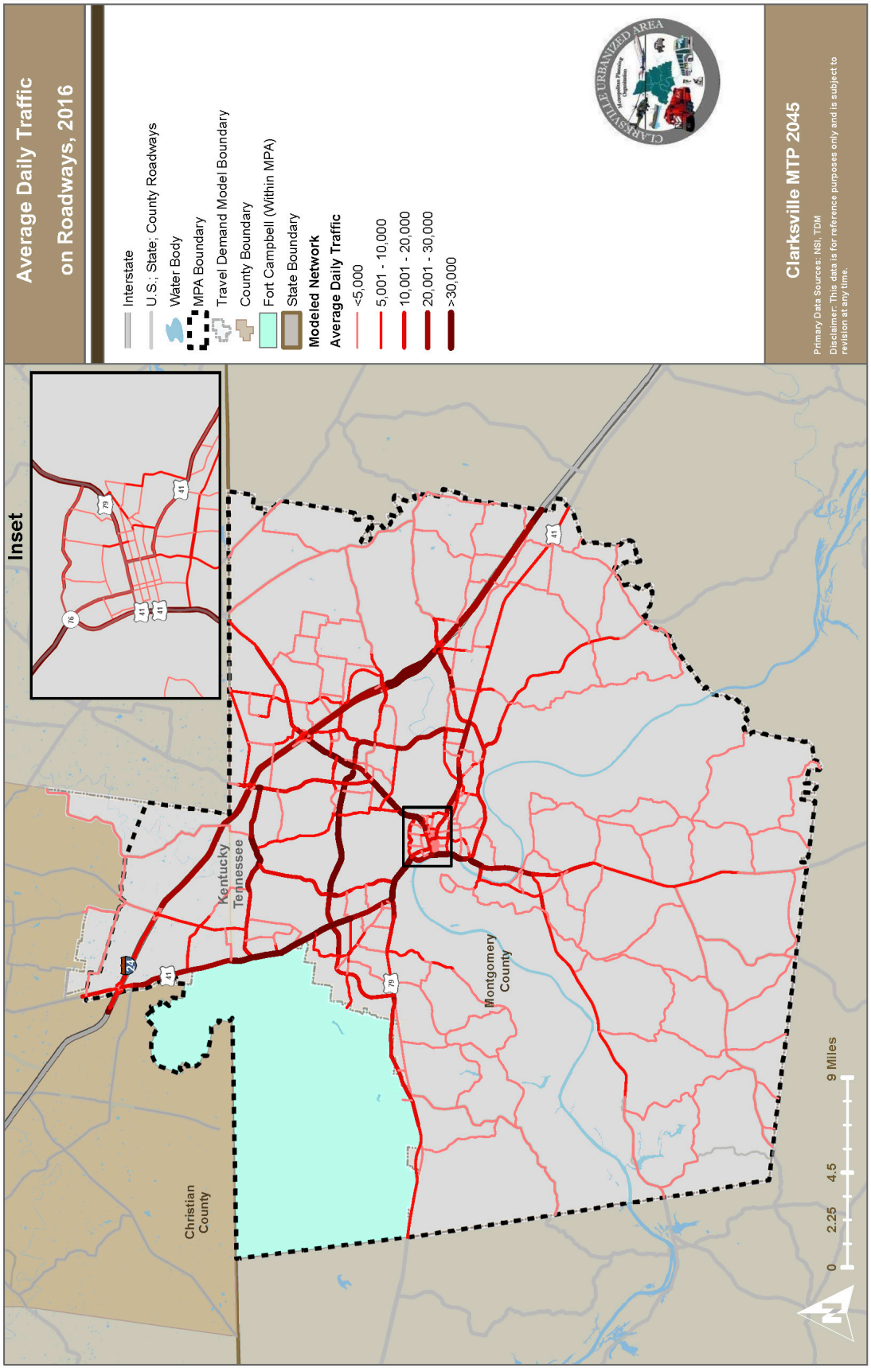


FIGURE 6.6 AVERAGE DAILY TRAFFIC ON ROADWAYS, 2016

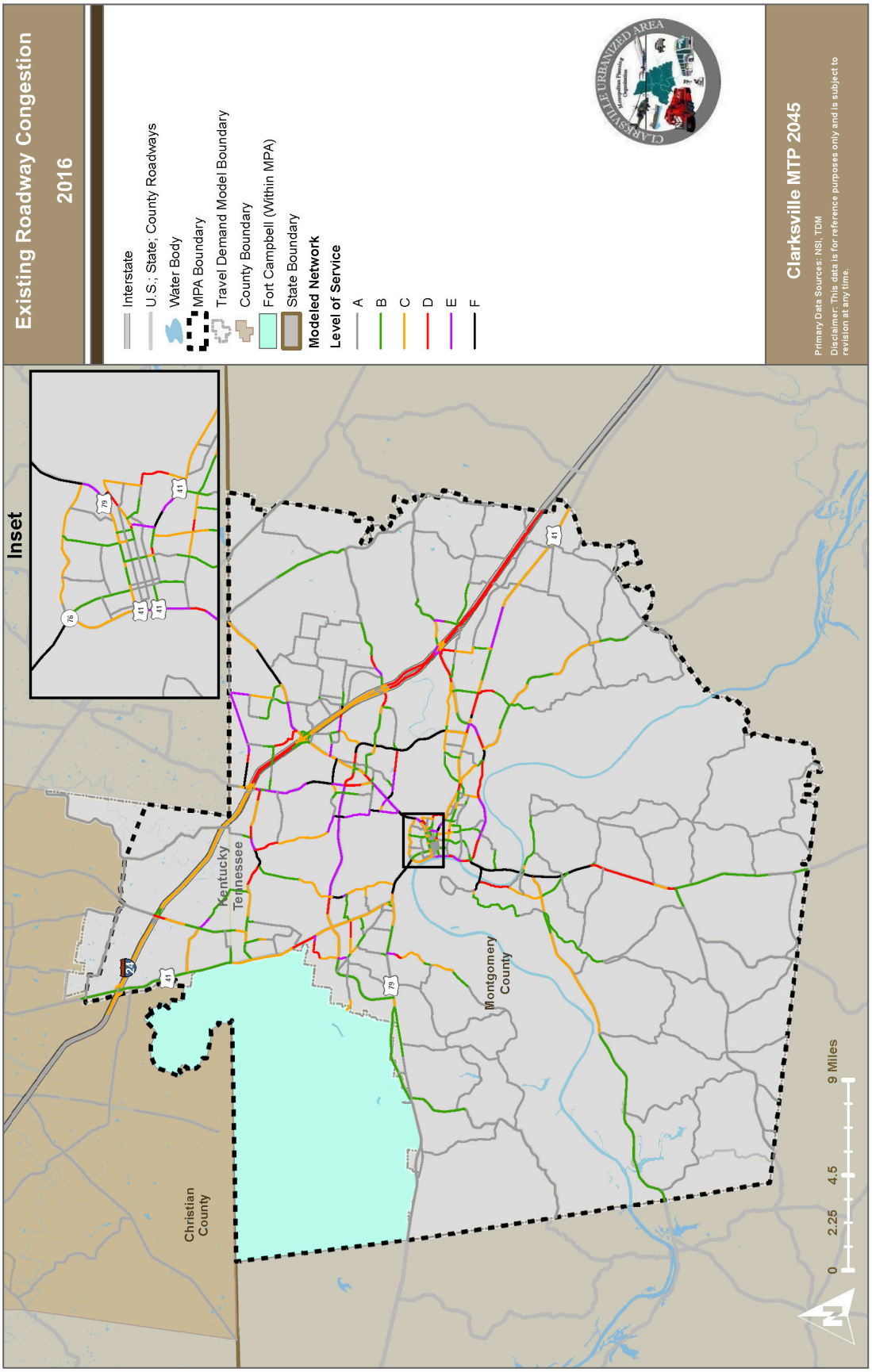


FIGURE 6.7 EXISTING ROADWAY CONGESTION, 2016

The Level of Travel Time Reliability (LOTTR) is defined as a roadway segment's ratio of a longer travel time (80th percentile) to a "normal" travel time (50th percentile.) The MPA's LOTTR data was obtained from the FHWA's National Performance Management Research Data Set (NPMRDS.) Roadway segments with an LOTTR less than 1.5 are defined by the FHWA as reliable.

The established performance measures for system reliability are:

- Percent of Person-Miles Traveled on the Interstate that are reliable.
- Percent of Person-Miles Traveled on the Non-Interstate NHS that are reliable.

Table 6.12 displays the baseline reliability conditions of the MPA's Interstate and non-Interstate NHS routes.

LESS THAN EIGHT (8) PERCENT OF THE MPA'S NHS ROADWAYS ARE NOT CONSIDERED RELIABLE.

Figure 6.8 shows the LOTTRs for the NHS routes in the MPA.

TABLE 6.12 MPA NHS ROADWAY RELIABILITY

Pavement Condition	Interstate			Non-Interstate		
	MPA Percent	TN Baseline Percent	KY Baseline Percent*	MPA Percent	TN Baseline Percent	KY Baseline Percent
Reliable	100.00%	87.70%	65.69%	92.40%	N/A	N/A
Not Reliable	0.00%	12.30%	4.31%	7.60%	N/A	N/A
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**N/A**	**N/A**
*Note- Kentucky Baseline values were unavailable at the time of the report.						

Source: NPMRDS, RITIS

System Performance Targets

Performance measures for overall system performance were finalized by the FHWA with an effective date of May 20, 2017. This requires the states to set their targets by May 20, 2018, and report them to the FHWA in the Baseline Performance Period Report by October 1, 2018. These targets are to be reported every 4 years afterwards. Each state is required to establish 2-year and 4-year targets for the Interstate performance measures, and a 4-year target for the non-Interstate performance measures. The CUAMPO may either support the targets established by KYTC and TDOT or establish their own. Following the 2022 reporting period, both Interstate and non-Interstate NHS targets will be on the same cycle. The CUAMPO is required to establish 4-year targets for both the Interstate and non-Interstate NHS performance measures. For the 2045 MTP, the CUAMPO has chosen to support the state targets established by KYTC and TDOT. Table 6.13 displays the TDOT and KYTC 2-year and 4-year system performance targets.

Table 6.13 TDOT and KYTC System Performance Targets

Percent of Pavement Condition	Interstate NHS Routes		Non-Interstate NHS Routes	
	2-year Target	4-year Target	2-year Target	4-year Target
Tennessee				
Reliable	85.3%	83.0%	N/A	87.5%
Kentucky				
Reliable	**93.0%**	**93.0%**	**N/A**	**82.5%**

Source: KYTC, TDOT

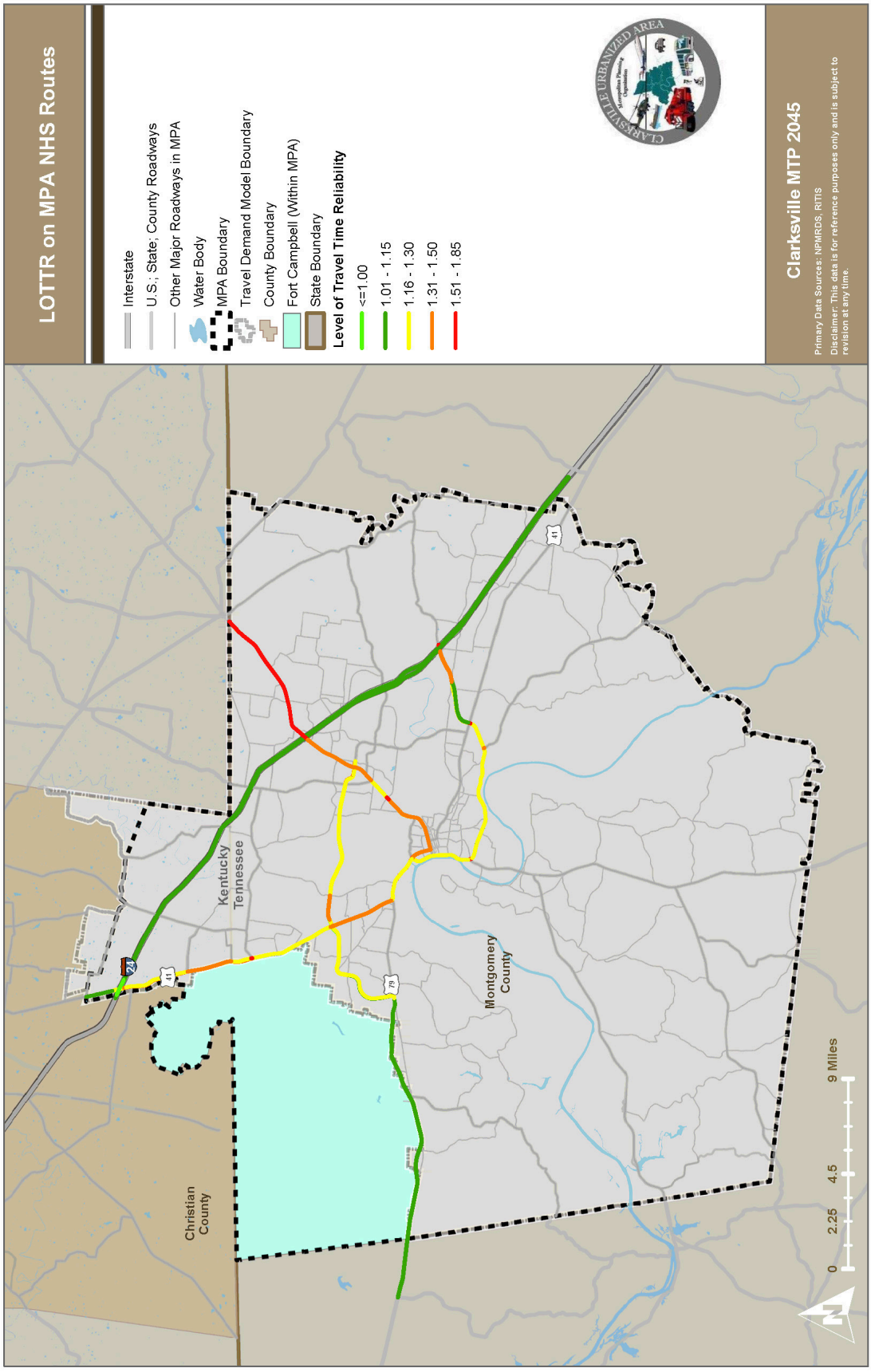


FIGURE 6.8 LOTTR ON MPA NHS ROUTES

Alternative Fuel Vehicles and Stations

Alternative Fuel Vehicles (AFVs) are vehicles which rely on fuels that are substantially non-petroleum, yield substantial energy security benefits, and offer substantial environmental benefits. These include fuels such as:

- liquefied petroleum gas (propane)
- Compressed Natural Gas (CNG)
- Liquefied Natural Gas (LNG)
- 85% and 100% Methanol (M85 and M100)
- 85% and 95% Ethanol (E85 and E95)
- electricity
- hydrogen

E85 and E95 should be distinguished from the more universal E10 and E15 fuels. E10 and E15 fuels have lower concentrations of ethanol and thus are not considered low-carbon. Hybrid vehicles are also considered AFVs.

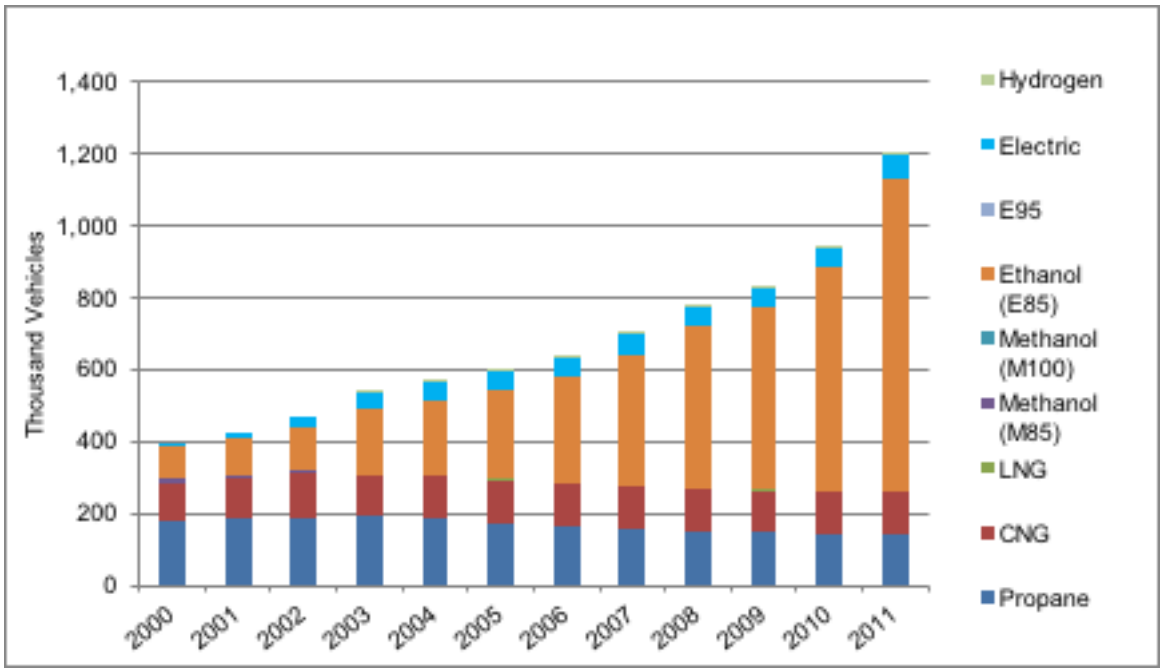
Existing Stock of AFVs

Data from the U.S. Department of Energy's Alternative Fuels Data Center indicates that the most used AFVs today use E85, propane, CNG, and electricity. The Alternative Fuels Data Center locator shows that the Clarksville area makes use of several AFV fuels. These are:

- electric
- ethanol
- hydrogen
- propane

The number of AFVs in use across the county has increased steadily from 1995 to 2011. This is largely due to federal policies that encourage and incentivize the manufacture, sale, and use of vehicles that use non-petroleum fuels. The popularity of ethanol vehicles grew widely during this time period. However, with the exception of electric vehicles, the number of other AFVs remained relatively constant.

FIGURE 6.9 ALTERNATIVE FUEL VEHICLES IN USE IN UNITED STATES, 2000-2011

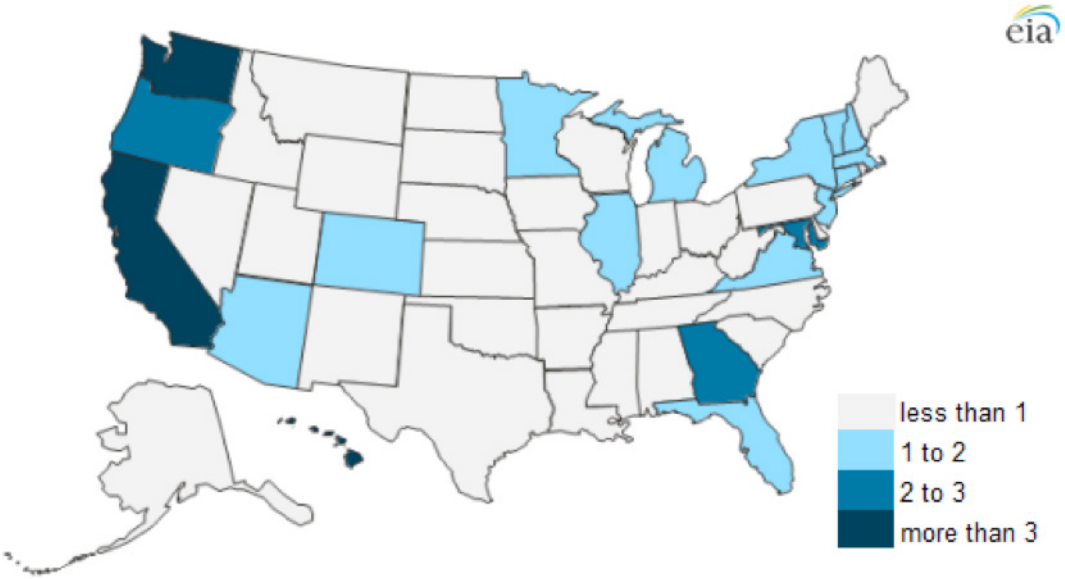


Recent data from other sources show that the number of electric vehicles has begun to steadily increase. There is also a growing concern that biofuels, such as ethanol, may have an overall environmental impact that is worse than petroleum-based fuels. This is once indirect emissions and land use impacts are taken into account.

According to 2013 data from the U.S. Energy Information Administration's Annual Energy Outlook, the most popular alternative fuel sources for cars and light-duty trucks in the U.S. are E85 (flex-fuel vehicles) and electricity (hybrid electric vehicles and plug-in electric vehicles). **In 2013, ethanol AFVs accounted for slightly over five percent of all cars and light-duty trucks, which includes fleet vehicles.** Electric AFVs accounted for slightly over one percent.

It should be noted that the popularity of different AFVs varies greatly by region. E85 AFVs are more popular in the Midwest, while electric AFVs are more popular on the West Coast. The use of electric AFVs across the nation is shown in Figure 6.10.

FIGURE 6.10 PLUG-IN ELECTRIC VEHICLES PER 1,000 REGISTERED VEHICLES



AFV Stations

At the national level, over 60 percent of all AFV stations are for electric vehicles. Approximately 18 percent of the AFV stations are for propane vehicles, while E85 accounts for 15 percent. In the Clarksville MPA area, the Alternative Fuels Data Center shows that there are 12 alternative fueling stations in the MPA. More than half of those stations are for ethanol fuel. It is important to note that publicly accessible AFV stations are constructed and managed both by private entities and local governments.

CLARKSVILLE MPA AREA

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ALTERNATIVE FUELING STATIONS

6.2 | Bicycle and Pedestrian

Personal vehicles are the primary mode of transportation in the Clarksville MPA. The use of alternative modes of transportation, such as walking and bicycling, decrease the load on infrastructure, reduce emissions, and increase health and livability. To optimize utilization, alternative transportation networks should be interconnected and integrated with vehicular thoroughfares.

CITIZENS AND POLICYMAKERS IN THE REGION HAVE SHOWN A DESIRE TO IMPROVE BICYCLE AND PEDESTRIAN INFRASTRUCTURE.

SEVERAL PLANS EXIST THAT ADDRESS THE NEEDS OF THE COMMUNITY, INCLUDING THE:

- Tennessee's State Bicycle Route Plan
- TDOT's 25-Year Long-Range Transportation Policy Plan
- Middle Tennessee Connected 2016-2040 Regional Transportation Plan
- Montgomery County, TN Zoning Code
- Clarksville, TN Zoning Code
- Clarksville Montgomery County Subdivision Regulations (2015)
- Clarksville-Montgomery County Greenway and Blueway Master Plan (2014)
- Downtown Clarksville Parking and Street Network Study (2010)
- Clarksville Smart Growth Plan 2030
- Clarksville Sidewalk Construction Priority Map (2016)
- Clarksville Strategic Transit Plan (2016)
- Clarksville Comprehensive Operations Analysis (2016)
- Oak Grove Zoning Ordinance

Classification of Bike/Ped Facilities and Bicycle Users

Types of Facilities

There are several ways that bicycle and pedestrian facilities can be designed to provide adequate accommodations for non-motorized travel needs. The American Association of State Highway and Transportation Officials (AASHTO) Guide to Bicycle Facilities, provides guidance on the type(s) of bicycle facilities that are most appropriate for specific roadway settings. Additionally, the KYTC published a Lane Configuration Guide to Support Safe Bicycling and Vehicular Travel based on the Manual on Uniform Traffic Control Devices (MUTCD).

Below is a brief description of each type of facility:

Shared Lane (or Shared Roadway) – This type of facility does not designate a separate area for bicycle traffic. Cyclists travel in the same lane as motorized vehicles, with no increase in lane width. Shared lanes can either be marked or unmarked. Under Tennessee and Kentucky state law, bicycles have the same rights and responsibilities as motorized vehicles. This effectively makes all public roads shared lane facilities, unless marked otherwise. Shared lanes may be marked by posting "Share the Road" signs that promote motorist awareness of bicyclists. The use of "sharrow" marking is a recently adopted alternative for roads with a speed limit of 35 mph or less.

Wide Outside Lane – These lanes are a modification of a shared lane, in which the roadway lane is wider than standard (typically 14 feet instead of 11 or 12 feet). The increased width allows bicycles and motor vehicles to operate with fewer potential conflicts. The facilities allow motor vehicles to pass a bicyclist and maintain the required 3-foot distance while remaining in the same lane.

Bicycle Boulevard – This type of facility is a designated alternative to a roadway with high traffic volumes or limited space for bicycles. Bicycle boulevards provide travel in the same direction as the roadway, and often travel parallel to the roadway.

Bike Lane – These facilities are solely used by cyclists. They are designated using pavement markings, striping, and special signing.

Buffered Bike Lane- These facilities are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.

Shared-Use Path – This type of facility may be used by cyclists and pedestrians. It is physically separated from motorized vehicles, and can be constructed adjacent to a street or highway. When these facilities are built near roadways, there are adequate safeguards designed to keep motorized vehicles from entering the path.

Shoulder – Roadway shoulders provide a safe area for cyclists, while lessening the chance that motorists must enter the opposite lane to avoid them. Typically, shoulder widths are at least four feet and are not marked as a bike lane.

Multi-Use Paths – This type of facility can be paved or unpaved. It is intended for use by cyclists, pedestrians, rollerbladers, and horseback riders.

Greenways are a type of multi-use path that are developed within a natural corridor. Their purpose is conservation, as well as non-motorized transportation and recreation.

Sidewalks – This type of facility is solely used for pedestrians. Sidewalks are often located along roadways, separated with a curb and/or planting strip, and have a hard, smooth surface. All sidewalks must meet the requirements of the Americans with Disabilities Act (ADA). The ADA requires public rights-of-way to be accessible to people with disabilities, including those with visual impairments.

Types of Bicycle Users

Bicycle travel varies with trip purpose and/or rider proficiency. A 1994 report by the FHWA outlines three general categories of cyclists. These categories assist highway designers in selecting the appropriate types of facilities. These guidelines have been adopted by the AASHTO Guide to Designing Bicycle Facilities (2012).

Group A cyclists: These are advanced or experienced cyclists who generally use their bicycle as they would a motor vehicle. They typically prefer direct access to destinations, with a minimum of detour or delay. They are generally comfortable riding with traffic, and prefer to have sufficient operating space on the travelway or shoulder; eliminating the need for the cyclist or a passing motor vehicle to shift position.

Group B cyclists: This category includes basic or less confident adult riders. They might use their bicycles for transportation purposes, such as traveling to work or shopping. They prefer avoiding roads with fast or busy traffic unless there is ample separation between them and the traffic. They are comfortable riding on neighborhood streets and separated pathways, and prefer designated facilities such as pathways and striped bicycle lanes.

Group C cyclists: Children riding on their own or with parents are included in group C. They may not travel as far as Group A or B cyclists, but require access to key destinations in their community (e.g. schools, recreational facilities or convenience stores). Appropriate facilities for group C bicyclists include:

- separated pathways,
- residential streets with low vehicle speeds, and
- other streets with well-defined separation between bicyclists and motor vehicles.

No single type of facility meets the needs or desires of all cyclists. Typically, the needs of Groups B and C are combined to create two broad classes of cyclists for design consideration. Group A cyclists are best served by sufficient operating space on all roadways. Group B and C bicyclists are better served by designated bicycle routes and/or separated pathways. Table 6.14 displays the types of bicycle facilities that are best applied to the given conditions.

Table 6.14 Design of Bicycle Facilities for Given Conditions

Bike Facility Type	Best Use	Motor Vehicle Design Speed	Traffic Volume	Classification or Intended Use
Shared Lanes (unmarked)	Minor roads with low volumes, where bicyclists can share the road with no special provisions.	Variable (rural or urban)	Generally less than 1,000 vehicles per day	Rural roads, or neighborhood/local streets.
Bicycle Boulevards	Local roads with low volumes and speeds, offering an alternative to, but running parallel to, major roads.	Use where the speed differential between motorists and bicyclists is typically 15 mph or less. Generally posted limits of 25 mph or less.	Generally less than 3,000 vehicles per day.	Residential roadways.
Marked Shared Lanes	Space-constrained roads with narrow travel lanes, or road segments for which bike lanes are not selected, due to space constraints or other limitations.	Variable. Use where the speed limit is 35 mph or less.	Variable. Useful where there is high turnover in onstreet parking.	Collectors or minor arterials.
Shared Lanes (wide outside lanes)	Major roads where bike lanes are not selected due to space constraints or other limitations.	Variable. Generally, any road where the design speed is more than 25 mph.	Generally more than 3,000 vehicles per day.	Arterials and collectors intended for major motor vehicle traffic movements.
Bike Lanes	Major roads that provide direct, convenient, quick access to major land uses. Also can be used on collector roads and busy urban streets with slower speeds.	Generally, any roadway where the design speed is more than 25 mph.	Variable. Speed differential is generally a more important factor in the decision to provide bike lanes than traffic volumes.	Arterials and collectors intended for major motor vehicle traffic movements.
Paved Shoulder	Rural highways that connect town centers and other major attractions.	Variable. Typical posted rural highway speeds (generally 40-55 mph)	Variable.	Rural roadways; intercity highways

Source: AASHTO Guide to Bicycle Facilities 2012

continued

TABLE 6.14 DESIGN OF BICYCLE FACILITIES FOR GIVEN CONDITIONS

BIKE FACILITY TYPE	BEST USE	MOTOR VEHICLE DESIGN SPEED	TRAFFIC VOLUME	CLASSIFICATION OR INTENDED USE
OFF-ROAD FACILITIES				
Shared use path adjacent to roadway	Adjacent to roadways with no or very few intersections or driveways. The path is used for a short distance to provide continuity between sections of path on independent rights of way.	Use where the adjacent roadway has high- speed motor vehicle traffic, such that bicyclists might be discouraged from riding on the roadway.	Use where the adjacent roadway has very high motor vehicle traffic volumes, such that bicyclists might be discouraged from riding on the roadway.	Provides a separated path for bicyclists and pedestrians. Intended to supplement a network of on-road bike lanes, bicycle boulevards, and paved shoulders. Not intended to substitute or replace on road accommodations for bicyclists, unless bicycle use is prohibited.
Shared use path on independent right-of-way (greenway)	Linear corridors in greenways, or along waterways, freeways, active or abandoned rail lines, utility right of way, or unused right of way.	N/A	N/A	Provides a separated path for bicyclists and pedestrians. Intended to supplement a network of on-road bike lanes, bicycle boulevards and paved shoulders.

Source: AASHTO Guide to Bicycle Facilities 2012

Existing Conditions

Bicycle Facilities

The Update of Tennessee's State Bicycle Route Plan inventories the State's bicycle routes. The state bicycle routes in Montgomery County are shown to the right. The state bicycle routes within the MPA are the Kentucky to Alabama Midstate, and the Reelfoot Lake to Nashville Route.

The routes identified in the Update of Tennessee's State Bicycle Route Plan are state, county, and city streets and highways. These roadways are used by trucks and cars, with no special lanes provided for bicycles. Currently, the routes are not signed.

Source: Update of Tennessee's State Bicycle Route Plan

The City of Clarksville maintains approximately 24.6 miles of separate lane bike paths. The paths are primarily focused in the downtown area. The existing paths, and proposed paths within the City of Clarksville from the Clarksville-Montgomery County Greenway and Blueway Master Plan are shown in Figure 6.11. Additional paths depicting the outlying areas can be found in the full plan document[1].

City of Clarksville

24.6

Miles of Separate Bike Lanes

1 http://www.cuampo.com/files/GreenwayBluewayMasterPlan2015-05-07.pdf

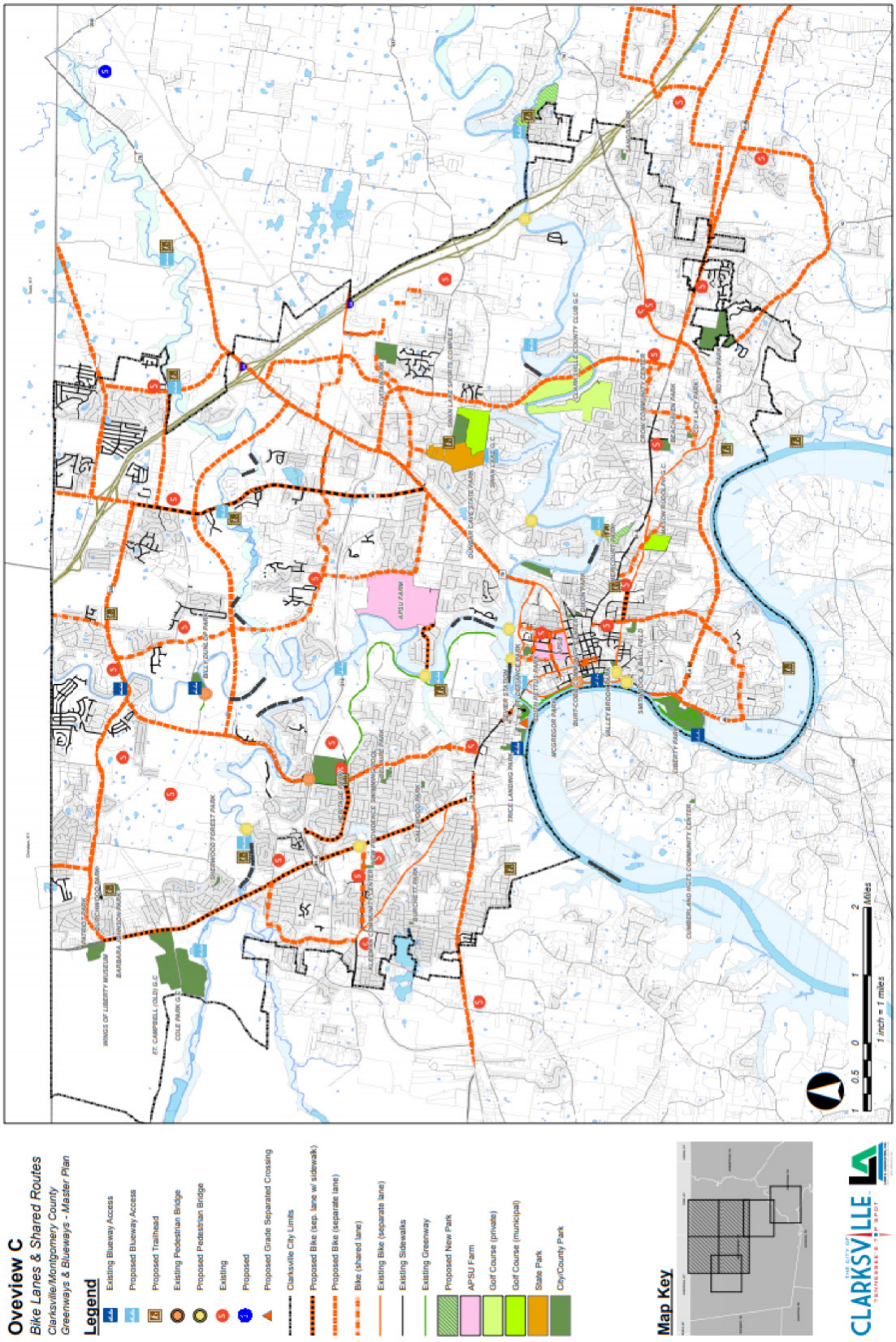


FIGURE 6.11 EXISTING AND PROPOSED BICYCLE PATHS IN CLARKSVILLE
Source: Clarksville Montgomery County Blueway and Greenway Master Plan

In 2016, a bike sharing service (BCycle) was launched in Clarksville and expanded to include the Austin Peay State University in 2018. This service operates at five (5) strategic locations, shown in Figure 6.12. The service provides access to 44 bicycles, displayed in Table 6.15.

6.15 BCycle Locations

Name	Address	Bikes	Docks
Pollard Trailhead (Greenway)	1011 Pollard Rd	10	5
Cumberland Riverwalk	640 N Riverside Drive	8	6
Public Square + Franklin	1 Public Square	10	4
Liberty Park	1451 Zinc Plant Road	6	8
Austin Peay State University	Foy Recreation Center	10	--

Source: BCycle.com

The City of Clarksville Parks and Recreation is considering a bike and pedestrian advocacy group and has conducted initial meetings to gauge interest.

In the City of Oak Grove, the Southern Lakes Bike Tour route passes through the northeastern part of the Plan area. This route uses Bradshaw Road (KY-109) and Barkers Mill Road (KY-1881).

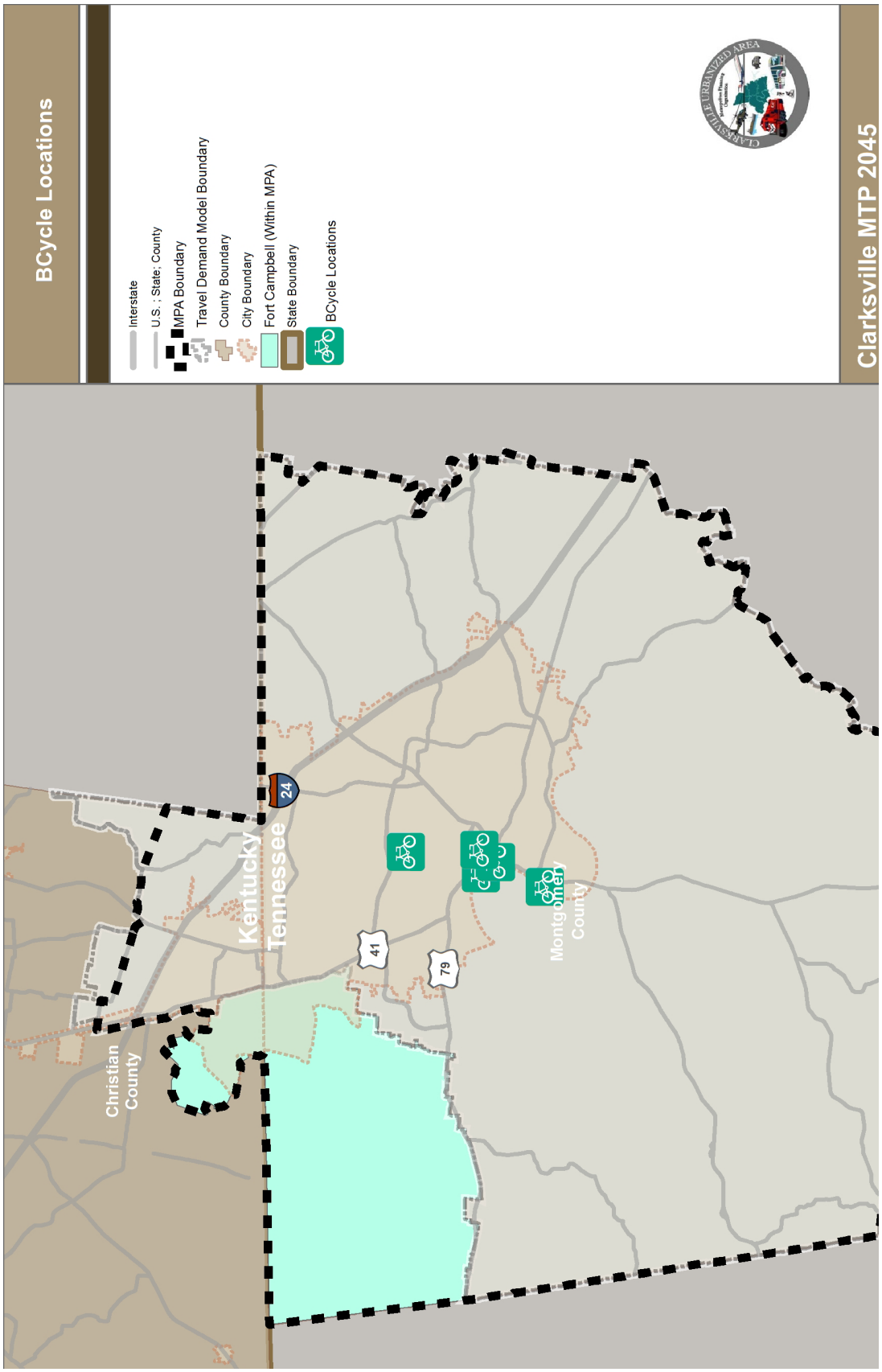
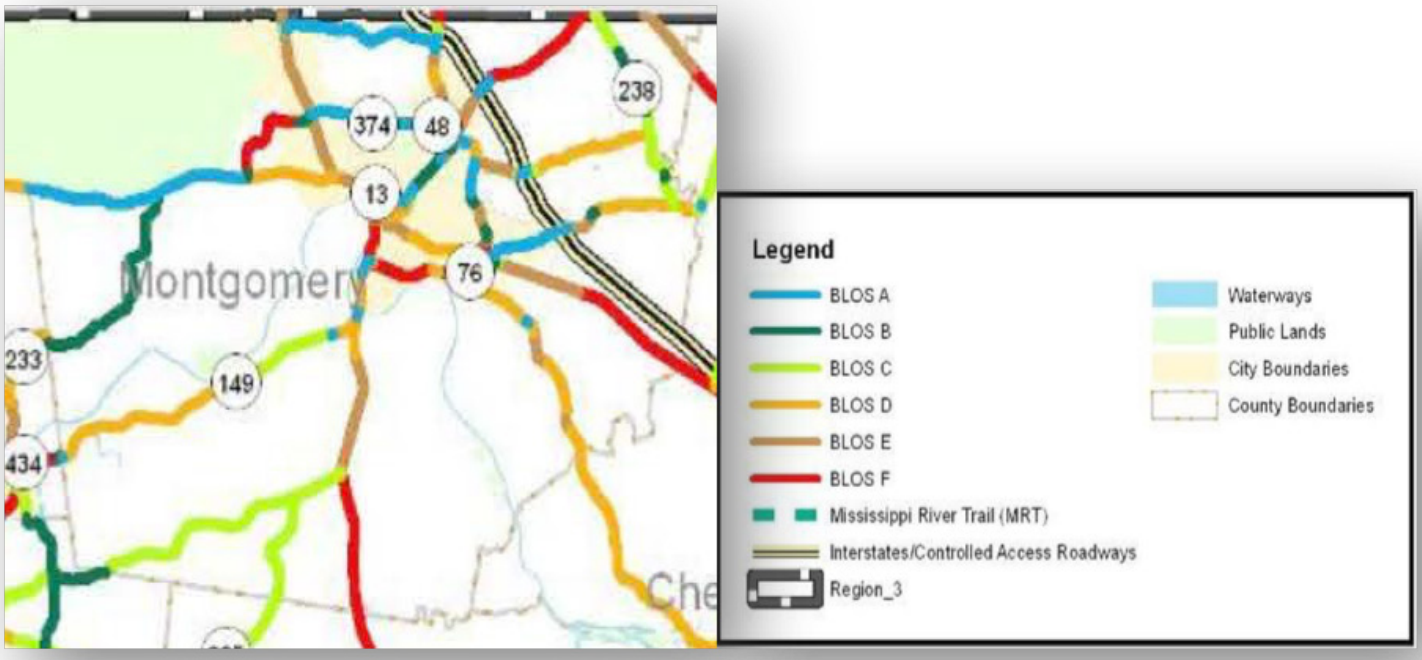


FIGURE 6.12 BCYCLE LOCATIONS

As part of the 2005 PLAN Go TDOT Long Range Transportation Plan bike and pedestrian element, an analysis was conducted showing a Bicycle Level of Service (BLOS) on state roads in Tennessee. The BLOS of state roads in Montgomery County is shown in Figure 6.13. The BLOS is an evaluation of cyclists' perceived safety and comfort with respect to motor vehicle traffic while traveling in a roadway corridor. **The analysis shows that about half of the MPA experiences a BLOS of D or worse.**

Improvements to corridors since the completion of the study in 2005 have altered some of these findings; however, the impacts are unknown at this time.

FIGURE 6.13 STATEWIDE BICYCLE LEVEL OF SERVICE (BLOS)



Source: PLAN GO TDOT Long Range Transportation Plan

Pedestrian Facilities

Clarksville MTP 2045 Transportation Survey 2017:

"All neighborhoods need sidewalks. For exercise, dog walking, children on bicycles and getting to know your neighbors. This would truly impact our city as being one that is forward thinking; one that values and believes in health, community and the well-being of the population."

The Clarksville-Montgomery County Greenway and Blueway Master Plan contains an inventory of the existing pedestrian infrastructure in Montgomery County. The KYTC maintains a sidewalk inventory for the City of Oak Grove and the Christian County portion of the MPA.

The existing sidewalks in the City of Clarksville, and proposed pedestrian facilities, are shown in Figure 6.14. The existing sidewalks in Montgomery County are concentrated around downtown Clarksville, and newer subdivisions built after the passage of the City of Clarksville and Montgomery County Subdivision Ordinance in 2004.

THERE IS A LACK OF SIDEWALKS ALONG MAJOR CORRIDORS OUTSIDE OF THE DOWNTOWN AREA. THIS DEFICIENCY GREATLY IMPACTS SCHOOL CHILDREN AND PUBLIC TRANSIT RIDERS, AND HAS BEEN NOTED IN PREVIOUS PLANS AND STUDIES FOR THE MPA.

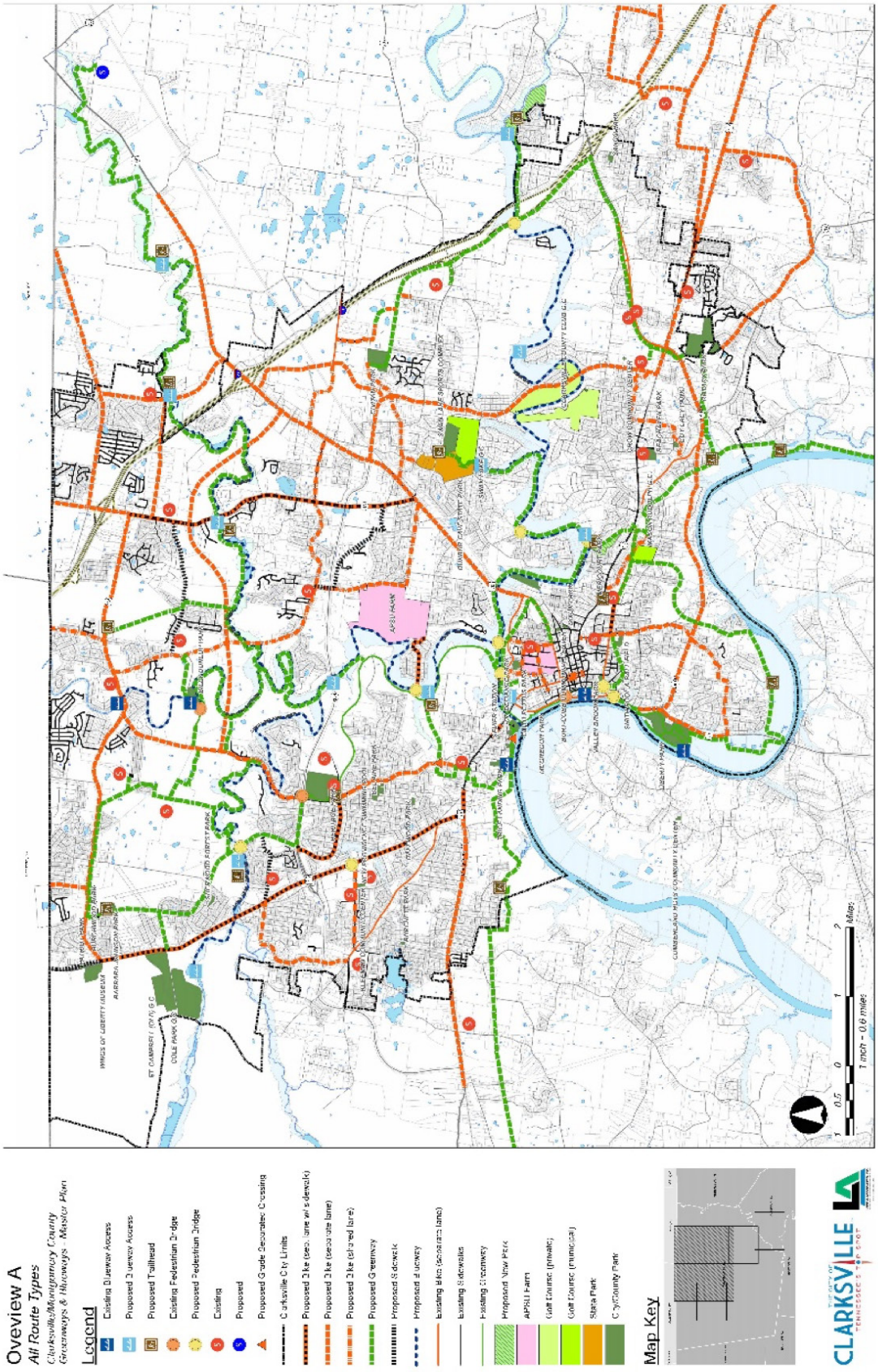


FIGURE 6.14 EXISTING AND PROPOSED PEDESTRIAN IMPROVEMENTS

Source: Clarksville-Montgomery County Blueway and Greenway Master Plan

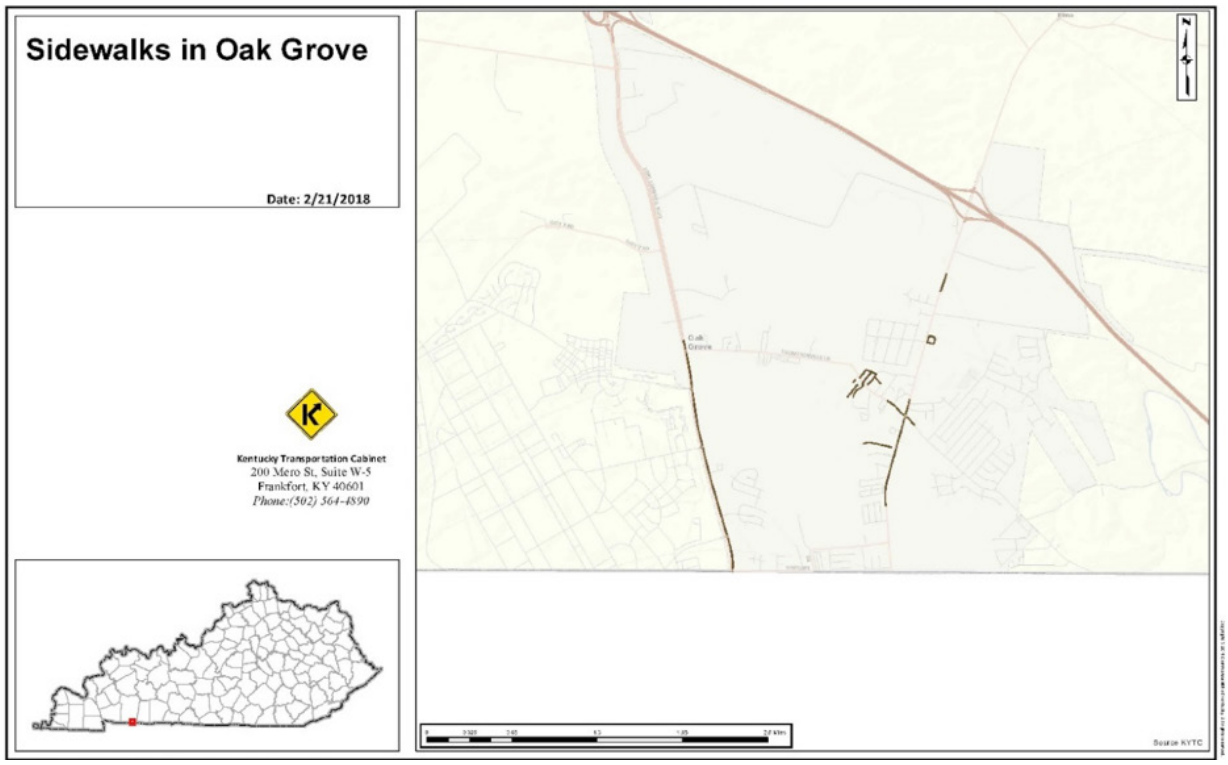
Other priority areas for the installation of sidewalks are near public transit stops. The Clarksville Transit System (CTS) has identified the need for sidewalks near transit stops in both the Comprehensive Operations Analysis (COA) and the Strategic Plan. Over half of all persons riding the bus walk to the bus stop[2]. Many of the stops are located along streets with high levels of vehicular traffic, posing a safety risk for pedestrians.

Sidewalks within the City of Oak Grove are shown in Figure 6.15. The following observations about the sidewalk infrastructure within the Kentucky portion of the MPA are as follows:

- Fort Campbell Boulevard (US-41A) has sidewalks on the east side between the state line and Morgan Road.
- There are sidewalks on both sides of Fort Campbell Boulevard (US-41A) between Morgan Road and Thompsonville Lane (KY-911).
- Pembroke-Oak Grove Road (KY-115) has sidewalks between Thompsonville Lane (KY-911) and Nick Lane.
- There are no sidewalks in the more populated southern end of the City of Oak Grove, adjacent to the state line.
- There are no sidewalks adjacent to the CTS bus route that is near the city.

2 Who's on Board: What Today's Riders Teach Us about Transit that Works. 2016. Transit Center. www.transitcenter.org.

FIGURE 6.15 SIDEWALKS IN OAK GROVE



Source: Kentucky Transportation Cabinet

Trails and Greenways

The City of Clarksville maintains approximately 11.6 miles of paved trails. These trails are along the Little Red River and the downtown riverfront along the Cumberland River. Plans for multi-use paths for Clarksville-Montgomery County are contained within the Clarksville-Montgomery County Greenway and Blueway Master Plan.

The City of Clarksville has almost 10 miles of paths that connect to parks, schools, and the downtown riverfront. These include:

- The Upland Trail runs 1.7 miles from Valleybrook Park along Spring Street, to College Street, where it connects to the Clarksville Riverwalk.
- The Riverwalk and its North Extension form a mile-long trail running along the Cumberland River.
    - This trail provides access to McGregor Park.

CITY OF CLARKSVILLE

11.6

MILES OF PAVED TRAILS

- The Fort Defiance Trail is an 0.85-mile trail that is located between Providence Boulevard and the Cumberland River.
    - It begins at Fort Defiance Civil War Park and Interpretative Center and ends at a former Civil War outpost overlooking the Cumberland and Red Rivers.
- The Clarksville Greenway is a 9-mile pathway through wooded areas.
    - This trail is part of the Rails to Trails initiative.
    - A trailhead is located on Marys Oak Drive, with a marked pedestrian crossing from the Kenwood High School campus that allows users to cross East Pine Mountain Road.
    - A second trailhead is located further east at the end of Pollard Road.
    - From the end of Pollard Road, the greenway follows along the west side of the Red River for another 2.75 miles, where it ends at the sewer treatment plant.
    - A third trailhead exists at Heritage Park with ample parking.
    - The trailheads were coordinated with the BCycle location at the Pollard Road Trailhead and the bike sharing service provides a convenient way to ride the trails.
- The recently opened Liberty Park provides a 1.8-mile path around a 10-acre community fishing pond.
    - The park is located on the south end of the downtown riverfront, bordered by Cumberland Drive and Zinc Plant Road.
- The City of Clarksville is beginning Segment 1 of the Clarksville River Trail.
    - This trail extends from the junction of the Cumberland and Red Rivers and continues north along the Red River for about a quarter of a mile.
    - With the addition of Segment 2, the path will reach the sewer treatment plant where the Clarksville Greenway currently ends.
- Rotary Park offers five miles of recreational hiking and biking trails in a nature preserve.
    - The park is maintained by Montgomery County, and is located at the US-41A Bypass (Ashland City Road) and E. Old Ashland City Road.

In the City of Oak Grove, there is a bicycle/pedestrian trail that is part of a four-acre development near Walter Garrett Lane and US-41A.

Existing Plans

Bicycle Plans and Policies

There are no requirements or incentives for bicycle facilities in the *Montgomery County, TN Zoning Code, Clarksville Zoning Code*, or the *Oak Grove Zoning Code*. There are also no requirements or incentives for bicycle parking, or bicycle route connections, as part of a development.

The *Clarksville-Montgomery County Greenway and Blueway Plan* provides an in-depth evaluation of existing bicycle and pedestrian facilities within Montgomery County.

The KYTC has a policy that requires consideration of incorporating pedestrian and bicycling facilities on any new, or reconstructed, state-maintained roadways. This policy applies to all existing and planned urban or suburban areas. TDOT's Multimodal Access Policy requires the same consideration on Tennessee roadways.

Pedestrian Plans and Policies

In Montgomery County, and the City of Clarksville, roadway projects are required to incorporate sidewalks (except for routine resurfacing). Each municipality assumes responsibility for sidewalk maintenance and repair in their respective jurisdictions. Per the *Clarksville-Montgomery County Subdivision Regulations*, sidewalks are required on both sides of the dedicated public right-of-way or dedicated road easement. Sidewalks must also meet ADA standards. Sidewalks outside the City limits are required to be maintained by homeowner associations, not the County Highway Department. Future site plans are required to include pedestrian circulation plans.

The State of Tennessee recently adopted an access management policy[3] for new developments along state highways. The policy requires increased use of shared driveways and internal access for developments. This will create fewer points of conflict between vehicles and pedestrians, increasing safety.

In Oak Grove, sidewalk requirements are limited to the following zoning categories:

- Enhanced commercial district
- Central business district
- Planned unit developments (PUD)

3 Manual for Constructing Driveway Entrances on State Highways. 2015. TDOT

In the enhanced commercial district and central business district:

"All lots adjacent to a residentially zoned […] shall be connected via sidewalk to the residential area wherever possible to create a pedestrian friendly environment"

"Sidewalks at least five (5) feet wide shall be used to connect all primary businesses in this zone". (7.5 B-4; 7.5 B-4).

In a PUD:

"The developed areas shall have a sidewalk on at least one side of the street. In the event the required open space is on one side of the street and the built-out area is on the other, the required sidewalk shall be placed on the same side as the developed areas."

The projected growth in the MPA over the next 25 years will require substantial residential development. It is notable that there are no requirements for sidewalks as part of residential development.

6.3 | Public Transit

In the past, public transportation rhetoric split potential riders into two categories, "choice riders" and "captive riders". Choice riders can afford to drive a personal vehicle and are physically able to drive, but prefer to use public transportation for a variety of reasons. The captive riders' population is diverse; however, they do not have transportation options, and rely on public transportation for their daily needs.

New research into transit use suggests there are three common patterns which have created new ridership groups. Each of these groups require a different approach to providing transit service and increasing ridership.

The Three Patterns Are:

1. Occasional riders who take transit once in a while.
2. Commuters who take transit regularly but only for work.
3. All-purpose riders who take transit regularly for multiple purposes.

The goal is to engineer a transit system that encourages the creation of "all-purpose riders" by improving transit services. Improvements in luxury amenities, such as Wi-Fi, have been used to stimulate choice ridership increases in the past. The new research suggests that strategies targeting the three ridership groups are more successful, and the goal should be to not only bring new riders into the system, but to encourage riders to become all-purpose riders.

To do this, an emphasis is placed on increasing the core system's strength and reliability to make the system more attractive to everyone. This can be achieved by fostering reliable, frequent service. The research identifies walkability, frequency, and travel time improvements as something all ridership groups value. Without good, reliable transit systems, even captive riders will find alternative transportation at the first opportunity.

It is important to note that riders in all three categories will supplement their use of the transit system with other modes of transportation, including using ride-sharing services, walking, cycling, or using an automobile.

Special Concerns within the MPA

Age 18-34

The presence of Fort Campbell means that there are a higher than average number of people aged 18-34 within the MPA. Recent studies have shown a decline in vehicle miles traveled for this age group. Data from the National Household Travel Survey in 2009 found that this age group is more willing to walk, use a bicycle, or use public transit.

Trend **Decline in Vehicle Miles Traveled**
From 2001 to 2009:
The number of vehicle miles traveled by persons aged 16-34 **dropped 23 percent, from 10,300 to 7,900.**
During this same time:
The number of bike trips by this age group **increased 24 %**
The number of walking trips to destinations **increased 16 %**
The number of passenger miles traveled on public transit **increased 40 %**

These trends are expected to continue. Forty-five (45) percent of the respondents aged 18-34 said they have consciously made an effort to replace driving with transportation alternatives[4]. Existing data on transportation use and mode preferences indicates an opportunity, and a need, to increase active transportation and public transportation use.

Fort Campbell

In the MPA, a large contingent of soldiers, families, spouses of soldiers, and civilian support staff at Fort Campbell provide an additional source of ridership that do not follow traditional ridership patterns. Fort Campbell operates as its own city within the MPA. The base is given consideration in transportation planning efforts in the region due to its large impact on travel patterns.

4 "Transportation and the New Generation: Why young people are driving less and what it means for transportation policy." 2012. Frontier Group & U.S. PIRG Education Fund.

The demographic makeup of Fort Campbell's population is supportive of increases in ridership, as mentioned in the previous section. These challenges and opportunities require a close, working relationship with the leadership of Fort Campbell to implement proposed improvements to transit service that are affected by the base's presence.

Local Public Transit Providers

The public transportation network in the MPA is comprised of fixed route and demand responsive services. Fixed route services are offered within the City of Clarksville, and to a couple key destinations, by the Clarksville Transit System (CTS). CTS operates a route to Fort Campbell. CTS and the Regional Transit Authority (RTA) operate a regional commuter bus route between Clarksville and Nashville. Currently there is no fixed route public transportation serving the Christian County portion of the MPA; although some CTS routes do operate in the area.

The surrounding areas are served by demand responsive public transit services operated by:

- CTS's Lift service within the City of Clarksville.
- Mid-Cumberland Human Resource Agency (MCHRA) in Tennessee.
- Pennyrile Allied Community Services (PACS) in Kentucky.

The region is also served by a Greyhound bus station in downtown Clarksville, which provides access outside the region.

KEY PERFORMANCE STATISTICS AS NOTED IN THE RECENT (2016) COMPREHENSIVE OPERATIONS ANALYSIS (COA) OF CTS ARE:

- Since the 2010 Census, CTS has transported over 5,275,000 passengers, averaging approximately 64,300 passenger trips per month.
- Since the 2010 Census, CTS has transported over 200,000 passengers on The Lift service, averaging approximately 2,440 passenger trips per month.
- CTS transports approximately 5,800 APSU students monthly.
- CTS transports approximately 4,500 senior citizens monthly.
- Senior citizen ridership has increased by 102 percent since the start of the Senior Ride Free Program.
- CTS transports approximately 1,500 children under age four monthly.
- Commuter bus service to Nashville carries approximately 4,600 passengers monthly.

Clarksville Transit System Fixed Routes

In January 2016, CTS completed a Strategic Transit Plan with the stated goal

"to develop operational and policy recommendations that can be implemented in the next one to five years that will allow CTS to make measurable gains in terms of safety, quality and efficiency of transit service delivery in Clarksville. Objectives of the plan addressed service delivery and operations, maintenance and state of good repair (SGR), service quality and customer service and efficiency and effectiveness"

In August 2016, CTS completed their COA "to assess the public transportation services for the City of Clarksville, TN, Fort Campbell Military Installation and the City of Oak Grove, KY."

A MAJOR OBJECTIVE OF THE COA INVOLVED A CONSTRUCTIVE ANALYSIS OF THE TRANSIT SYSTEM AND RECOMMENDATIONS FOR AN APPROPRIATE ALLOCATION OF RESOURCES.

The Strategic Transit Plan and the COA provide data, analysis, and recommendations for the CTS. The plans incorporate solid public input and stakeholder input.

The stated mission of CTS is to "plan, implement, maintain and manage a public transportation system that allows for maximum mobility for the community with emphasis on safety, quality and efficiency." The CTS is the only fixed-route system in the MPA. It operates in a "hub and spoke" pattern, with all buses leaving and returning to the Transit Center, located at 200 Legion Street. The CTS routes are shown in Figure 6.16. The buses circulate throughout the community and return to the centralized Transit Center enabling passengers to transfer from one route to another route to reach their final destination. There are additional transfer points along each route for quicker transport.

CTS OPERATES EIGHT ROUTES, WITH MOST OPERATING FROM 4:30 A.M. TO 9 P.M. MONDAY THROUGH SATURDAY. THE TRANSIT CENTER IS OPEN MONDAY THROUGH FRIDAY FROM 5:30 A.M. - 8 P.M., AND SATURDAY FROM 6:30 A.M. - 8 P.M.

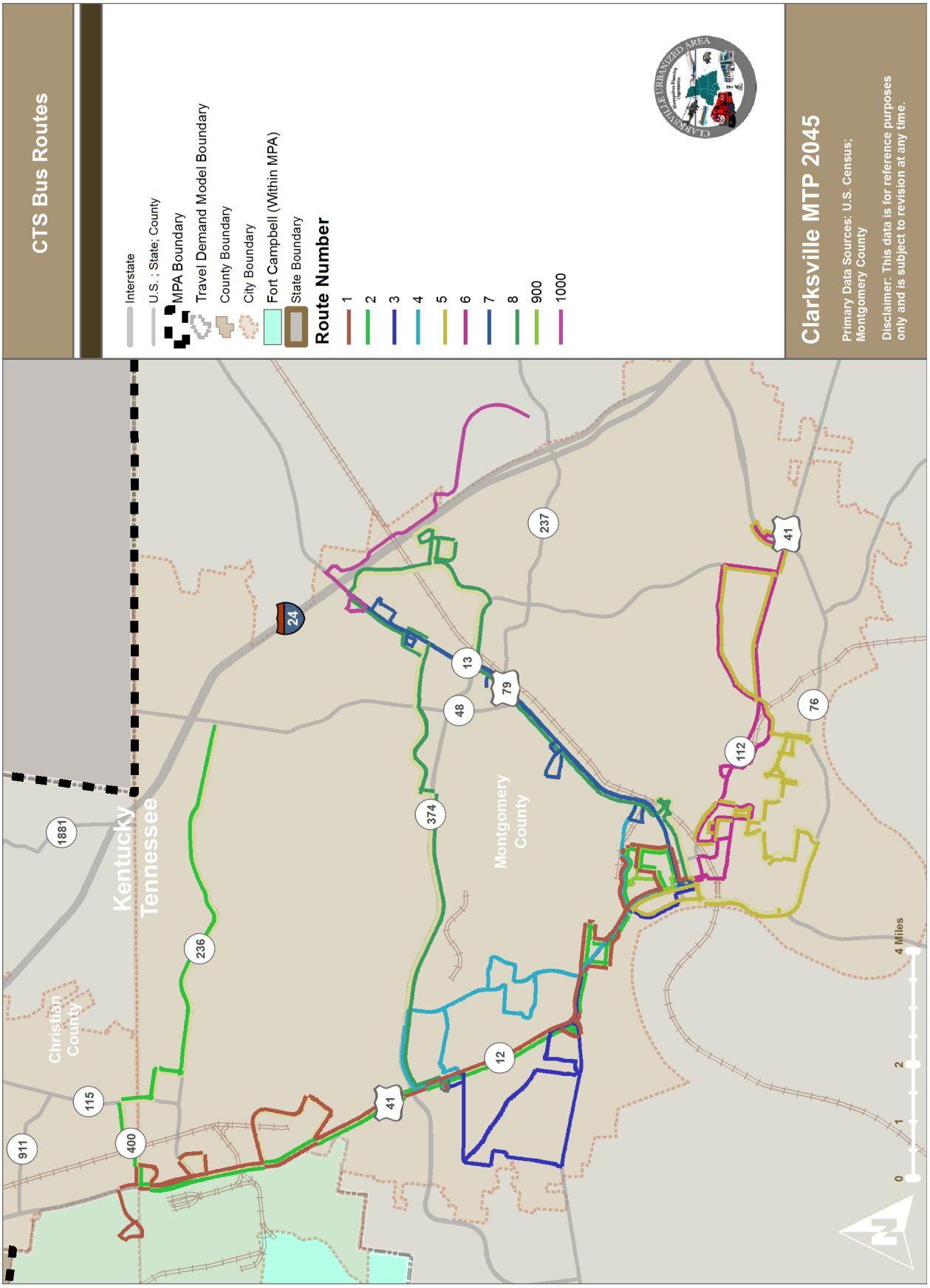


FIGURE 6.16 BUS ROUTES

In April of 2016, CTS began operating Route 1000. The route is a circulator that runs on 30-minute loops, connecting targeted employment areas including the Walmart on Wilma Rudolph Boulevard and major employers east of the Interstate. This route also connects with the new Hankook tire facility. The service runs from 6:30 a.m. to 6:30 p.m.

The base bus fare for CTS is $1.50. Reduced fares are available for specific members of the community. A breakdown of the fares is displayed in Table 6.16.

Table 6.16 CTS Fare Rates

Type	Fare	Passes
Fixed Route		
Full Fare	$1.50	One-Day: $4 10-ride: $15 31-day (Liberty Pass): $50
Student (with I.D. card):	$1.00	10-ride: $10
65 & Over (with CTS Photo I.D.)	Free	N/A
Disabled (with CTS Photo I.D. card or Medicare card)	$0.75	10-ride: $7.50 31-day (Liberty Pass): $25
City Employee (with City of Clarksville I.D.)	$0.75	N/A
Children (age 4 and under)	Free	N/A
"The Lift" Paratransit		
Eligible Riders	$2.50	N/A

Source: CTS

The CTS recently reinstated transfers on their system. This allows riders to complete one continuous trip for a $0.25 transfer fee. The approved transfer locations are:

- the CTS Transit Center
- the WalMart on Ft. Campbell Blvd
- the St. B Walmart on Wilma Rudolph Blvd
- Sango Wal-Mart on Madison St.

Daily ridership for CTS is highest along Route 6-Madison Street, Route 1-Fort Campbell, Route 7-Governors Square Mall, and Route 3-Cunningham Loop. These routes also serve the highest number of passengers per hour and passengers per mile. Route 6 serves the high need area with the greatest density in the system. Route 1 serves Fort Campbell, leading to its high ridership. The Ridership on each route in the CTS is displayed in Table 6.17.

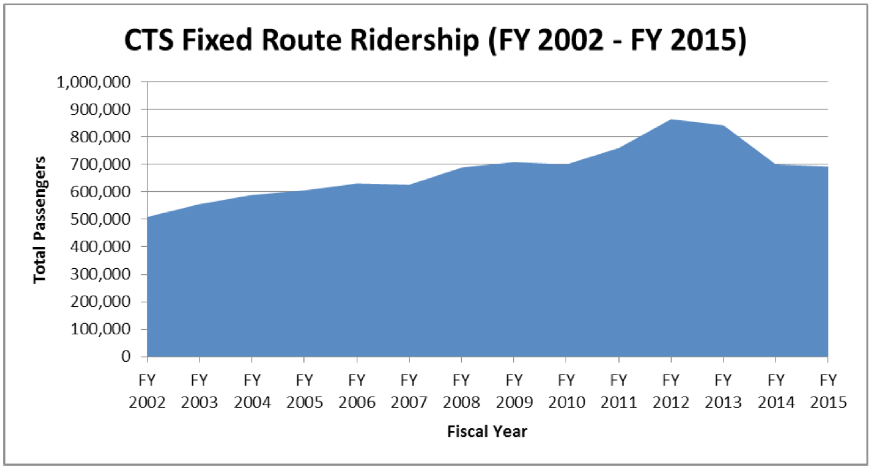
Table 6.17 CTS Route Ridership

Route	Daily Ridership	Annual Ridership	Passengers per Hour	Passengers per Mile
Total	2,679	683,060	10.7	0.6
Route 1-Fort Campbell	412	104,992	11.4	0.7
Route 2- Tiny Town Rd	328	83,612	10.6	0.5
Route 3- Cunningham Loop	378	96,418	12.7	0.7
Route 4- Peachers Mill	154	39,294	8.6	0.5
Route 5- Hilldale	335	85,424	9.2	0.6
Route 6- Madison St.	466	118,765	15.6	1
Route 7- Governors Square Mall	384	98,036	11.5	0.7
Route 8- 101 Express/ Gateway Medical Center	222	56,519	6.3	0.3
Route 900 -Peay Pickup	52	7,114	5.8	0.6

Source: CTS

From 2002 to 2012, ridership increased from approximately 500,000 to 850,000. Since 2012, CTS ridership has decreased. Although some local factors may play a role, such as the fare increase in 2013, this follows a nationwide trend of decreased ridership based on data from the FTA. There is no consensus on the causes of this trend. Ridesharing services such as Uber and Lyft have affected public transportation ridership, but this effect has not been quantified. Figure 6.17 shows the fixed route ridership on the CTS from 2002 through 2015.

FIGURE 6.17 CTS ANNUAL FIXED ROUTE RIDERSHIP



Source: CTS

Clarksville Transit System Lift Service

The Lift is a demand response service for the disabled and elderly. The ADA requires complementary paratransit service for passengers who are:

- unable to navigate the public bus system,
- unable to get to a point where they could access the public bus system, or
- have a temporary need for these services because of injury or some type of limited duration cause of disability (49 CFR 37.123).

The FTA requires that the paratransit service area comprises a three-quarter mile buffer around existing fixed routes. This means that paratransit service must be offered if the origin or destination of a trip is within three-quarters of a mile of the existing fixed route alignment. The service is by appointment only.

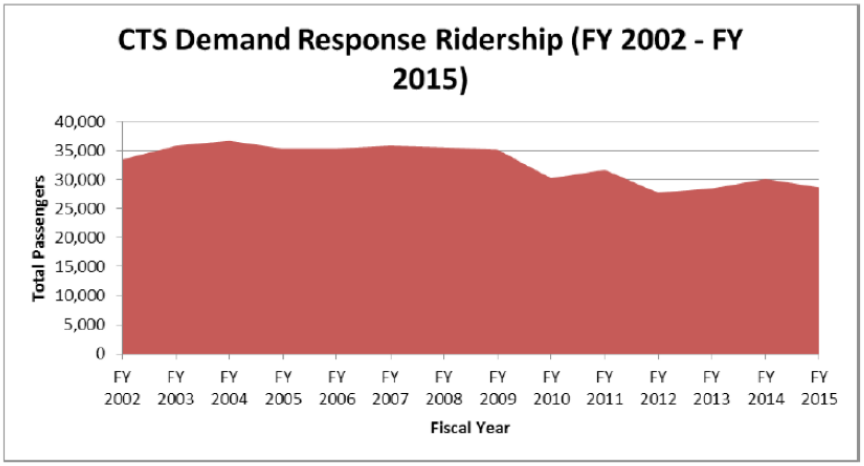
Recent ridership numbers indicate a decrease since 2009; however, the COA noted that ridership is expected to increase as the elderly population eligible for the service increases over the next 50 years. Figure 6.18 shows the Lift ridership on the CTS from 2002 through 2015.

THE LIFT PROVIDES

2,400

TRIPS PER MONTH

FIGURE 6.18 CTS ANNUAL LIFT RIDERSHIP



Source: CTS

Some of the decreases in ridership may be attributed to the CTS travel training program. The program is for passengers with disabilities who wish to learn to navigate the fixed route bus system. Qualified passengers can schedule the training with CTS, and a travel trainer will meet them at the downtown transit center. At that time, the travel trainer will go over the bus schedule, fares, passes, and routes.

The trainer will also instruct the passenger on obtaining the proper ID for receiving a reduced fare. The trainer will then ride the bus with the passenger and teach them about:

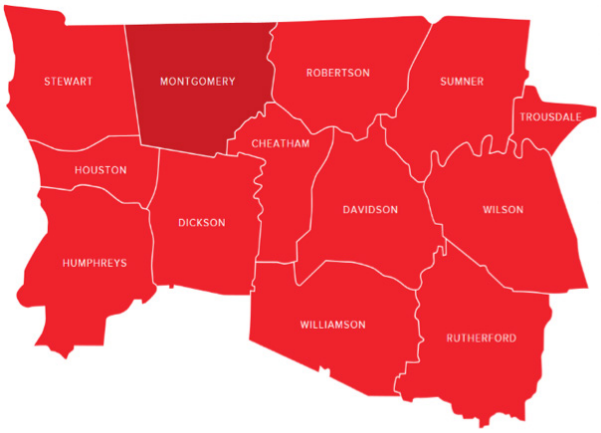
- using the fare box,
- listening for ADA announcements,
- how to signal for a stop,
- using the Lift if needed.

The trainer will make at least one transfer with the passenger, and complete at least one full round trip. The passenger will also be taught what a bus stop looks like, and safe procedures for waiting for the bus[5].

MCHRA Public Transit

The Mid-Cumberland Human Resource Agency (MCHRA) serves a 13-county area in Tennessee. It provides rural transit services to:

- Montgomery
- Cheatham
- Dickson
- Davidson
- Houston
- Humphreys
- Robertson
- Rutherford
- Stewart
- Sumner
- Trousdale
- Williamson
- Wilson Counties



Graphic Courtesy of MCHRA

The MCHRA's service area covers 5,145 square miles over 1.1 million persons. The service operates 126 vehicles and provides nearly 248,000 vehicle trips annually. In 2016, MCHRA vehicles drove approximately 3.8 million miles[6]. Within Montgomery County, the MCHRA operates 10 vehicles and employs 12 drivers. The service operates Monday through Friday from 6 a.m. to 6 p.m. A one-way ticket within the county is $3.00, and the service is by appointment only.

Pennyrile Allied Community Services (PACS)

The Pennyrile Allied Community Services (PACS) provides rural public transportation for a nine-county area in Kentucky. This area is comprised of the following counties:

- Christian
- Caldwell
- Crittenden
- Hopkins
- Livingston
- Lyon
- Muhlenberg
- Todd
- Trigg

5 Clarksville Comprehensive Operations Analysis Report. 2016
6 NTD database 2016

The PACS operates 90 demand response vehicles and 3 buses. In 2016, the service provided nearly 195,000 trips and traveled almost 2.3 million miles. The demand response service is available Monday through Friday. In-county trips are $0.70 per mile per person. Out of county trips are $1.10 per mile per person. Veterans have a reduced fare of $0.35 per mile. Medicaid eligible persons and seniors ride for free. Special fares are available for groups. Service is by appointment only.

The PACS now offers inter-city transit services to Nashville. The service must be scheduled 24 hours in advance and costs $12.50 for round trip. The service stops at:

- Vanderbilt University Medical Center
- Nashville International Airport
- Nashville MTA
- the Department of Veterans Affairs

Transit Capital Assets

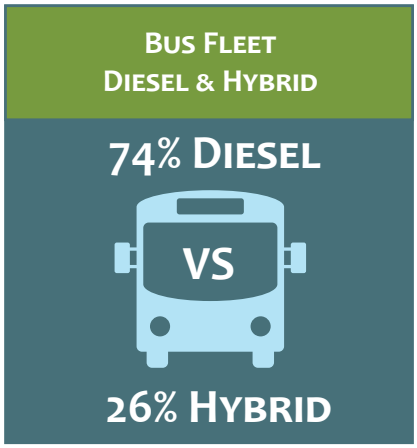
An inventory of capital assets for the CTS was provided in the COA. Inventory of the MCHRA and PCS systems are not included, since capital funding for these providers comes from sources outside of metropolitan planning sources.

CTS OPERATES:

- twenty-one buses
- two trolleys
- twelve demand response vehicles
- support vehicles for its operations

The trolleys are used to serve the APSU route. Each bus has between 26 and 30 seats, two wheelchair positions, and a bike rack. The fixed route vehicles average 8.1 years of service and nearly 414,000 miles per vehicle.

Almost half of the fleet (10 buses) are more than 10 years old and considered in poor condition. The trolleys are 11 years old and in fair condition. These vehicles are nearing the end of their useful life. The vehicles are generally replaced in a 10-year cycle. The vehicles are reaching the point where repairs and maintenance will exceed the costs of purchasing new vehicles.



The fleet is 74 percent diesel and 26 percent hybrid. The hybrid buses are between two (2) to eight (8) years old. Hybrid buses are considered a more economical option for the long-term since they can offer up to 40% reduction in fuel costs. However, hybrid buses can be almost double the cost of a traditional diesel bus. In order to maintain current levels of service while replacing the older vehicles in the fleet, it may be necessary to consider diesel vehicles.

The demand response fleet, operated under Lift, drives 172,000 miles annually. The fleet's average vehicle age is 5.2 years old. The useful life of a demand response vehicle is 4 years.

A complete list of the CTS transit inventory and capital assets can be found in the COA.

Transit Dependent Populations

It is important that the CTS serves all members of the community. This section analyzes the location of existing routes relative to transit dependent populations. These populations include:

- persons in poverty
- minorities
- zero-vehicle households
- persons over the age of 65

While not a transit dependent population, this section also analyzes the location of public transit in relation to those persons aged 18-34, due to their increased propensity to use public transit. Table 6.18 displays a breakdown of the demographic information, available in the COA, for the MPA.

TABLE 6.18 CTS DEMOGRAPHICS BREAKDOWN

POPULATION	KY	TN	CHRISTIAN COUNTY	MONTGOMERY COUNTY	MPA	CITY OF OAK GROVE	CITY OF CLARKSVILLE
Minority	14%	25%	33%	35%	39%	38%	40%
Households in Poverty in Last 12 Months	19%	18%	20%	16%	21%	17%	17%
Zero-Vehicle Households	8%	6%	8%	5%	8%	5%	5%
Over 65	14%	15%	11%	8%	7%	1%	8%
18-34	23%	23%	32%	31%	35%	42%	33%

Source: CTS

Methodology

DATA FROM THE 2015 AMERICAN COMMUNITY SURVEY 5-YEAR ESTIMATES WAS ANALYZED AT THE BLOCK GROUP LEVEL TO DETERMINE HOW WELL THE CTS SERVES THE POPULATION. THE FOLLOWING METHODOLOGY WAS USED TO ANALYZE IF CTS MEETS THE NEEDS OF THE POPULATION:

- The percentage of each transit dependent population by block group was calculated.
- The percentage was then compared to the MPA average.
- Each block group was placed in a category of:
  - "below average"
  - "at or below average"
  - "slightly above average"
  - "moderately above average"
- These categories were defined based on standard deviations above the mean.
  - Guidance from the EPA concerning formal environmental analyses suggests using a metric of 2 standard deviations above the mean to identify an outlier group.

This analysis considered it more meaningful to consider groups that fell more than one standard deviation outside the mean. Nearly 68 percent of the population falls within one standard deviation of the mean.

THIS ANALYSIS IDENTIFIED CONCENTRATIONS OF PERSONS WHO MAY NEED TRANSIT SERVICES, THUS IDENTIFYING TRANSIT DEPENDENT POPULATIONS IDENTIFIED AS THOSE "MODERATELY ABOVE" THE MPA AVERAGE.

Minority Populations

For the purposes of this plan, a minority group is defined as any group other than "non-Hispanic white alone," based on the U.S. Census. The MPA average was approximately 27 percent.

BLOCK GROUPS THAT HAVE A MINORITY POPULATION OF 56 PERCENT OR GREATER ARE CONSIDERED MODERATELY ABOVE AVERAGE.

The CTS routes are along every Census block group that is moderately above average. The CTS routes and percentage of minority populations within the MPA are shown in Figure 6.19.

ON BOARD SURVEYS, CONDUCTED AS PART OF THE COA, FOR THOSE RIDERS WHO SELECTED JUST ONE RACE OR ETHNICITY SHOW THAT:

41%	BLACK/AFRICAN AMERICAN
37%	WHITE
3%	HISPANIC/LATINO
1%	ASIAN AND NATIVE AMERICAN

THIS INDICATES THAT A MAJORITY OF CURRENT CTS RIDERS ARE MINORITY PERSONS.

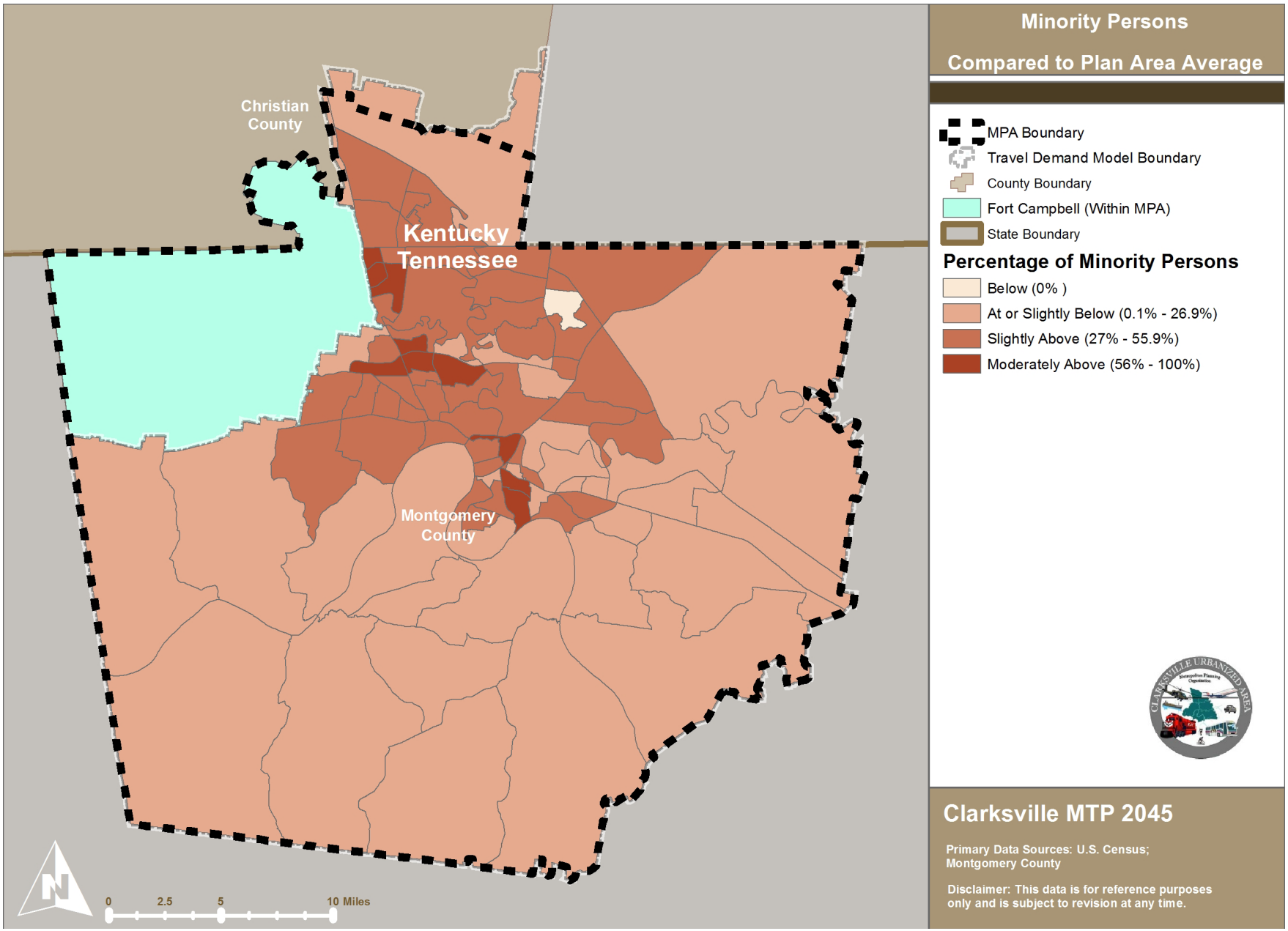


FIGURE 6.19 MINORITY PERSONS COMPARED TO PLAN AREA AVERAGE

Poverty

For this plan, poverty was identified by the U.S. Census "households in poverty in the last 12 months". The plan area average was approximately 18 percent.

BLOCK GROUPS WITH AN AVERAGE OF 30 PERCENT OR MORE HOUSEHOLDS IN POVERTY WERE IDENTIFIED AS MODERATELY ABOVE AVERAGE.

The CTS lines reach the majority of the block groups identified using this method. The CTS routes and percentage of poverty populations within the MPA are shown in Figure 6.20.

On board surveys conducted as part of the COA show that **49 percent of those surveyed indicated that their household income falls within the poverty level.**

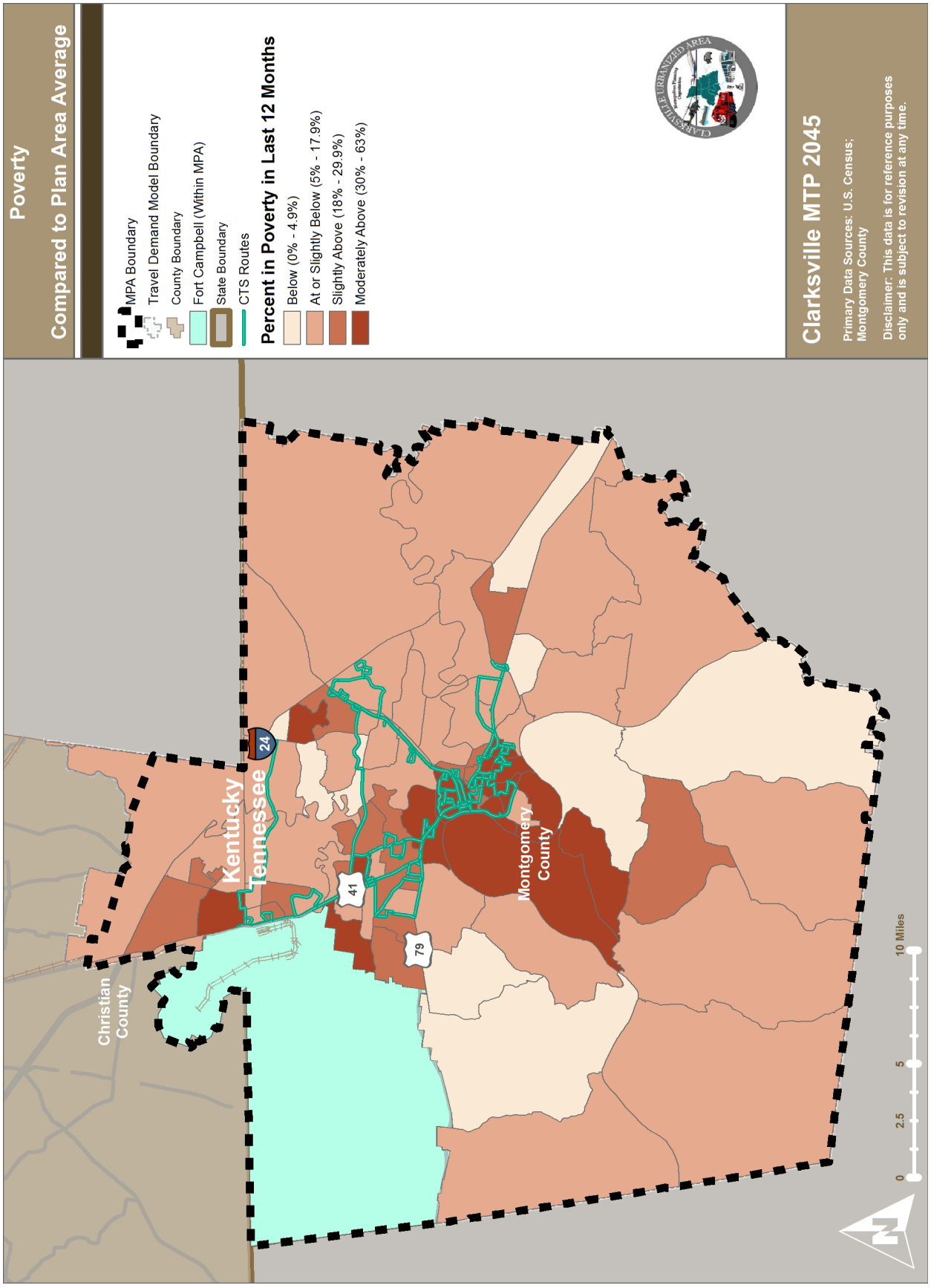


FIGURE 6.20 POVERTY COMPARED TO PLAN AREA AVERAGE

Zero-Vehicle households

Households with no vehicles available to them were identified using the U.S. Census "zero-vehicle households". The average percent of households within the MPA that have no access to a vehicle was approximately 6 percent.

THE BLOCK GROUPS WITH 13 PERCENT OR MORE HOUSEHOLDS THAT HAVE NO VEHICLES WERE IDENTIFIED AS MODERATELY ABOVE THE AVERAGE.

The CTS lines reach the majority of the block groups identified using this method. There are two pockets of households with no access to vehicles outside the CTS operating area. One is to the north in Oak Grove. The other is to the south of the existing routes shown. The CTS routes and percentage of zero-vehicle households within the MPA are shown in Figure 6.21.

Surveys conducted as part of the COA show 61 percent of CTS riders did not have a working vehicle in the household. When this question was further expanded to assess whether a vehicle was available for the trip, 87 percent said that a vehicle was not available. This indicates that the service is currently serving a majority of "captive riders," since they do not have access to a vehicle.

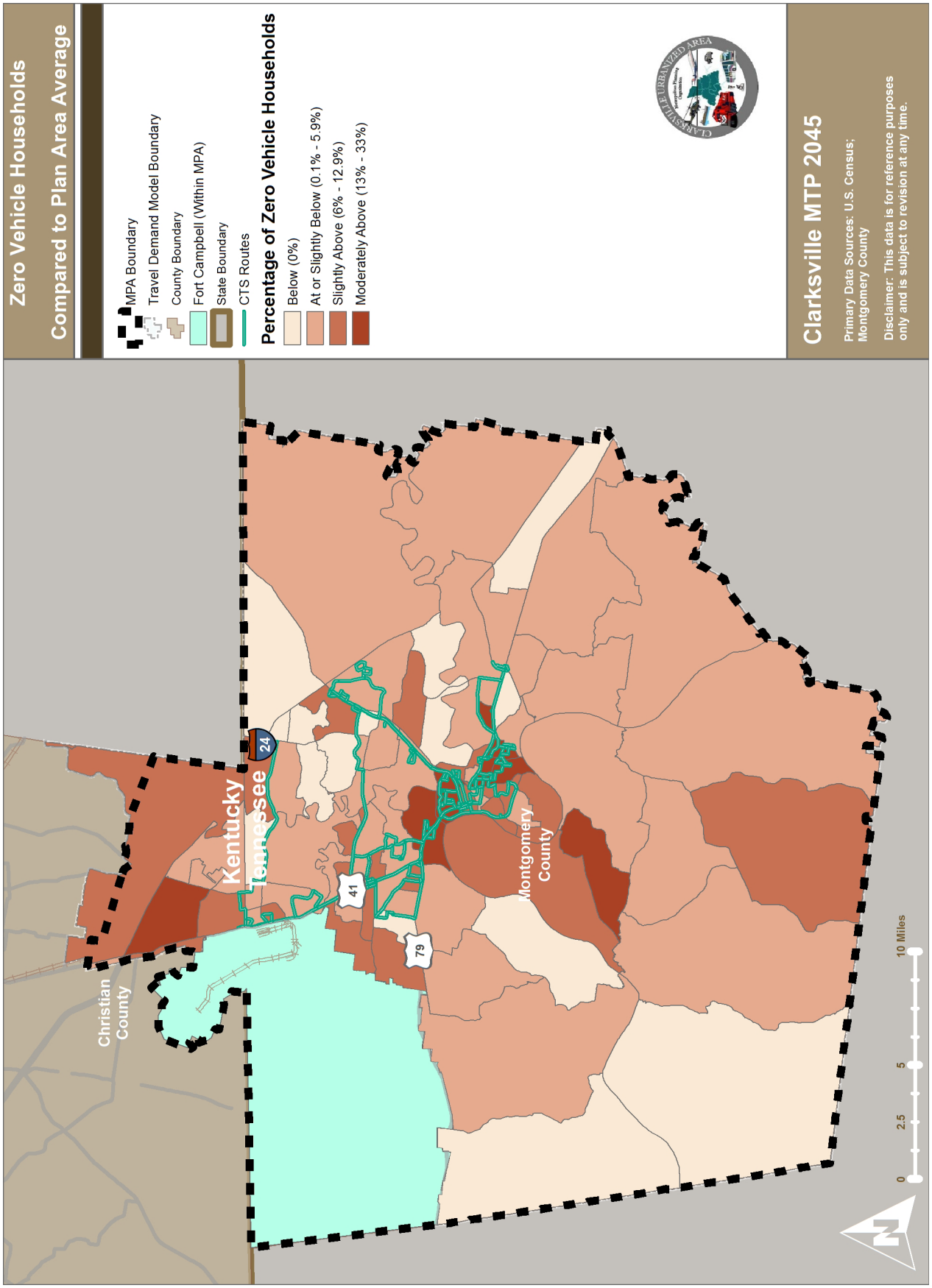


FIGURE 6.21 ZERO-VEHICLE HOUSEHOLDS COMPARED TO PLAN AREA AVERAGE

Over 65 Years of Age

Persons over 65 years of age were identified using the U.S. Census. Within the MPA, the average percentage of persons 65-years old or greater in a block group was approximately 10 percent.

BLOCK GROUPS WITH A PERCENTAGE OF 17 OR GREATER WERE IDENTIFIED AS MODERATELY ABOVE THE AVERAGE.

The block groups with the highest percentage of persons over the age of 65 are in the southern portion of the Plan area.

THE CTS SERVICE COVERS THE BLOCK GROUPS WITH HIGH PERCENTAGES OF PERSONS OVER THE AGE OF 65 WITHIN THE URBAN CORE OF THE MPA. THE OTHER PORTIONS OF MONTGOMERY COUNTY, WHICH ARE NOT COVERED BY THE CTS, ARE SERVED BY THE MCHRA ON-DEMAND TRANSIT SERVICES.

The CTS routes and percentage of elderly population within the MPA are shown in Figure 6.22.

Surveys conducted during the COA show that CTS serves a broad range of riders by age; however, persons over 65 account for only six (6) percent of bus ridership. This reflects the relatively young population within the MPA.

The percentage of persons over the age of 65 is 14 percent in the State of Kentucky, and 15 percent in the State of Tennessee. These percentages are expected to increase as the number of elderly Americans is expected to double by 2060 [7]. **The number of persons over age 65 in Montgomery County is anticipated to increase from approximately 18,000 in 2016 to 66,000 in 2070 [8] .**

Persons over 65 years of age may live in group housing, such as nursing homes and assisted living communities, which provide transportation services. This increase in the elderly population will place a greater demand on MCHRA and CTS services in the future.

7 "Fact Sheet: Aging in the United States". 2016. U.S. Census Population Reference Bureau (PRB)
8 Boyd Center for Business and Economic Research, University of Tennessee, Knoxville - September 2017

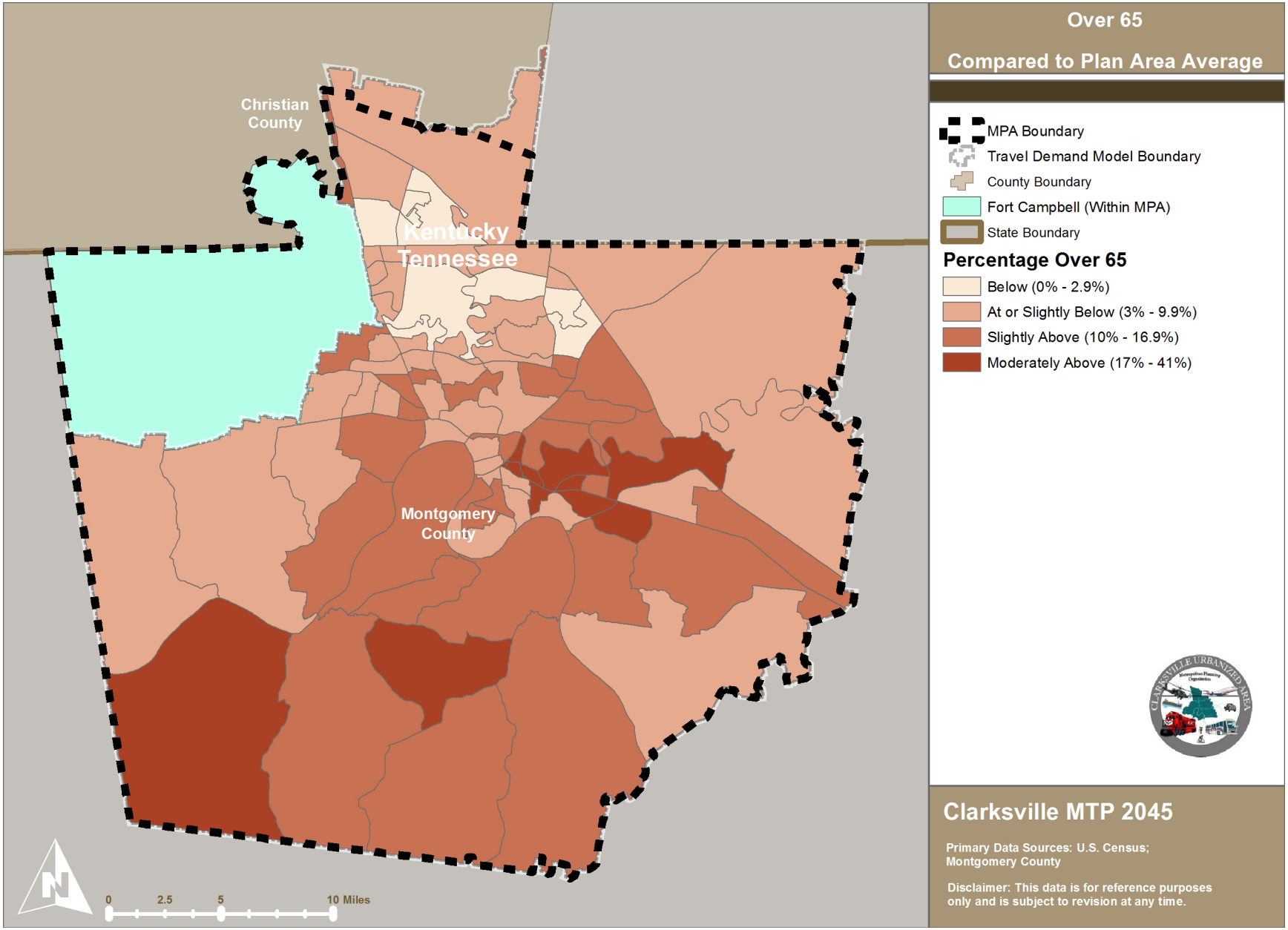


FIGURE 6.22 OVER 65 COMPARED TO PLAN AREA AVERAGE

Persons Aged 18-34

As previously mentioned, the presence of Fort Campbell means that there are a higher than average number of people aged 18-34 within the MPA. This age group is more willing to walk, use a bicycle, or use public transit. While not a transit dependent population, they have a large impact on the transit system. The plan area average for this age group was approximately 30 percent.

BLOCK GROUPS WITH AN AVERAGE OF 43 PERCENT OR MORE WERE IDENTIFIED AS MODERATELY ABOVE THE AVERAGE. THE CONCENTRATION OF THIS AGE GROUP IS IN THE NORTHERN PART OF THE MPA, NEAR FORT CAMPBELL, NEW DEVELOPMENT, AND JOBS.

DATA FROM COA SHOWS:

41%
OF RIDERS ARE AGES
18-34

The CTS currently serves the majority of areas. The CTS routes and percentage of population aged 18-34 within the MPA are shown in Figure 6.23.

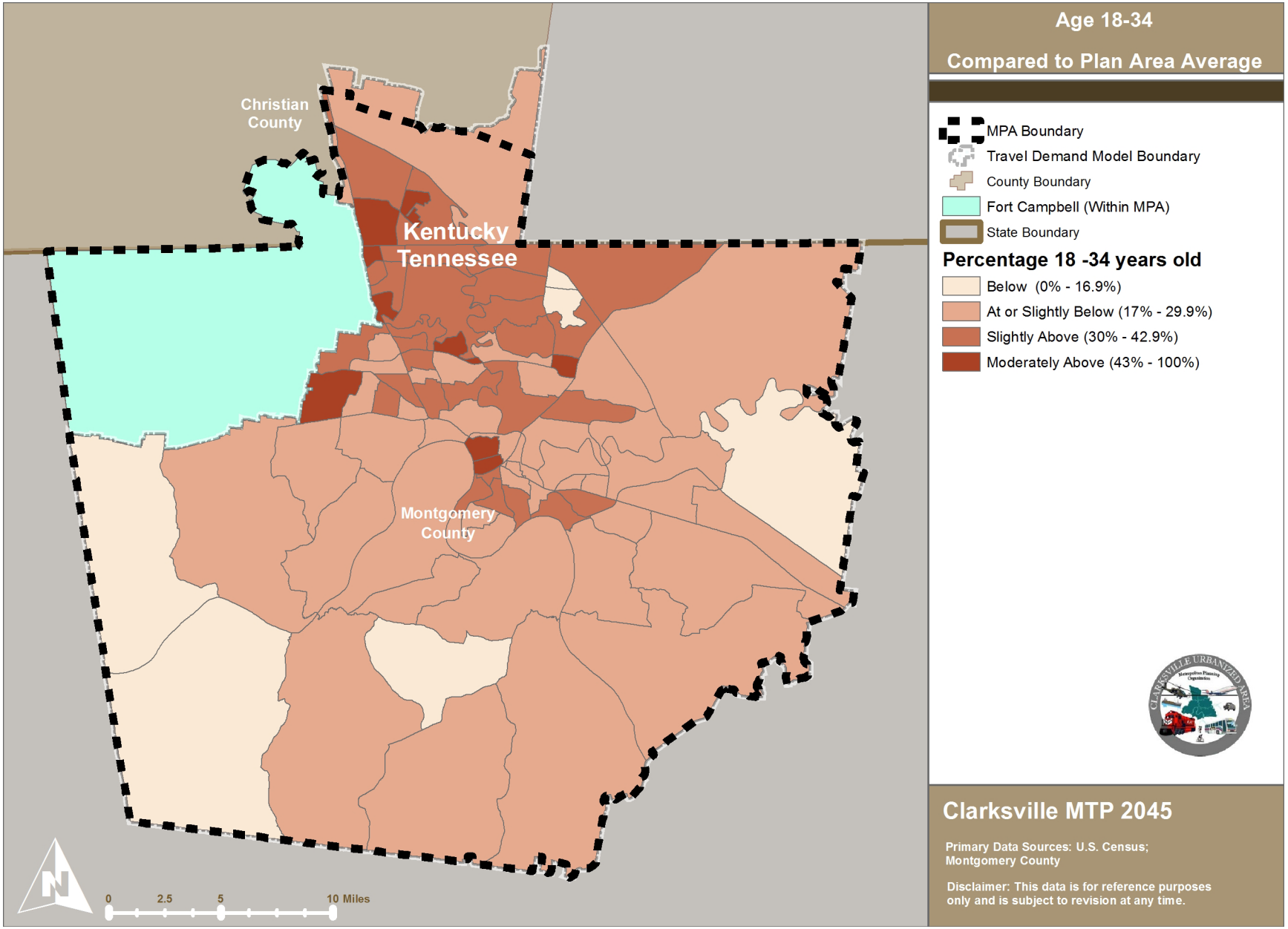


FIGURE 6.23 AGE 18-34 COMPARED TO PLAN AREA AVERAGE

System Performance Targets

In order to provide a well-maintained transportation system, the FTA requires all transit facilities and vehicles be in a State of Good Repair (SGR). New requirements call for the completion of a Transit Asset Management Plan (TAM) to inventory and assess the SGR of assets by October, 2018. The CTS Strategic Plan (2016) outlines a path to obtaining a "state of good repair"and serves as CTS's TAM plan.

The CTS COA inventoried some assets and set a timeframe for replacement of rolling stock meeting useful life.

http://www.cuampo.com/files/FINAL122115StrategicPlan.pdf

http://www.cuampo.com/files/Final%20CTS%20COA%20Report%20(1).pdf

As part of the process of establishing metrics to determine what a State of Good Repair means for the Clarksville MPO, performance measures and targets were established. TDOT and KYTC established and submitted their targets to the FTA in August 2017. In February, the MPO stated their intention to use the targets established by the state departments of transportation. This intention is formalized in a Memorandum of Agreement between the MPO agencies.

THE PLANNING PERFORMANCE MEASURES ESTABLISHED BY THE FTA ARE:

- Percent of revenue vehicles exceeding ULB (Useful Life Benchmark).
- Percent of non-revenue service vehicles exceeding ULB.
- Percent of facilities rated under 3.0 on the TERM (Transit Economic Requirements Model) Scale for the "Administrative and Maintenance" and "Passenger and Parking" classes.
- Percent of track segments under performance restriction, by mode, excluding BRT and Ferry.

The MPA's baseline performance and performance targets are shown in Table 6.19. Data for the State of Tennessee baseline was not available for this report.

TABLE 6.19 - TRANSIT ASSET MANAGEMENT PERFORMANCE MEASURE TARGETS

CLARKSVILLE TRANSIT SYSTEM						
	NTD REPORTING YEAR FY- 2018			PERFORMANCE TARGET YEAR FY- 2019		
ASSET CLASS/ULB	CURRENT YEAR NUMBER OF ASSETS IN SGR	CURRENT YEAR NUMBER OF ASSETS IN SGR BACKLOG	CURRENT YEAR PERCENT OF ASSETS IN SGR BACKLOG	TARGET YEAR NUMBER OF ASSETS IN SGR	TARGET YEAR NUMBER OF ASSETS IN SGR BACKLOG	PERFORMANCE TARGET
Rolling Stock State of Good Repair (SGR)						
BU Bus/ 14 years	12	0	0.00%	12	0	0.00%
CU Cutaway/ 10 years	4	0	0.00%	7	0	0.00%
MV Minivan / 8 years	2	0	0.00%	2	0	0.00%
RT Rubber-tired vintage trolley/8 years	0	0	0.00%	0	0	0.00%
VN Van/ 8 years	7	0	0.00%	7	0	0.00%
Facilities:						
Admin-Maintenance/40 years	4	0	0.00%	4	0	0.00%
Transit Station/40 years	1	0	0.00%	1	0	0.00%
Equipment State of Good Repair (Support Vehicles Only)						
AO Automobile/8 years	11	6	35.29%	13	4	23.53%
MID-CUMBERLAND HUMAN RESOURCE AGENCY						
Rolling Stock State of Good Repair (SGR)						
BU Bus/ 14 years	0	0	0.00%	0	0	25.00%
CU Cutaway/ 10 years	0	0	0.00%	0	0	25.00%
MV Minivan / 8 years	10	19	65.52%	22	7	25.00%
RT Rubber-tired vintage trolley/14 years	0	0	0.00%	0	0	25.00%
VN Van/ 8 years	64	32	33.33%	72	24	25.00%
Facilities:						
Admin-Maintenance/40 years	0	0	0.00%	0	0	25.00%
Transit Station/40 years	0	0	0.00%	0	0	
Equipment State of Good Repair (Support Vehicles Only)						
AO Automobile/8 years	0	0	0.00%	0	0	25.00%

6.4 | Freight

Freight Movement/Regional Commodity Flows

Movement by Weight and Value for Trucks and Rail

Using data obtained from Transearch by TDOT, general trends in freight movement within Montgomery County, Tennessee can be observed. Freight data was unavailable for Christian County, Kentucky.

In 2012, Montgomery County was the 11th highest truck freight-generating county in Tennessee.

Montgomery County trailed counties from other metropolitan areas, as well as several non-metropolitan counties. In terms of value transported, Montgomery County ranks 10th.

Table 6.20 shows that in 2012, truck freight originating or destined for Montgomery County accounted for less than three percent of truck freight volume by weight. The county also accounts for less than two (2) percent of truck freight value in Tennessee. For rail, Montgomery County accounted for less than one (1) percent of all rail freight volume and value in Tennessee.

Table 6.20 Freight Movement by Weight and Value in Montgomery County, 2012

	Truck		Rail	
	Tons	Value	Tons	Value
Montgomery County, TN	6,911,929	$6,524,558,958	68,640	$140,218,135
Kentucky	241,326,300	$424,551,650,000	76,940,170	$18,632,670,000
Tennessee	262,478,590	$441,721,710,000	35,984,660	$22,216,630,000

Note: Excludes through-traffic
Source: Transearch, Freight Analysis Framework

Table 6.20 displays the freight truck movement within Montgomery County. It should be noted that the information above does not include through traffic, which accounts for 60 percent of freight transported in Tennessee, as indicated in Table 6.21. Nearly 48 percent of all truck freight volume by weight is through traffic in Tennessee, while nearly 67 percent of all rail freight volume by weight is through traffic.

Table 6.21 Freight Movement in Tennessee by Direction by Weight, 2012

	Inbound	Outbound	Intrastate	Through	Total
Truck	133,551,873	125,024,562	60,261,031	290,440,845	609,278,311
Rail	98,102,632	76,352,009	7,813,027	372,983,680	555,251,348
Total	**231,654,505**	**201,376,571**	**68,074,058**	**663,424,525**	**1,164,529,659**

Source: Transearch

Table 6.22 Freight Truck Movement in Montgomery County by Direction by Weight, 2012

	From Outside Tennessee	To Outside Tennessee	From Other Tennessee County	To Other Tennessee County	Within County	Total
Montgomery County	2,746,997	1,816,627	1,177,231	1,133,545	37,529	6,911,929

Source: Transearch

Movement for Other Modes

Due to the MPA's size and relatively low freight volumes, the FHWA's Freight Analysis Framework (FAF) commodity flow data is not available at any geography relevant to the MPA. State-level data can provide some insight to how freight is handled in the MPA.

Table 6.23 and Table 6.24 show the ton-miles of freight generated in Kentucky and Tennessee, respectively. The truck and rail modes account for about 50 percent of all ton-miles of freight in the State of Kentucky, and over 70 percent in the State of Tennessee. Since there are no multi-purpose commercial or industrial water ports in the MPA, it can be assumed that the truck and rail modes account for the overwhelming majority of ton-miles in the MPA as well. A key difference between the two modes of freight movement is that rail tends to travel much greater distances; nearly 750 miles compared to about 275 miles for trucks.

Table 6.23 Means of Transporting Freight Originating in Kentucky, 2015

	Ton-miles (millions)	
	Number	Percent of Ton-miles
Truck	32,434.53	28.73%
Rail	29,252.57	25.91%
Water	26,082.05	23.10%
Air (include truck-air)	53.29	0.05%
Multiple modes & mail	6,283.60	5.57%
Pipeline	18,779.73	16.64%
Total	**112,885.77**	**100.00%**

Source: Freight Analysis Framework

Table 6.24 Means of Transporting Freight Originating in Tennessee, 2015

	Ton-miles (millions)	
	Number	Percent of Ton-miles
Truck	41,966.88	62.11%
Rail	6,494.68	9.61%
Water	1,481.11	2.19%
Air (include truck-air)	24.32	0.04%
Multiple modes & mail	3,945.35	5.84%
Pipeline	13,651.80	20.21%
Total	**67,564.14**	**100.00%**

Source: Freight Analysis Framework

Trucking Network and Facilities

Network

The MPA has no active intermodal terminal facilities or roadways designated as intermodal connectors. I-24 is part of the National Primary Freight Network (NPFN), which makes it part of the National Highway Freight Network. The other two roadways within the MPA that are part of the National Highway Freight Network are SR-76 from Memorial Drive to I-24, and SR-13 from I-24 to Jim Johnson Road. TDOT has identified all interstates and state-owned arterials as key components of their freight network. The major roadways that have been identified are I-24, US 41A, and US 79. The State of Kentucky freight plan identifies all NHS routes and principal arterials as part of their freight network. This network also contains routes on the National Truck Network and 900 additional roadway miles that enhance the statewide geographic coverage of the network. These freight networks can be found in each state's freight plan[9] [10] .

All elements of the truck freight network in the MPA are illustrated in Figure 6.24.

Facilities

There are no active intermodal terminal facilities listed by the Bureau of Transportation Statistics within the MPA. Beyond intermodal terminal facilities, there are many trucking establishments within the MPA. These establishments provide both local and long- distance trucking services.

Traffic

In an effort to better understand freight needs, the travel demand model is able to calculate the estimated daily freight truck volumes on the MPA roadways. These estimated volumes are illustrated in Figure 6.25.

The estimated freight truck volumes suggest the following trends:

- Freight truck traffic is greatest on I-24, US 79, and US 41A. These correspond to the roadways included in the KY and TN state freight networks.
- Freight truck traffic is also relatively high on portions of SR-374 and a few other roadways segments.

9 https://transportation.ky.gov/Planning/Documents/Freight%20Planning/Freight%20Plan/2016%20KYTC%20Freight%20Plan/2016%20Kentucky%20Freight%20Plan.pdf

10 https://www.tn.gov/content/dam/tn/tdot/long-range-planning/TN%20Statewide%20Multimodal%20Freight%20Plan-web.pdf

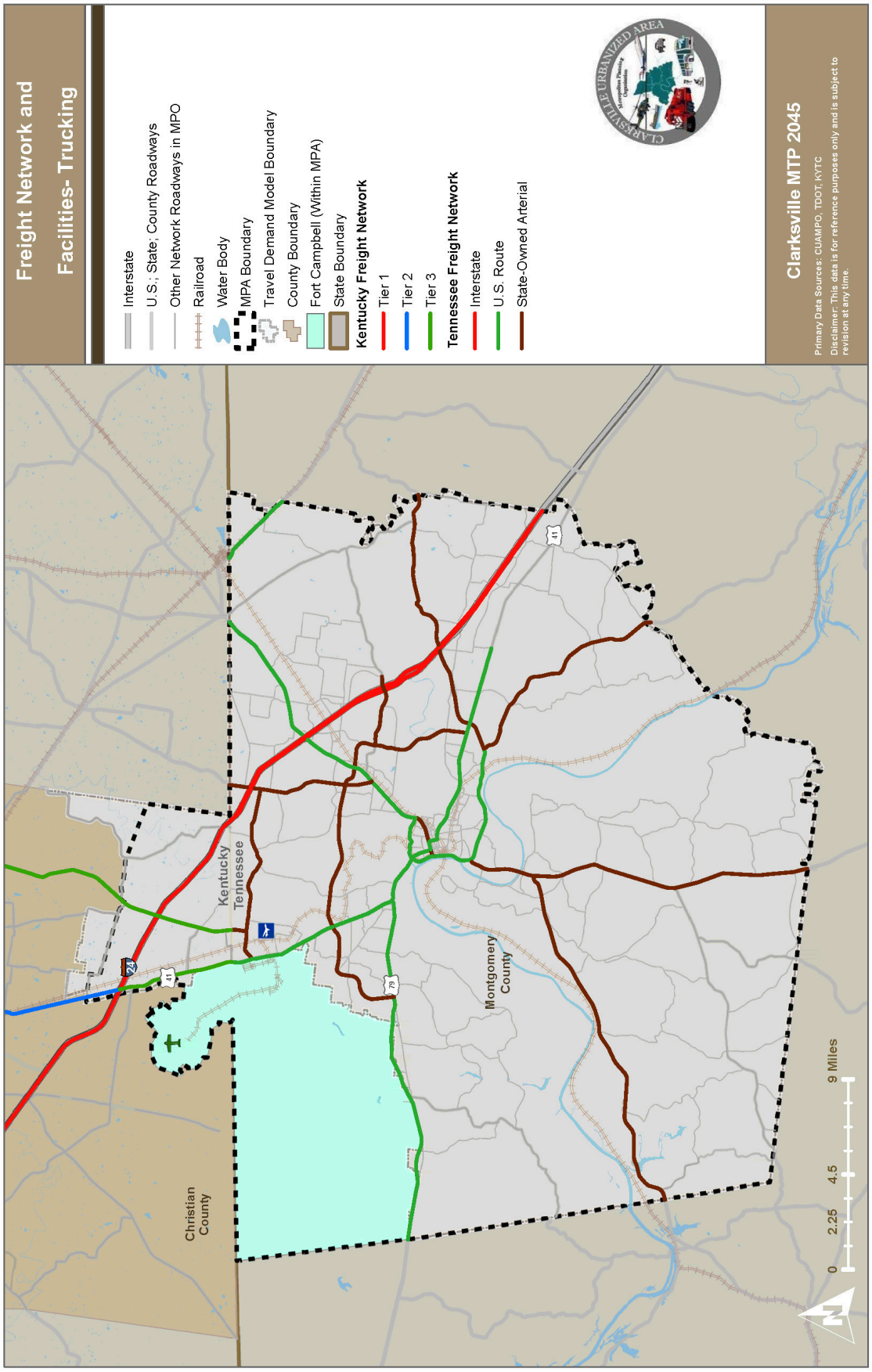


FIGURE 6.24 FREIGHT NETWORK AND FACILITIES- TRUCKING

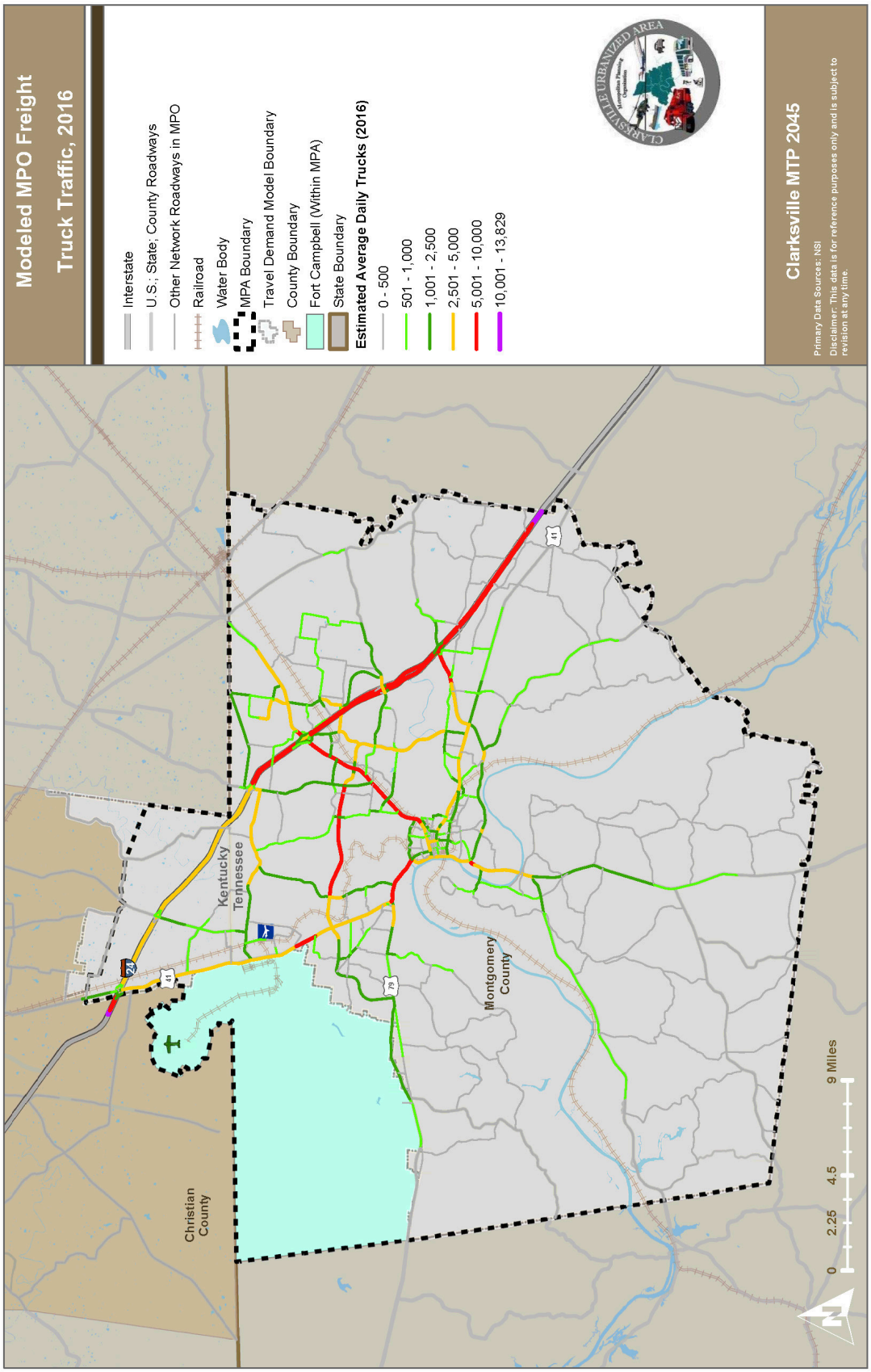


FIGURE 6.25 MODELED MPO FREIGHT TRUCK TRAFFIC, 2016

Freight Performance Measures

The FHWA established one performance measure for freight: the Truck Travel Time Reliability (TTTR) Index on the Interstate system. The FHWA states that the TTTR Index is calculated by:

"Freight movement will be assessed by the 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. 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."

Data from the NPMRDS states that I-24, the MPA's only Interstate, has an overall TTTR of 1.14. By comparison, the State of Tennessee has a TTTR of 1.35 in their baseline performance report, and the State of Kentucky has a TTTR of 1.23 in their Baseline Performance Report.

The TTTR of each I-24 segment is shown in Figure 6.26. Currently, there are no freight bottlenecks within the MPA reported by TDOT or KYTC.

Freight Targets

Performance measures for freight were finalized by the FHWA with an effective date of May 20, 2017. This requires the states to set their targets by May 20, 2018, and report them to the FHWA in the Baseline Performance Period Report by October 1, 2018. These targets must be reported every 4 years afterwards. Each state is required to establish 2-year and 4-year targets for the freight performance measure. The MPO may either support the targets established by KYTC and TDOT or establish their own 4-year target. For the 2045 MTP, the CUAMPO has chosen to support the state targets established by KYTC and TDOT.

The KYTC state performance measure targets for TTTR are 1.250 for both 2-year and 4-year targets. The TDOT state performance measure targets for TTTR are 1.350 for the 2-year target and 1.330 for the 4-year target.

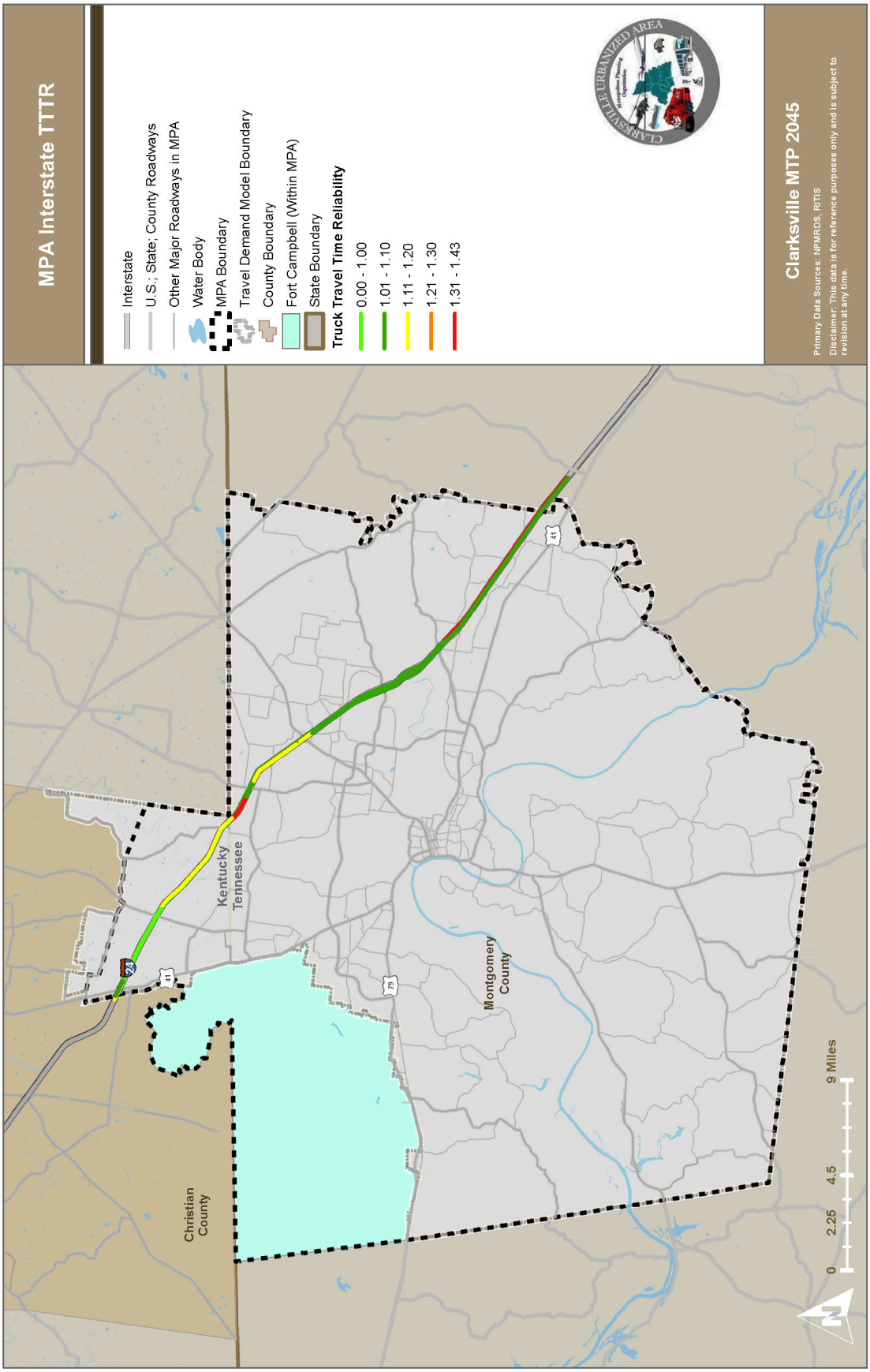


FIGURE 6.26 MPA INTERSTATE TTTR

Rail Network and Facilities

Network

The MPA is served by two railroads: Tier I CSX Transportation (CSXT), and the Tier II shortline from the R.J. Corman Railroad Company (RJCM). A third rail line in the MPA is used for Fort Campbell and the airport.

Facilities

CSXT is headquartered in Jacksonville, FL and maintains a rail line that passes through the northeast corner of the MPA. It operates about 21,000 miles of track, all of which is located in the eastern U.S. The portion of the rail line within the MPA is about 14 miles northeast of the City of Clarksville. It connects to both the RJCM and Fort Campbell rail lines. The CSXT line provides access to:

- Chicago, IL
- Jacksonville, FL
- Louisville, KY
- Nashville, TN
- Atlanta, GA

The RJCM is the MPA's main railroad. It passes through the MPA from southwest to northeast. The line connects with CSXT's lines in the northeastern corner of Clarksville and in Nashville. Services include a spur to Hemlock Semiconductor, Inc. and the Clarksville-Montgomery County Industrial Park. Commodities shipped by the RJCM include:

- aluminum
- steel
- wallboard
- lumber
- zinc
- grain
- paper
- chemicals

Traffic

The amount of freight carried by the rail lines in the Clarksville MPA is not readily available. Further information from CSX and RJCorman can be obtained through the rail lines. As TDOT has frozen funding for shortline railroads, the operators of those lines are not required to submit annual reports regarding the goods they transport.

Figure 6.27 shows the location of the rail facilities within the MPA.

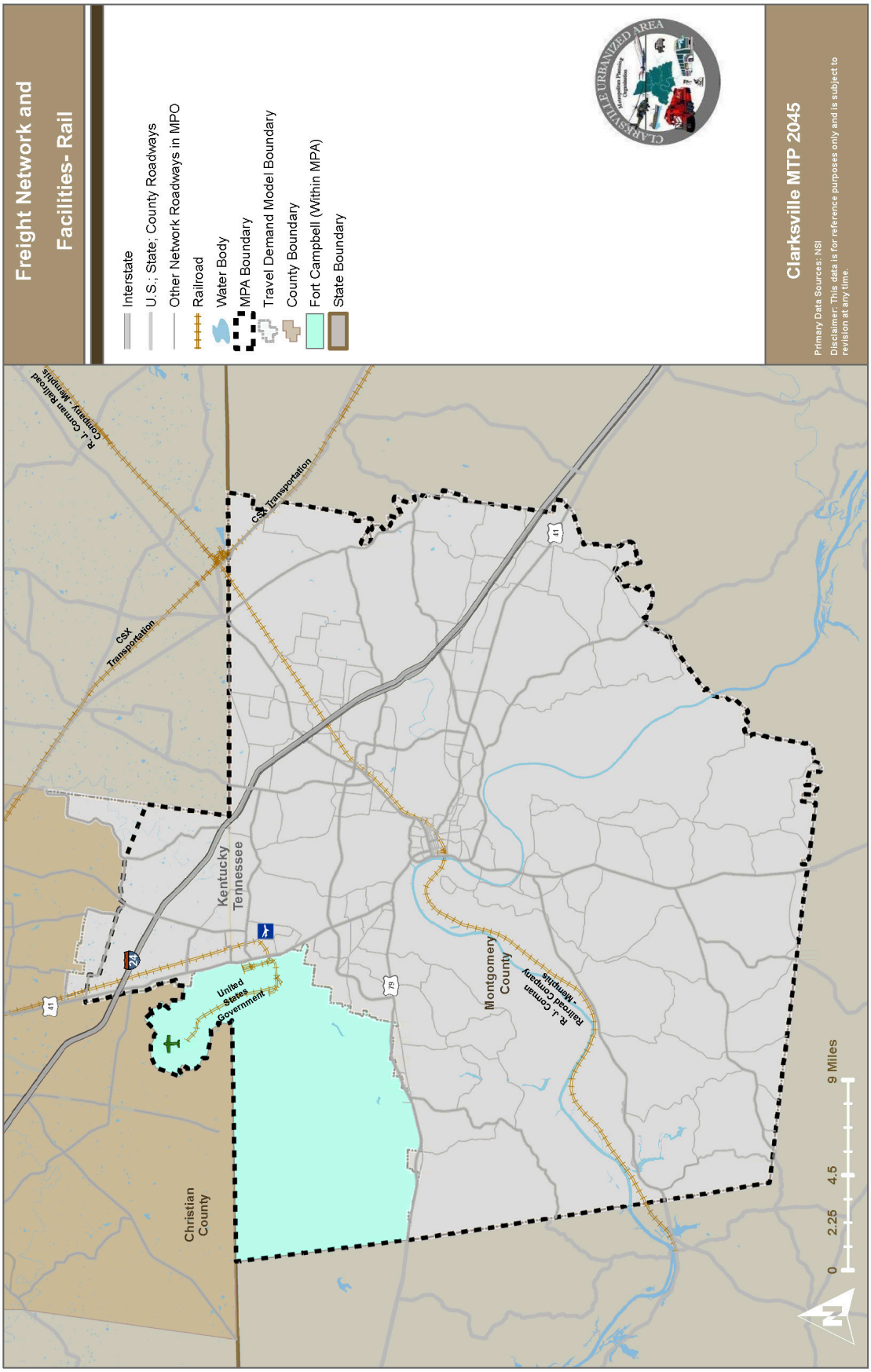


FIGURE 6.27 FREIGHT NETWORK AND FACILITIES- RAIL

Airports

Facilities

While only a small amount of freight is typically shipped by air, these commodities tend to be high in value. The area around airports also tends to serve as distribution and manufacturing hubs.

There is only one public-use airport in the MPA, the Clarksville Regional Airport, which is also known as Outlaw Field. The Clarksville Regional Airport is a general aviation airport that transports very little freight. The Nashville International Airport is the nearest airport that provides commercial service. Public transit is able to reach the airport by Route 1 (Fort Campbell) and Route 2 (Tiny Town).

The Clarksville Regional Airport is governed by the Clarksville-Montgomery County Regional Airport Authority, which has responsibility of operational oversight and maintaining safe and efficient air operations. From the air, the Clarksville Regional Airport is approximately 4.0 nautical miles southeast of Fort Campbell Army Airfield and 4.0 nautical miles northeast of Sabre Army Heliport. Due to the proximity of the airport to these locations, the arrival and departure of flights to the airport are controlled by Fort Campbell Air Traffic Control. Clarksville Regional Airport's airspace extends approximately 1.5 nautical miles west of the center of the airfield where it intersects the eastern edge of the R-3702A-B Restricted Airspace areas, and is within the A-371 Alert Area.

Clarksville Regional Airport

Total Aircraft:

59
(51 Single Engine)

Daily Aircraft Operations 2017

89

The total number aircraft based at the airport has increased over the past several years. The current hangars available at the airport are now at capacity. There are 59 total aircraft based at the Clarksville Regional Airport, with 51 of those aircraft being single engine planes. Daily operations at the airport average 89 aircraft in 2017 according to FAA traffic records. None of these aircraft operations included commercial flights. The airport is shown in Figure 6.28.

A new $5 million airport terminal was completed in 2012, as well as a new aircraft parking apron that was completed in 2015. This new apron includes weight bearing capabilities that match those of the runway and taxiway. There are now two dedicated helicopter landing pads at the airport. Recently, new T Hangars were built in 2016 which included sitework for future hangars. During the beginning of 2018, the airport

secured nearly 13 million in federal and state grant dollars to rebuild the main runway and associated taxiway. This project will add a new high visibility LED runway and taxiway lighting system.

Cargo Volume

No cargo data was available for the Clarksville Regional Airport.

Water Ports

Facilities

There are no major port facilities located within the MPA. However, there are four single-purpose port facilities (shown in Figure 6.28) located along the Cumberland River. These ports are for:

- Ingram Materials, Inc. – Located at river mile 126.7 near South Riverside Drive. The facility operates at a water depth of nine feet and a berthing space of 200 feet.
- Nystar Taylor Chemicals – Located at river mile 122.2 near Zinc Plant Road. The facility operates at a water depth of 11 feet and a berthing space of 1,000 feet. A surface railroad track connects the port to the R.J. Corman Railroad.
- Winn Materials, Inc. – Located at river mile 123.7 off Barge Point Road. The facility operates at a water depth of 22 feet and a berthing space of 390 feet. The facility's primary purpose is the loading of crushed limestone onto barges and the unloading of sand.
- Hopkinsville Elevator Company Inc. – Located at river mile 123.9 off Barge Point Road. The facility operates at a water depth of 22 feet and a berthing space of 800 feet. The facilities primary purpose is to ship grain products.

Cargo Volume

Cargo volumes for the four single-purpose ports listed above are not readily available.

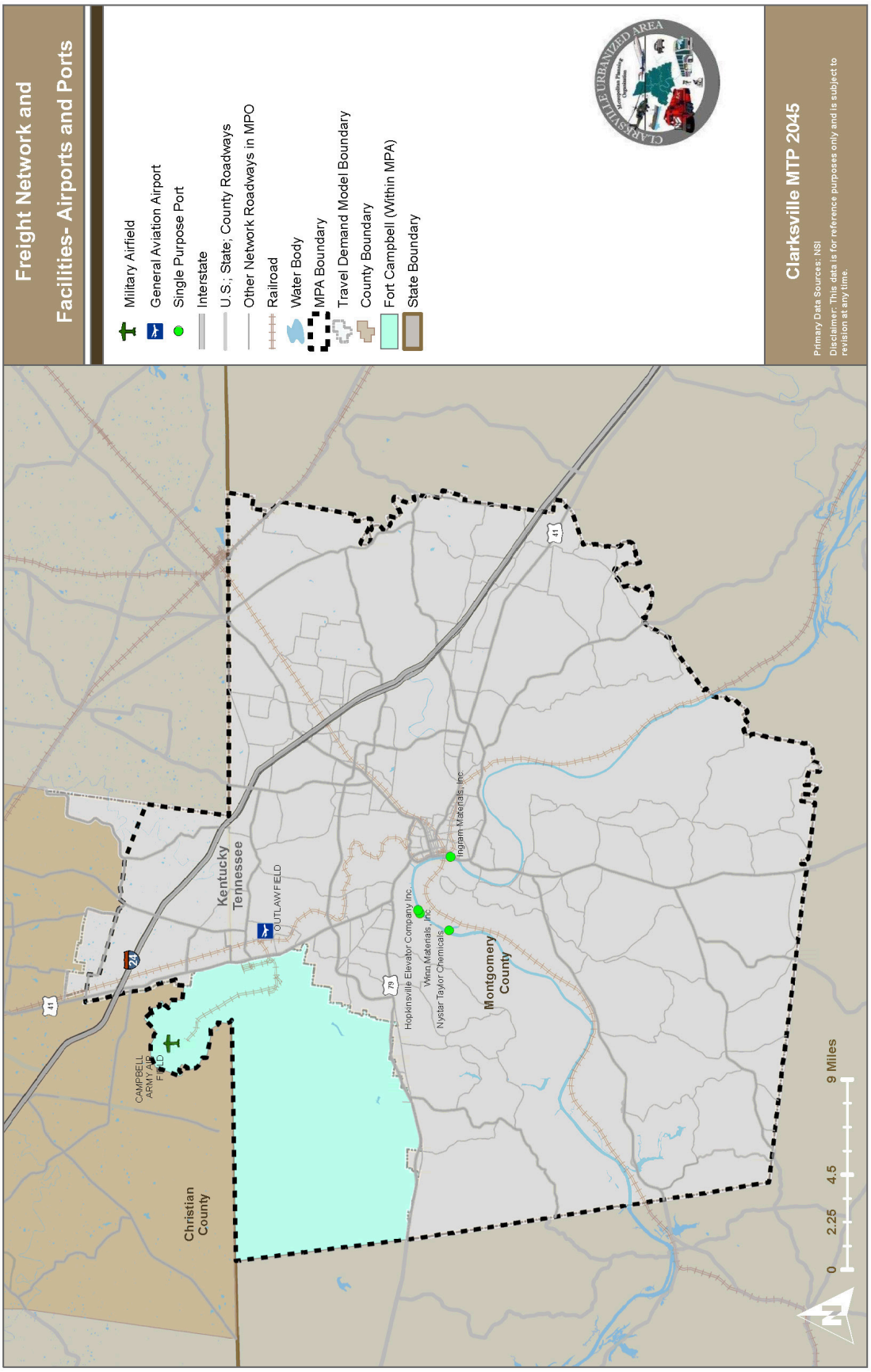


FIGURE 6.28 FREIGHT NETWORK FACILITIES- AIRPORTS AND PORTS

Statewide Freight Plan

Both KYTC and TDOT have statewide comprehensive freight plans. KYTC also maintains a separate statewide rail plan. These plans are a comprehensive evaluation of each state's freight transportation system. They allow for the efficient planning and investment in the preservation, improvement, and strategic expansion of each state's freight system.

Of particular importance, the freight plans do the following:

1. Identifies highway and rail freight corridors of statewide significance.
2. Identifies improvement strategies through a needs assessment, with a focus on ensuring continued efficient and safe movement of freight within the key freight corridors.
3. Identifies potential improvements and funding for the freight system.

6.5 | Safety

The safety element of the 2045 MTP focused on gathering and analyzing the available safety data and then identifying general hazardous areas.

Due to the limited scope of this study, it does not identify location specific recommendations for the identified hazardous locations. However, potential countermeasures which could be used to mitigate various crash types have been included in Chapter 8: Future Transportation Needs. The FAST Act requires each state to maintain a Highway Safety Improvement Program (HSIP). The HSIP must include the FHWA performance measures for roadway safety and the development a Strategic Highway Safety Plan (SHSP).

"Disclaimer: This document and the information contained herein is prepared solely for the purpose of identifying, evaluating and planning safety improvements on public roads which may be implemented utilizing federal aid highway funds; and is therefore exempt from discovery or admission into evidence pursuant to 23 U.S.C. 409."

Roadways Crash Data Analysis

According to the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS), between 2011 and 2015, approximately 33,400 fatalities occurred annually on United States roadways.

Every crash, regardless of the severity, costs money and time in damages, emergency services, and delays. These costs affect both governments and taxpayers. Despite the trend of reduced crashes over previous years, crashes and roadway safety still need to be addressed. One of the goals of this plan is to improve travel safety by reducing the risk of crashes on the roadways.

- severity
- location
- alcohol involvement
- vehicle type

Crash records for the MPA were obtained from KYTC and Tennessee's Integrated Traffic Analysis Network (TITAN). These crash records are from 2012 through 2016. The crash records included the:

From 2012 through 2016, the years for which all necessary data for analysis was available, a total of 29,728 crashes occurred within the MPA. Table 6.25 shows the breakdown of the crashes by county and year.

Table 6.25 MPA Crashes by Year, 2012-2016

Crash Year	Montgomery County Total	Montgomery County Fatal Crashes	Montgomery County Severe Crashes	Christian County Total	Christian County Fatal Crashes	Christian County Severe Crashes	MPA Total
2012	5,559	22	193	327	0	0	5,886
2013	5,412	21	196	327	2	0	5,739
2014	5,526	24	228	295	0	1	5,821
2015	5,842	27	234	321	0	0	6,163
2016	5,768	24	167	351	2	0	6,119
2017	6,300	26	172	--	--	--	6,300
Total	**34,407**	**144**	**1,190**	**1,621**	**4**	**1**	**36,028**

Note: Kentucky 2017 crash data was unavailable at the time of this report.

Source: KYTC, TITAN (2012-2016)

Crash Severity and Alcohol Involvement

Crash severity reveals the extent to which crashes in the MPA pose a safety risk to roadway users. The severity of the crashes within the MPA from 2012 through 2016 is shown in Table 6.26. Within the MPA, there were 121 fatal crashes and 7,331 crashes causing injuries. Less than four (4) percent of the total crashes resulted in a fatality or severe injury. Nearly 75 percent of the crashes had no injuries reported.

Table 6.26 MPA Crashes by Severity, 2012-2016

Severity	Montgomery County	Christian County	MPA Total	Percentage
Fatal	117	4	121	0.4%
Incapacitating Injury	983	35	1,018	3.4%
Non-incapacitating injury	6,190	123	6,313	21.2%
Property damage only (PDO)	20,817	1,447	22,264	74.9%
Unlisted	0	12	12	0.0%
Total	**28,107**	**1,621**	**29,728**	**100.0%**

Source: KYTC, TITAN (2012-2016)

An analysis was also conducted on alcohol involvement in the MPA's crashes. The Clarksville area has made strides in recent years to reduce impaired driving. As part of these efforts, law enforcement has been actively conducting sobriety checkpoints and introducing additional enforcement programs. Table 6.27 displays a breakdown of alcohol involvement for crashes that occurred in the MPA between 2012 and 2016. Less than two (2) percent of overall crashes in the MPA involved alcohol. Of the 121 total fatal crashes within the MPA, seven (7) were fatal crashes related to alcohol involvement, resulting in a nearly six (6) percent share of total fatality crashes being alcohol related.

Table 6.27 Alcohol Involvement in Crashes, 2012-2016

Alcohol Involvement	Montgomery County	Christian County	MPA Total	Percentage
Alcohol involved	335	62	397	1.3%
Alcohol not involved	27,772	1,559	29,331	98.7%
Total	**28,107**	**1,621**	**29,728**	**100.0%**

Source: KYTC, TITAN (2012-2016)

11 https://tntrafficsafety.org/
12 https://transportation.ky.gov/HighwaySafety/Pages/default.aspx

Additional efforts have been made by the Tennessee Highway Safety Office (THSO)[11] and the Kentucky Office of Highway Safety[12] (KOHS) to educate roadway users on the dangers of:

- drunk driving
- distracted driving
- lack of seatbelt use
- speeding

THE PROGRAMS INITIATED BY THESE TWO AGENCIES INCLUDE:

- Click It or Ticket
- Booze It & Lose It (THSO)
- Drive Sober or Get Pulled Over (KOHS)
- Buckle Up in Your Truck
- 100 Days of Summer Heat (THSO)
- One Text or Call Could Wreck It (KOHS)
- Speed Week (KOHS)

Crash Locations

THERE WERE NEARLY 12,400 INTERSECTION CRASHES IN THE MPA FROM 2012 TO 2016. THIS REPRESENTS NEARLY 42 PERCENT OF ALL MPA CRASHES.

Table 6.28 shows the top 20 intersections with the highest crash frequency in the MPA and their severity. Table 6.29 shows the collision types that occurred at these intersections. **These intersections account for nearly 28 percent of all intersection crashes within the MPA.** Figure 6.29 displays the top 20 intersections with high crash frequency.

The nature of this study is only to identify trends; thus it did not attempt to analyze each location and corresponding crash records.

11 https://tntrafficsafety.org/
12 https://transportation.ky.gov/HighwaySafety/Pages/default.aspx

Table 6.28 Top 20 Intersections with High Crash Frequency by Severity, 2012-2016

Rank	Location	Crashes	Fatal	Incapacitating Injury	Non-Incapacitating Injury	PDO
1	US 41A/Madison St @ SR-76	342	0	4	66	272
2	US 41A/Providence Blvd @ US 79/Kraft St	287	0	7	67	213
3	US 79/Wilma Rudolph Blvd @ SR-48/Trenton Rd	270	0	4	46	220
4	SR-48/College St @ Second St	253	0	4	67	182
5	SR-48/Trenton Rd @ SR-236/Tiny Town Rd	253	0	9	59	185
6	US 79/Wilma Rudolph Blvd @ Dunbar Cave Rd	211	0	5	50	156
7	SR-374/101st Airborne Division Pkwy @ Peacher's Mill Rd	189	0	9	34	146
8	SR-76 @ Sango Rd	178	1	9	46	122
9	US 41A/Providence Blvd @ Peacher's Mill Rd	147	0	3	35	109
10	US 41A/Fort Campbell Blvd @ SR-236/Tiny Town Rd	134	0	0	23	111
11	US 79/Wilma Rudolph Blvd @ Ted Crozier Blvd	134	0	1	22	111
12	SR-374/101st Airborne Division Pkwy @ Old Trenton Rd	133	0	3	39	91
13	US 79/Wilma Rudolph Blvd @ Needmore Ln	123	0	1	25	97
14	SR-374/101st Airborne Division Pkwy @ SR-48/Trenton Rd	122	3	7	39	73
15	US 79/Wilma Rudolph Blvd @ Dunlop Ln	120	0	3	25	92
16	SR-374/Richview Rd @ Memorial Dr	111	0	1	19	91
17	US 79/Wilma Rudolph Blvd @ I-24 EB Ramps	111	0	2	27	82
18	US 41A/Fort Campbell Blvd @ Britton Springs Rd	108	0	2	30	76
19	SR-48/Trenton Rd @ Needmore Rd	106	0	4	25	77
20	US 41A/Madison St @ Memorial Dr	105	1	4	18	82
	Total	**3,437**	**5**	**82**	**762**	**2,588**

Source: KYTC, TITAN (2012-2016)

TABLE 6.29 TOP 20 INTERSECTIONS WITH HIGH CRASH FREQUENCY BY COLLISION TYPE, 2012-2016

RANK	LOCATION	CRASHES	NO COLLISION WITH VEHICLE	REAR END	HEAD ON	ANGLE	SIDE-SWIPE SAME DIR.	SIDE-SWIPE OPP. DIR	REAR TO SIDE	REAR TO REAR	OTHER	UN-KNOWN
1	US 41A/Madison St @ SR-76	342	7	241	3	71	14	1	0	0	2	3
2	US 41A/Providence Blvd @ US 79/Kraft St	287	14	137	13	89	27	4	0	0	3	0
3	US 79/Wilma Rudolph Blvd @ SR-48/Trenton Rd	270	5	228	1	26	7	0	0	1	2	0
4	SR-48/College St @ Second St	253	8	105	13	107	10	3	0	0	6	1
5	SR-48/Trenton Rd @ SR-236/Tiny Town Rd	253	6	152	8	73	8	3	1	0	2	0
6	US 79/Wilma Rudolph Blvd @ Dunbar Cave Rd	211	4	136	2	54	15	0	0	0	0	0
7	SR-374/101st Airborne Division Pkwy @ Peacher's Mill Rd	189	2	115	4	43	16	2	1	4	2	0
8	SR-76 @ Sango Rd	178	3	67	0	96	8	1	1	0	2	0
9	US 41A/Providence Blvd @ Peacher's Mill Rd	147	8	76	6	47	8	1	0	0	1	0
10	US 41A/Fort Campbell Blvd @ SR-236/Tiny Town Rd	134	3	81	0	40	7	1	0	0	2	0
11	US 79/Wilma Rudolph Blvd @ Ted Crozier Blvd	134	2	61	1	58	7	2	2	0	0	1
12	SR-374/101st Airborne Division Pkwy @ Old Trenton Rd	133	1	103	2	21	1	1	1	1	2	0
13	US 79/Wilma Rudolph Blvd @ Needmore Ln	123	0	57	2	54	8	1	0	0	1	0

Source: KYTC, TITAN (2012-2016)

continued

TABLE 6.29 TOP 20 INTERSECTIONS WITH HIGH CRASH FREQUENCY BY COLLISION TYPE, 2012-2016

RANK	LOCATION	CRASHES	NO COLLISION WITH VEHICLE	REAR END	HEAD ON	ANGLE	SIDE-SWIPE SAME DIR.	SIDE-SWIPE OPP. DIR	REAR TO SIDE	REAR TO REAR	OTHER	UN-KNOWN
14	SR-374/101st Airborne Division Pkwy @ SR-48/ Trenton Rd	122	2	72	8	33	6	0	0	0	1	0
15	US 79/Wilma Rudolph Blvd @ Dunlop Ln	120	2	66	0	42	6	1	0	0	2	1
16	SR-374/Richview Rd @ Memorial Dr	111	4	86	1	16	3	0	0	0	1	0
17	US 79/Wilma Rudolph Blvd @ I-24 EB Ramps	111	2	74	1	27	6	0	0	0	1	0
18	US 41A/Fort Campbell Blvd @ Britton Springs Rd	108	6	42	4	44	10	0	0	0	2	0
19	SR-48/Trenton Rd @ Needmore Rd	106	1	69	1	26	6	2	0	0	1	0
20	US 41A/Madison St @ Memorial Dr	105	8	51	3	32	6	2	0	0	3	0
	Total	**3,437**	**88**	**2,019**	**73**	**999**	**179**	**25**	**6**	**6**	**36**	**6**

Source: KYTC, TITAN (2012-2016)

Crash Rates

Crash rates for the study area were based on the model network layer and base year (2016) volumes obtained from the Clarksville MPO travel demand model. The length of each segment and the corresponding daily traffic volumes from the model are used in the crash rate equation. The segment crash rate equation is:

$$\text{Segment Crash Rate} = \frac{N*10^6}{365*ADT*L}$$

Where:

Segment Crash Rate = crashes per million vehicle miles traveled

N = average annual crash frequency of the segment

ADT = average daily traffic of the segment

L = length of the segment in miles

Table 6.30 shows the ten (10) segments with the highest crash frequencies in the MPA and their corresponding crash rates. Table 6.31 shows the ten (10) segments with the highest crash rates in the MPA (with a length that is greater than one-tenth of a mile). Figure 6.29 illustrates the locations with the highest crash frequencies and crash rates. Tables 6.30 and 6.31 show the relative ranking of the segments by their crash frequencies and rates and are not used to infer an order of priority.

The equation that was used to calculate intersection crash rates is:

$$\text{Intersection Crash Rate} = \frac{N*10^6}{365*ADT}$$

Where:

Intersection Crash Rate = crashes per million vehicles entering

N = average annual crash frequency of the intersection

ADT = average daily traffic entering the intersection

Table 6.32 shows the ten (10) intersections with the highest crash frequencies in the MPA and their corresponding crash rates.

Table 6.30 Top 10 High Crash Frequency Segments and Crash Rates, 2012-2016

Segment	From	To	Total Crashes	Annual Crash Frequency	ADT	Length (mi)	Crash Rate*
US 41A/US 79/ Providence Blvd	Peacher's Mill Rd	0.94 miles east	265	53.00	42,626	0.94	5.43
I-24 EB	SR-237/Rossview Rd	SR-76	210	42.00	31,218	2.11	1.75
I-24 EB	SR-48/Trenton Rd	US 79/Wilma Rudolph Blvd	176	35.20	27,035	2.33	1.53
US 41A/ Fort Campbell Blvd	Britton Springs Rd	0.54 miles south	131	26.20	31,687	0.54	4.22
US 79/SR-13/ Wilma Rudolph Blvd	I-24 West Ramps	I-24 East Ramps	111	22.20	33,937	0.27	6.66
US 41A/ Fort Campbell Blvd	0.20 miles south of SR-374	0.44 miles south of SR-374	109	21.80	33,494	0.24	7.32
US 41A/Fort Campbell Blvd	0.26 miles north of KY-400/State Line Rd	KY-400/State Line Rd	102	20.40	29,795	0.26	7.11
US 79/SR-13/ Wilma Rudolph Blvd	Old Trenton Rd	SR-48/Trenton Rd	99	19.80	33,537	0.13	12.74
Needmore Ln	0.24 miles west of US 79/ Wilma Rudolph Blvd	US 79/Wilma Rudolph Blvd	95	19.00	9,767	0.24	22.30
Tiny Town Rd	0.46 miles west of SR-48/ Trenton Rd	SR-48/Trenton Rd	94	18.80	28,179	0.46	3.99

Note: *Crash Rate is expressed in crashes per million vehicle miles traveled

Source: KYTC, TITAN (2012-2016)

TABLE 6.31 TOP 10 HIGH CRASH RATE SEGMENTS, 2012-2016

SEGMENT	FROM	TO	TOTAL CRASHES	ANNUAL CRASH FREQUENCY	ADT	LENGTH (MI)	CRASH RATE*
Red River St	SR-48/College St	0.19 miles north	13	2.60	168	0.19	227.86
Hickory Grove Blvd	US 41A Bypass/Riverside Dr	0.35 miles east	6	1.20	49	0.35	189.47
Old Hwy 48	Martha's Chapel Rd	1.96 miles east	10	2.00	22	1.96	127.80
Main St	US 41A Bypass/Riverside Dr	Public Square	20	4.00	1,092	0.12	82.48
Woodlawn Church Rd	0.21 miles south of US 79/Dover Rd	US 79/Dover Rd	2	0.40	78	0.21	66.06
Stephanie Dr	US 79/Dover Rd	0.28 miles north	4	0.80	123	0.28	64.06
Antioch Church Rd	0.69 miles north of Antioch Rd	0.85 miles north of Antioch Rd	2	0.40	117	0.16	60.31
Commerce St	6th St	0.10 miles east	11	2.20	1,049	0.10	57.31
Lake Rd	Lylewood Rd	1.56 miles east	4	0.80	25	1.56	56.38
Franklin St	Public Square	Second St	19	3.80	1,624	0.15	43.88

Note: *Crash Rate is expressed in crashes per million vehicle miles traveled

Source: KYTC, TITAN (2012-2016)

6.32 Top 10 High Crash Rate Intersections, 2012-2016

Location	Total Crashes	Annual Crash Frequency	ADT	Crash Rate*
SR-48/College St @ Second St	253	50.6	22,509	6.16
US 41A/Madison St @ SR-76	342	68.4	39,922	4.69
US 79/Wilma Rudolph Blvd @ SR-48/Trenton Rd	270	54.0	37,267	3.97
SR-48/Trenton Rd @ SR-236/Tiny Town Rd	253	50.6	37,857	3.66
US 41A/Providence Blvd @ US 79/Kraft St	287	57.4	46,422	3.39
SR-76 @ Sango Rd	178	35.6	34,329	2.84
US 79/Wilma Rudolph Blvd @ Dunbar Cave Rd	211	42.2	41,866	2.76
SR-374/101st Airborne Division Pkwy @ Peacher's Mill Rd	189	37.8	53,751	1.93
US 41A/Fort Campbell Blvd @ SR-236/Tiny Town Rd	134	26.8	40,778	1.80
US 41A/Providence Blvd @ Peacher's Mill Rd	147	29.4	46,393	1.74

Note: *Crash Rate is expressed in crashes per million vehicles entering

Source: KYTC, TITAN (2012-2016)

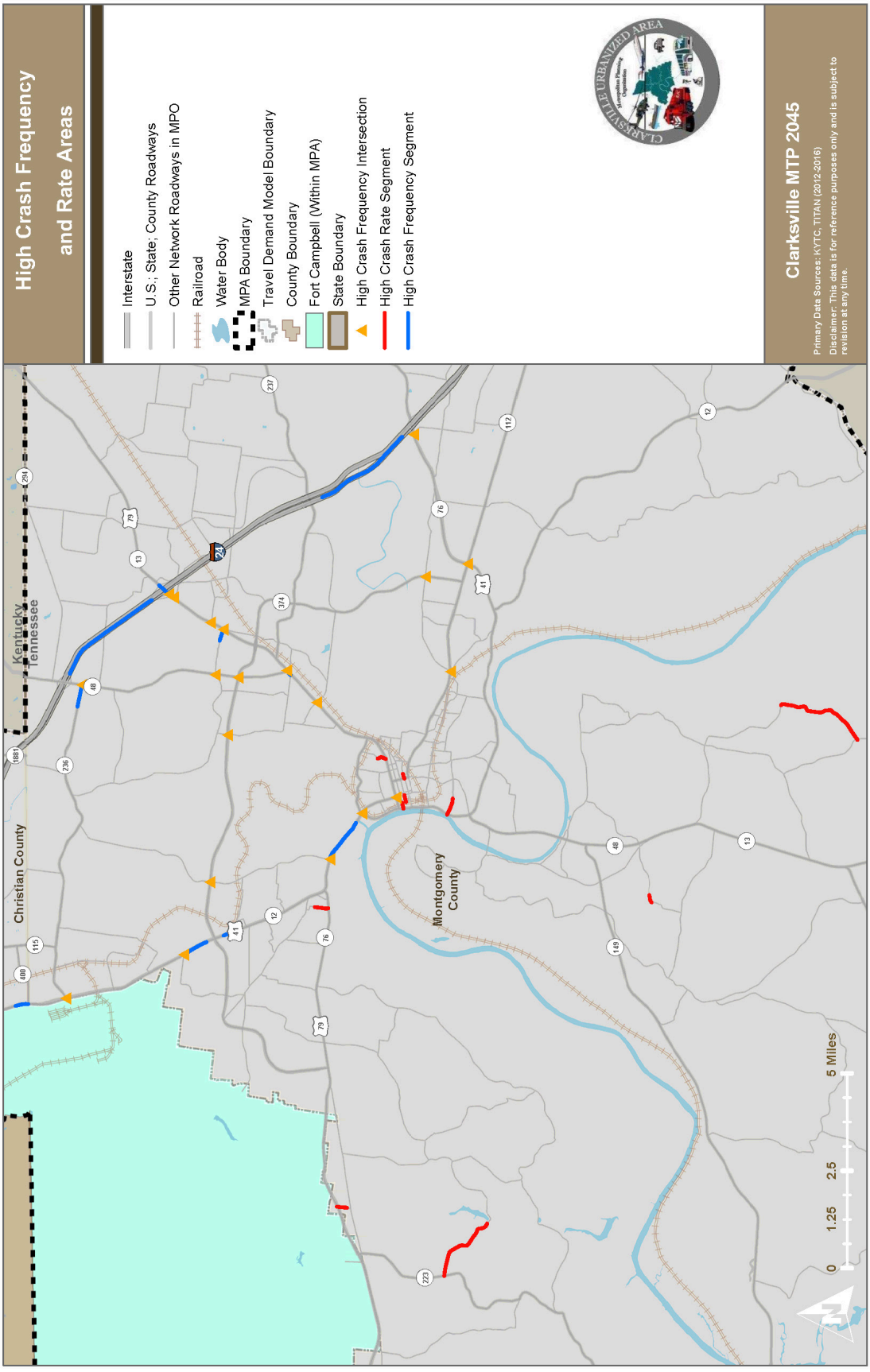


FIGURE 6.29 HIGH CRASH FREQUENCY AND RATE AREAS

Bicycle and Pedestrian Crash Data Analysis

When involved in a crash, pedestrians and bicyclists are more likely to experience severe or fatal crashes.

These roadway users are considered vulnerable due to the lack of protection that they have in a crash. Crashes involving pedestrians and bicyclists were analyzed based on the crash records from 2012 to 2016. A total of 144 pedestrian crashes and 79 bicycle crashes occurred in the MPA during the five-year study period and are illustrated in Figure 6.30. Table 6.33 breaks down the number of pedestrian and bicycle crashes by county and year.

Table 6.33 Pedestrian and Bicycle Crashes (2012 - 2016)

Mode	Year	Montgomery County	Christian County	Total
Pedestrian	2012	33	0	33
	2013	21	1	22
	2014	25	3	28
	2015	29	0	29
	2016	29	3	32
Total Pedestrian		**137**	**7**	**144**
Bicycle	2012	21	0	21
	2013	18	0	18
	2014	13	0	13
	2015	15	0	15
	2016	10	2	12
Total Bicycle		**77**	**2**	**79**

Source: KYTC, TITAN (2012-2016)

Between 2012 and 2016, thirteen (13) fatal pedestrian crashes and one (1) fatal bicycle crash occurred in the MPA, as shown in Tables 6.34 and 6.35. Less than five (5) percent of pedestrian crashes and less than fourteen (14) percent of bicycle crashes were property damage only (PDO).

Table 6.34 Pedestrian Crashes by Severity (2012-2016)

Severity	Montgomery County	Christian County	Number of Crashes	Percentage
Fatal	13	0	13	9.0%
Incapaciting Injury	31	1	32	22.2%
Non-Incapacitating Injury	90	3	93	64.6%
PDO	3	4	7	4.9%
Unlisted	0	0	0	0.0%
Total	**137**	**7**	**144**	**100.0%**

Source: KYTC, TITAN (2012-2016)

Table 6.35 Bicycle Crashes by Severity (2012-2016)

Severity	Montgomery County	Christian County	Number of Crashes	Percentage
Fatal	1	0	1	1.3%
Incapaciting Injury	11	0	11	13.9%
Non-Incapacitating Injury	55	1	56	70.9%
PDO	10	1	11	13.9%
Unlisted	0	0	0	0.0%
Total	**77**	**2**	**79**	**100.0%**

Source: KYTC, TITAN (2012-2016)

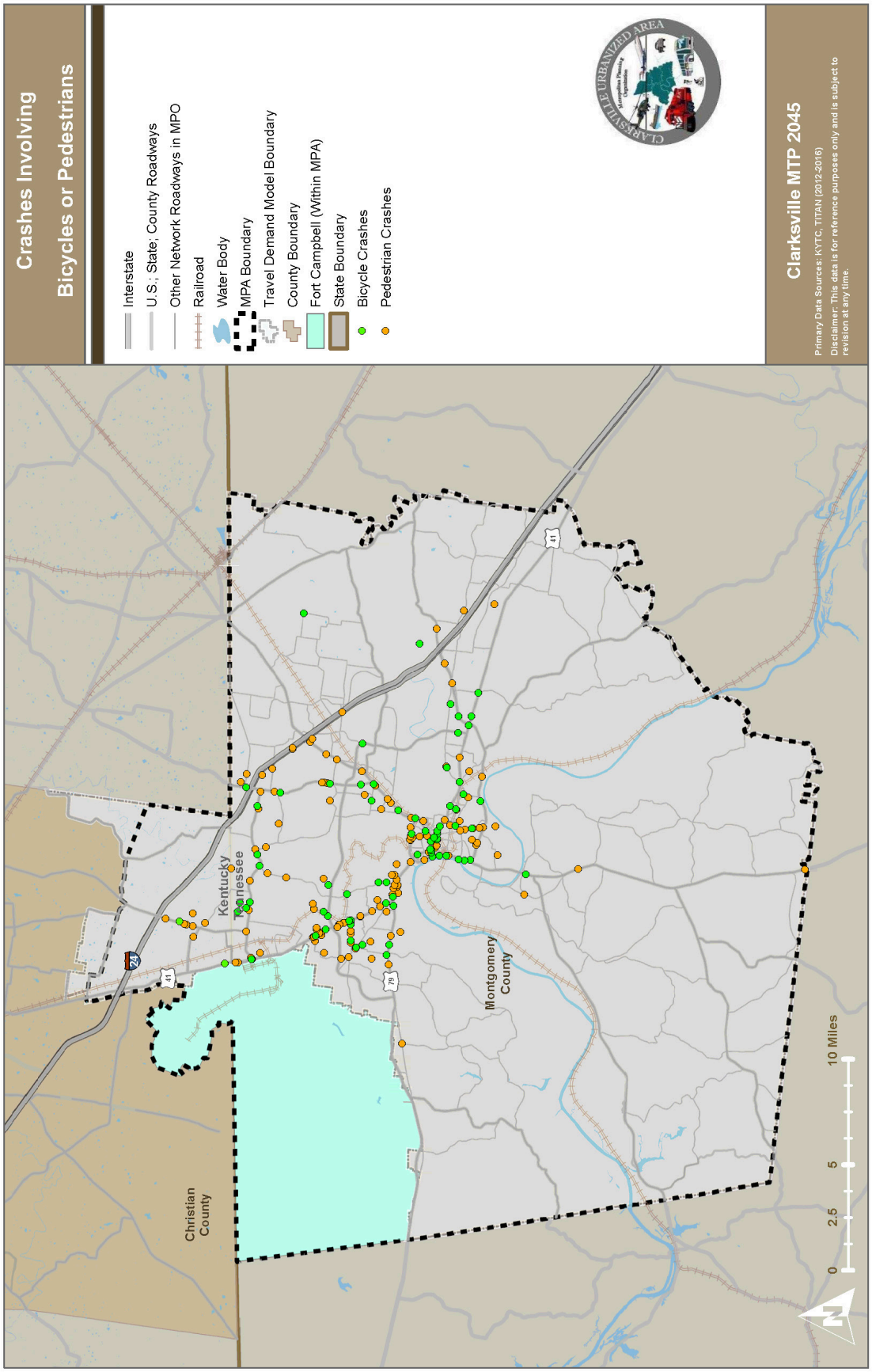


Figure 6.30 Crashes Involving Bicycles or Pedestrians

Motorcycle Crash Data Analysis

Motorcyclists are also considered vulnerable roadway users.

The State of Tennessee requires all motorcycle riders to wear a helmet, while the State of Kentucky requires all motorcycle riders and passengers in sidecars below the age of 21 to wear a helmet.

The State of Tennessee also offers a Motorcycle Rider Education Program. The program offers classes for both beginning and experienced motorcyclists in order to educate motorcyclists on basics, licensing, and more.

Crashes involving motorcyclists were also analyzed based on the crash records from 2012 to 2016. A total of 827 motorcycle crashes occurred in the MPA during the five-year study period and are illustrated in Figure 6.31. Table 6.36 breaks down the number of motorcycle crashes by county and by year.

Table 6.36 Motorcycle Crashes (2012 - 2016)

Year	Montgomery County	Christian County	Total
2012	193	14	207
2013	148	5	153
2014	140	11	151
2015	161	4	165
2016	144	7	151
Total	**786**	**41**	**827**

Source: KYTC, TITAN (2012-2016)

Between 2012 and 2016, 19 fatal motorcycle crashes occurred in the MPA. The severity of the motorcycle crashes within the MPA is shown in Table 6.37.

TABLE 6.37 MOTORCYCLE CRASHES BY SEVERITY (2012-2016)

SEVERITY	MONTGOMERY COUNTY	CHRISTIAN COUNTY	NUMBER OF CRASHES	PERCENTAGE
Fatal	19	0	19	2.3%
Incapaciting Injury	94	10	104	12.6%
Non-Incapacitating Injury	280	7	287	34.7%
PDO	393	24	417	50.4%
Unlisted	0	0	0	0.0%
Total	**786**	**41**	**827**	**100.0%**

Source: KYTC, TITAN (2012-2016)

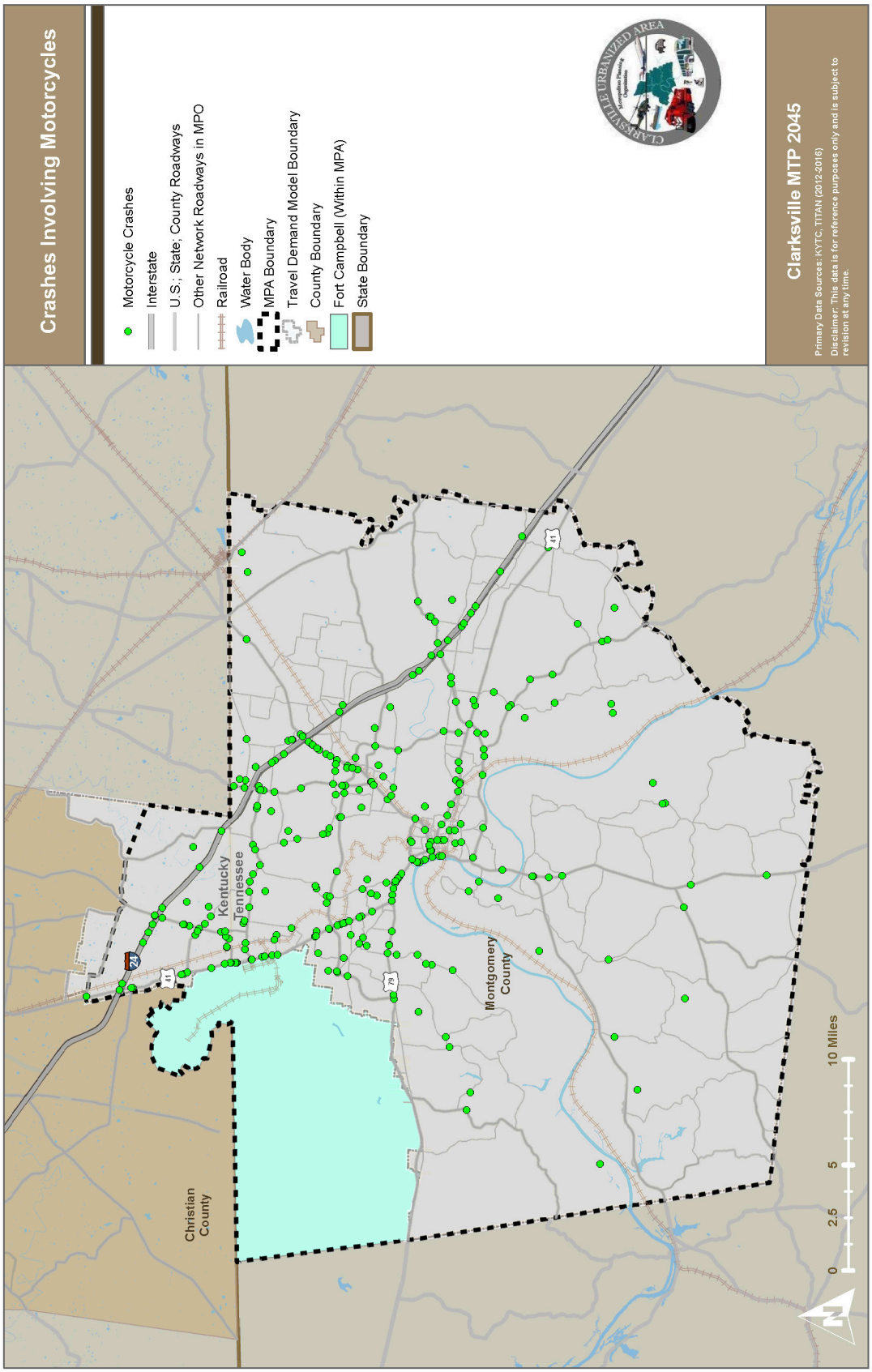


FIGURE 6.31 CRASHES INVOLVING MOTORCYCLES

Transit Safety Events Analysis

From 2012-2016, there were 25 crashes involving a Transit Bus, as defined in the TITAN database. However, the database does not contain information on which provider is involved in the crash. Further information can be obtained from the service providers discussed in Section 6.3.

Freight Truck Safety Analysis

Crashes involving heavy vehicles were analyzed using crash records from 2012 to 2016 obtained from KYTC and TITAN. A total of 897 crashes involving heavy vehicles occurred within the Clarksville MPA counties during the study period. Table 6.38 shows the number of heavy vehicle crashes by county during the study period. Figure 6.32 shows the crashes in the MPA involving freight trucks.

Table 6.38 Heavy Vehicle Crashes by Year by County (2012-2016)

Crash Year	Montgomery County	Christian County	Total
2012	121	15	136
2013	105	25	130
2014	139	21	160
2015	196	23	219
2016	225	27	252
Total	**786**	**111**	**897**

Source: KYTC, TITAN (2012-2016)

During the same time-period, nine (9) fatal crashes involving heavy vehicles occurred within the MPA. While this represented one (1) percent of heavy vehicle crashes, about seven (7) percent of all fatal crashes in the MPA involved a heavy vehicle.

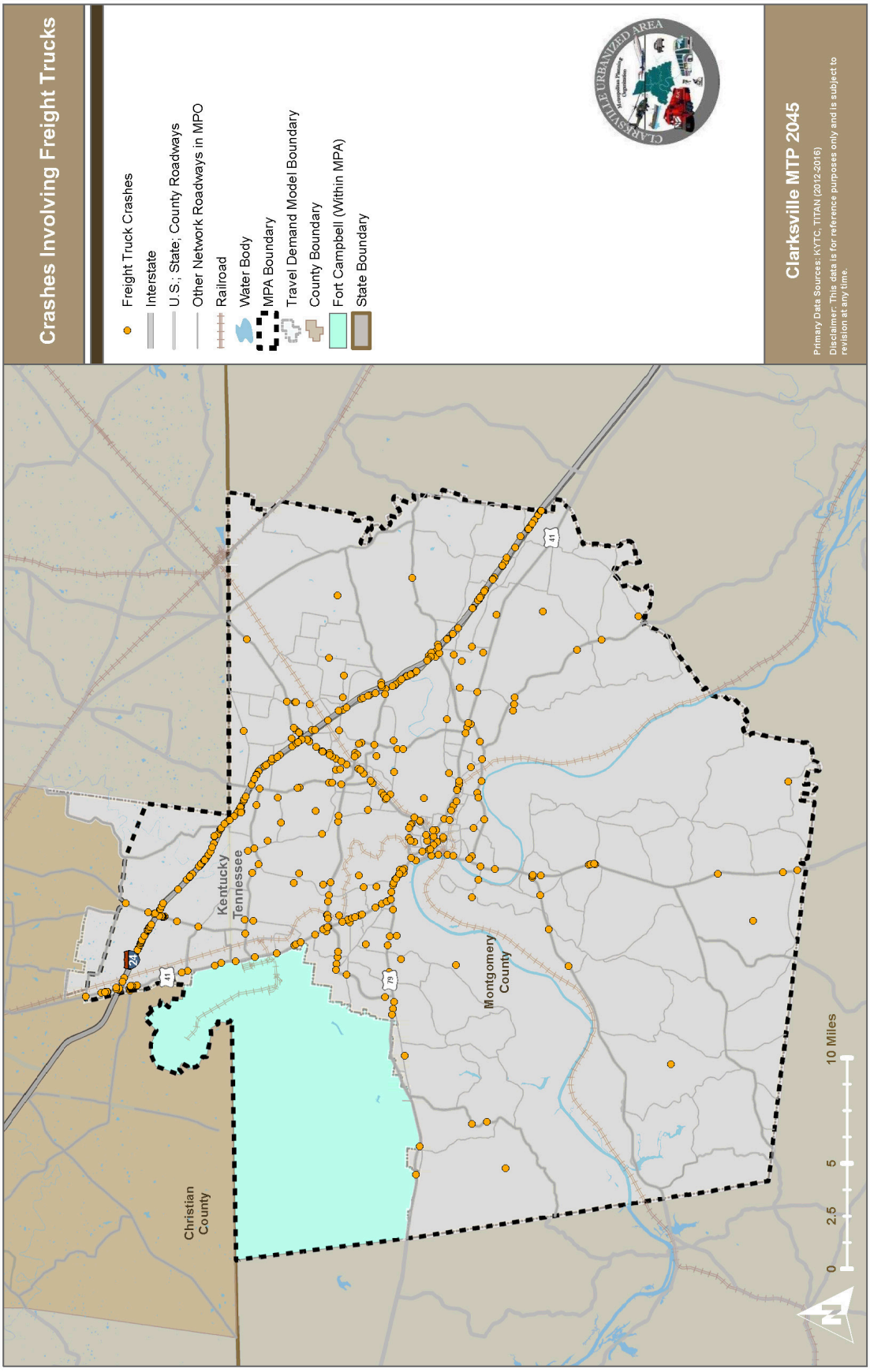


Figure 6.32 Crashes Involving Freight Trucks

Rail Safety Analysis

Rail-Automobile Collisions

From 2012 through 2016, there were no crashes involving an automobile and a train within the MPA.

Derailments

According to the Federal Railroad Administration (FRA), from 2012 to 2016, no train derailments occurred in the MPA.

Strategic Highway Safety Plans

A SHSP is a statewide-coordinated safety plan that is developed to reduce fatalities along state highways and all public roads. Each state maintains a SHSP that was put in place as part of the SAFETEA-LU requirements, which formed the core of the MAP-21 and FAST Act legislation. The State of Tennessee updated its SHSP in 2014 and the State of Kentucky updated its SHSP in 2015. Almost all SHSP's use the 4Es of traffic safety: Engineering, Enforcement, Emergency Response, and Education.

In order to improve on a state's roadway safety, the SHSP often identifies emphasis areas that are the most common causes for crashes in a state.

The State of Tennessee's emphasis areas in the 2014 SHSP are:

- Data Collection and Analysis
- Driver Behavior
- Infrastructure Improvements
- Vulnerable Road Users
- Operational Improvements
- Motor Carrier Safety

THE STATE OF KENTUCKY'S EMPHASIS AREAS IN THEIR 2015 SHSP ARE:

Behavior Modifications

- Aggressive Driving
- Distracted Driving
- Impaired Driving
- Occupant Protection

Design and Operation

- Intersections
- Roadway Departure

System Management

- Commercial Vehicle Safety
- Incident Management

Vulnerable Roadway Users

- High Risk Drivers
- Motorcycles
- Non-Motorized Users

Each of the states have developed strategies that will reduce the number of injury and property damage crashes based on the focus areas identified in their SHSP. These expected crash reductions will help the MPO and states to meet their designated targets under the transportation planning measures required by the FHWA.

Safety Performance Measures

The safety performance measures were the first established by the FHWA, with an effective date of April 14, 2016. The rules for the effective performance measures required all states to develop an HSIP which coordinates with the state's SHSP. As part of the HSIP, the states were required to establish their initial targets for the performance measures in their August 31, 2017, HSIP Annual Report. These targets are updated with each HSIP Annual Report.

THE PERFORMANCE MEASURES ESTABLISHED BY THE FHWA FOR SAFETY ARE:

- The number of fatalities
- The rate of fatalities per 100 million VMT
- The number of serious injuries
- The rate of serious injuries per 100 million VMT
- The number of non-motorized fatalities and non-motorized serious injuries

A database of fatal crashes, provided by the Fatal Accident Reporting System (FARS)[13], was used to analyze the yearly fatalities within the MPA from 2012 through 2016. This database reports the characteristics and locations of all reported fatal crashes within the country. Using GIS, only those fatal crashes that occurred within the MPA were selected for analysis. The MPO's Travel Demand Model (TDM) was used to determine the annual VMTs for typical weekdays on the study area's network. The number of serious injuries in automobile crashes, and non-motorized fatalities and serious injuries, were obtained by the 2012-2016 crash databases provided by KYTC and TITAN.

TABLE 6.39 MPA BASELINE SAFETY PERFORMANCE

Measure	2012	2013	2014	2015	2016	MPA BASELINE (2012-2016)	TN BASELINE (2013-2017)	KY BASELINE (2013-2017)
Number of Fatalities	22.0	23.0	24.0	27.0	26.0	24.4	1,000.6	737.4
VMT (100 million)	11.6	11.4	11.8	12.2	12.3	11.9	752.9	484.8
Rate of Fatalities (per 100 million VMT)	1.902	2.015	2.039	2.209	2.107	2.054	1.329	1.521
Number of Serious Injuries	193.00	196.00	229.00	234.00	167.00	203.80	7,227.6	3,124.8
Rate of Serious Injuries (per 100 million VMT)	16.685	17.168	19.452	19.141	13.532	17.195	9.594	6.451
Number of Non-Motorized Fatalities and Serious Injuries	8.0	12.0	16.0	8.0	14.0	11.6	467.7	277.8

Source: FARS, TDM, KYTC, TITAN (2012-2016)

13 ftp://ftp.nhtsa.dot.gov/fars/

Safety Targets

The initial safety targets for each state are located in the annual HSIP report[14] [15] . The CUAMPO may either support the targets established by KYTC and TDOT or establish their own. For the 2045 MTP, the CUAMPO has chosen to support the state targets established by KYTC and TDOT in their HSIP. These targets are shown in Table 6.40.

TABLE 6.40 KYTC AND TDOT STATE SAFETY TARGETS

PERFORMANCE MEASURE	KY BASELINE (2013-2017)	KY TARGET 2019	TN BASELINE (2013-2017)	TN TARGET 2019
Number of Fatalities	737.4	737.0	1000.6	1,022.0
Rate of Fatalities (per 100 million VMT)	1.521	1.500	1.329	1.291
Number of Serious Injuries	3,124.8	2,991.8	7,227.6	7,374.6
Rate of Serious Injuries (per 100 million VMT)	6.451	6.070	9.594	9.324
Number of Non-motorized Fatalities and Serious Injuries.	277.8	276.0	467.7	546.8

Note: The Baseline and Target values are 5-year rolling averages, as specified by the FHWA guidance.

Source: KYTC, TDOT

IN ORDER TO SUPPORT THE SAFETY TARGETS ESTABLISHED BY EACH STATE, THE CUAMPO WILL NEED TO WORK WITH STATE AND SAFETY STAKEHOLDERS TO ADDRESS AREAS OF CONCERN WITHIN THE MPA. THIS IS PARTICULARLY IMPORTANT FOR THE CRASH FATALITY AND SERIOUS INJURY RATES WITHIN THE CLARKSVILLE AREA. THIS WILL NECESSITATE COORDINATION BETWEEN THE CUAMPO AND THEIR STATE DOT PARTNERS AS THEY UPDATE THEIR SHSPS AND HSIPS. WHILE THE FHWA MONITORS IF STATE DOTS MEET THEIR PERFORMANCE TARGETS OR NOT, THERE IS NO DIRECT ASSESSMENT OF THE MPO'S PERFORMANCE MEASURE PROGRESS TOWARDS THE HSIP. THE MPO WILL REVIEW THE TARGETS WITH EACH SUCCESSIVE MTP AND ADJUST THEM AS NECESSARY.

14 https://safety.fhwa.dot.gov/hsip/reports/pdf/2017/ky.pdf

15 https://safety.fhwa.dot.gov/hsip/reports/pdf/2017/tn.pdf

During the public survey period, traffic safety was identified as one of the most important issues facing the residents of Clarksville. This lead to an increased impact of safety on the scoring methodology used to rank the test projects developed during the MTP. By doing so, these scores assist the MPO's efforts to support the established state targets by selecting projects that have a higher safety benefit to the study area's roadway users.

Special Safety Issues

Some drivers present unique safety challenges for the MPA. This is due to the presence of Fort Campbell and the soldiers returning from deployment. A 2012 USAA report found that the average enlisted soldier returning from recent deployment was nearly a quarter more likely to be at-fault in a crash. This is a result of the training and instincts developed while on deployment. These factors influence driver behavior and are very different from everyday driving. Figure 6.33 displays these learned behaviors and how they translate to driving on the roadways when they return.

Figure 6.33 Driving Behaviors Learned During Military Deployment

In Combat		At Home
Drives as far as possible from road edge to avoid IEDs.	▶	Drives in middle of road, straddling lanes.
Changes direction and lanes unexpectedly, especially at tunnels or underpasses where insurgents might be waiting.	▶	Weaves through traffic. Does not signal turns, merges or lane changes. Avoids or changes lanes at underpasses and tunnels.
Always moving. Does not stop for traffic or people. Always has right of way.	▶	Anxious when stopped. Rolls through traffic lights and stop signs. Does not yield right of way to other vehicles.
Speeds as fast as the lead vehicle in a convoy.	▶	Drives over posted speed limit.
Hypervigilant of roadside elements.	▶	Overly attentive to roadside elements.

Source: Office of The Surgeon General (Army)

Source: Returning Warriors: 2012 Driving Safety Report (USAA)

The 2040 MTP identified several countermeasures for these driving behaviors. These countermeasures, which still apply, are based on the ITE Traffic Handbook and consultation with Dr. Erica Stern at the University of Minnesota. The countermeasures are shown in Table 6.41. Upon MPO review of the accident reports within the MPA, if the behaviors shown in Table 6.41 are contributing to the cause of the crash, the MPO will work with TDOT/KYTC local maintenance, and the City/County highway departments, to develop and deploy potential improvements. As this process evolves, the MPO will establish new procedures for the evaluation of the crashes and establish, or work with, a local safety coalition for this purpose.

Table 6.41 Potential Countermeasures for Deployment Learned Behaviors

Behavior	Potential Countermeasure
Drives in middle of road	Upgrade pavement markings / delineation Increase lane width Install rumble stripes
Traffic congestion increases anxiety	Use dynamic signage to inform drivers of congestion and advise on alternate routes Utilize smart phone app for traffic congestion / road work
Rolls through traffic signals and stop signs	Increase yellow or all red signal phase for additional intersection clearance time
Drives over posted speed limit	Reduce speed limit with enforcement Have law enforcement keep track of warnings issued
Overly attentive to roadside elements	Remove sight obstructions Limit advertising Maintain clear zone Reduce trash / roadkill Increase space between sidewalk and curb
Anxiety driving alongside parked cars	Reduce / remove on-street parking
Anxiety driving at night	Additional street / highway lighting
Anxiety at tunnels / overpasses	Keep clear of debris / signage distraction; additional lighting
Weaves around potholes, etc.	Better pavement maintenance

Source: MTP 2040, ITE Traffic Handbook, 6th Edition; AASHTO Highway Safety Manual; discussion with Dr. Erica Stern, University of Minnesota

Another method that has been used to deal with this unique challenge includes the Veterans' Safe Driving Initiative. This initiative is a cooperation of the U.S. Department of Veterans Affairs, Department of Defense, and USDOT. It encourages returning service members to drive safely and provides them, family members, and medical staff with information about these driving behaviors. More information can be found on the VA website at:

https://www.va.gov/health/safedriving/

6.6 | Security

While safety and security are closely related, they are differentiated by the cause of the harm from which the transportation system and its users are being protected. Safety encompasses the prevention of unintentional harm to system users or their property. This includes vehicular crashes, train derailments, slope failures, sudden destruction of roadways, or non-motorized user injuries.

SECURITY INVOLVES THE PREVENTION, MANAGEMENT, AND RESPONSE TO INTENTIONAL HARM TO THE TRANSPORTATION SYSTEM OR ITS USERS.

This includes:

- theft or dismemberment of elements of the transportation infrastructure,
- assault on users of the system, or
- large-scale attacks intended to completely disrupt the movement of people and goods.

Security concerns can include natural disasters, acts of violence, and terrorism.

The MPA greatly benefits from Fort Campbell, which can provide security expertise and guidance. Of note is that Fort Campbell Boulevard (US-41A) in Christian County is a route designated for the movement of the installation's equipment and personnel. This makes the corridor a key security consideration.

MPO ROLE

THE MAIN ROLE OF MPOS IN PLANNING FOR SECURITY IS TO COORDINATE WITH RELEVANT AGENCIES, SUCH AS:

- emergency management officials
- police and sheriff's departments
- fire departments
- rescue squads

This means that the MPO is often in a supporting role to the agencies involved. The MPO may also be involved in the development of plans to identify critical infrastructure, system vulnerabilities, and the development of risk reduction plans.

As part of its security management, the CUAMPO participates in regular incident management meetings that are held throughout the Middle Tennessee region. These meetings involve local and state law enforcement, fire/rescue, TDOT, and more. Discussion of the resources needed for safety management and the opportunities for the various agencies to coordinate their efforts occurs at that time. The meetings also conduct "after action" reviews of a recent incident in order to analyze the response efforts and improve management of future incident scenes.

The CUAMPO can take certain measures to improve security within the MPA.

Prevention

As related to security, prevention refers to efforts to limit access to resources that may be compromised or efforts to increase surveillance. Examples of prevention measures include:

- access control systems
- closed circuit television (CCTV) systems
- security alarms
- fencing
- locks
- architectural barriers

The design of facilities and public spaces can also incorporate features that deter security breaches.

Protection

For facilities that are high vulnerability risks, additional design measures should be considered. These measures would mitigate potential security risks, should they occur. Protection efforts could also include law enforcement where necessary.

Response

Redundancy of transportation facilities should be encouraged in capital project planning. This assists in emergency evacuations or detours should a particular segment of the transportation network become unavailable. The use of Intelligent Transportation Systems (ITS) to control traffic signals and other controls also assists in responding to security risks.

Recovery

Short-term and long-term recovery plans should be familiar to transportation decision-makers. This includes everything from evacuations to restoring local businesses and neighborhoods. Both KYTC and TDOT maintain an emergency operations plan for their entire state.

In the Clarksville MPO area, Christian and Montgomery Counties each have their own emergency management bodies. More information can be found on each county's operations at:

Christian County, KY
http://www.christiancountyky.gov/emergency-management

Montgomery County, TN
https://mcgtn.org/ema

Key Security Participants

As stated previously, the MPO coordinates with relevant agencies and is in a support role when security issues arise. The CUAMPO can serve as a medium of communication between the various agencies involved. Several key participants have been identified to the security management process.

State and Local Governments

TDOT's Office of Emergency Operations maintains a preparedness program that includes planning, training, and exercises regarding emergency response activities. The department also provides traffic control, manpower, and equipment to the Tennessee Emergency Management Agency (TEMA) upon request. There is an additional emergency services coordinator who provides assistance to TEMA for emergencies involving railroads that are Class 1, Class 2, or Class 3.

Freeway Incident Management Programs have also been established and maintained by KYTC and TDOT. These programs coordinate with state and local emergency officials on freeway traffic control when incidents arise and respond to motorist emergencies. They are called "Safe Patrol" in Kentucky, and "HELP" in Tennessee.

Austin Peay State University

The university maintains an Emergency Action Plan that allows it to coordinate with state and local agencies. The plan contains transportation elements that allow for the evacuation, emergency transportation services, and clearance/restoration of roads on campus.

More information can be found at:

http://www.apsu.edu/police/emergency-procedures-plan

Additional MPO Measures

Ultimately it is the responsibility of each MPO to craft a security policy consistent with its goals, state guidance, and the FAST Act. Security will be a consideration in the establishment of MPO goals and the support for MPO funding priorities. Additional measures that the CUAMPO may take are shown below.

Use of MPO Transportation Model to Assess Evacuation Plans

The TransCAD regional model can be modified to simulate evacuation events. This can be used to test the effectiveness of existing plans or to improve plans for routing traffic through the MPO region.

Use of Area Transit Systems to Support Evacuation Events

The MPO will work with local transit providers to investigate opportunities for the use of transit vehicles to provide for the evacuation of transit dependent populations.

Integration of Intelligent Transportation Systems (ITS) in Evacuation Planning

The MPO supports investment in ITS technologies. The MPO understands the need to study and assess how this technology can be used to assist evacuees in their decision-making and expedite their progress

during evacuation events. This can include the use of the electronic message signs to guide motorists during emergency evacuations or adjusting signal timings to aide with these efforts.

Strategic Highway Network (STRAHNET)

The STRAHNET is a portion of the NHS which is considered vital to the nation's strategic defense. The current STRAHNET is about 61,000 miles long and links military installations with roadways that provide for the mobility of strategic military assets. All interstate highways are included as part of the STRAHNET.

The following routes in the MPA are part of STRAHNET:

- I-24
- US-41A, from Screaming Eagle Blvd (Fort Campbell, Gate 4) north to I-24, Exit 86.

The STRAHNET routes need additional considerations, which include maintenance of bridge capability, pavement conditions, and congestion management. Recently KYTC developed video surveillance and installed dynamic message signs and other technologies along the I-24 corridor. This allows for better management of the traffic related to military convoys.

Intelligent Transportation Systems and Security

The MPO and its partner agencies can use the Clarksville Regional Intelligent Transportation System to increase security within the MPA. ITS technologies, such as the use of cameras, can provide the agencies with the ability to monitor suspicious activity, reduce theft, or aid in emergency response.

6.7 | Overview of MPO Planning Performance Measures

The MTP 2045 follows the regulations laid out in MAP-21 and the FAST Act, which require that MPOs meet national goals and track the established TPMs. The plan follows the principles of Performance-Based Planning and Programming. The sections above provided the MPO's baseline performance and the supported state targets. Tables 6.42 through 6.45 summarize the performance data in the previous sections and identify areas of concern that may be addressed.

Table 6.42 MPA Interstate and Non-Interstate Performance

Pavement Condition Index	Interstate NHS Routes							Non-Interstate NHS Routes						
	MPA Base-line	TN Base-line	KY Base-line	TN 2-year Target	TN 4-year Target	KY 2-year Target	KY 4-year Target	MPA Base-line	TN Base-line	KY Base-line	TN 2-year Target	TN 4-year Target	KY 2-year Target	KY 4-year Target
Good	98.80%	75.60%	66.20%	N/A	60.00%	N/A	50.00%	53.40%	44.80%	78.90%	42.00%	40.00%	35.00%	35.00%
Fair	1.20%	24.26%	33.80%	N/A	N/A	N/A	N/A	46.20%	51.96%	16.80%	N/A	N/A	N/A	N/A
Poor	0.00%	0.14%	0.00%	N/A	1.00%	N/A	3.00%	0.40%	3.24%	4.30%	4.00%	4.00%	6.00%	6.00%

Level of Travel Time Reliability	Interstate NHS Routes							Non-Interstate NHS Routes						
	MPA Base-line	TN Base-line	KY Base-line	TN 2-year Target	TN 4-year Target	KY 2-year Target	KY 4-year Target	MPA Base-line	TN Base-line	KY Base-line	TN 2-year Target	TN 4-year Target	KY 2-year Target	KY 4-year Target
Reliable	100.00%	87.70%	95.69%-	85.30%	83.00%	93.00%	93.00%	92.40%	N/A	N/A	N/A	87.50%	N/A	82.50%
Not Reliable	0.00%	12.30%	4.31%	N/A	N/A	N/A	N/A	7.60%	N/A	N/A	N/A	N/A	N/A	N/A

Truck Travel Time Reliability	Interstate NHS Routes							Non-Interstate NHS Routes						
	MPA Base-line	TN Base-line	KY Base-line	TN 2-year Target	TN 4-year Target	KY 2-year Target	KY 4-year Target	MPA Base-line	TN Base-line	KY Base-line	TN 2-year Target	TN 4-year Target	KY 2-year Target	KY 4-year Target
TTTR	1.14	1.35	1.23	1.35	1.33	1.25	1.25	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: KYTC, TDOT, NPMRDS

Table 6.43 Bridge Performance

Bridge Condition	NHS Bridges						
	MPA Baseline	TN Baseline	KY Baseline	TN 2-year Target	TN 4-year Target	KY 2-year Target	KY 4-year Target
Good	57.90%	39.50%	34.80%	36.00%	36.00%	35.00%	35.00%
Fair	42.10%	55.60%	61.40%	N/A	N/A	N/A	N/A
Poor	0.00%	4.90%	3.80%	6.00%	6.00%	3.70%	3.20%

Source: KYTC, TDOT, NBI

Table 6.44 MPA Safety Performance

Performance Measure	MPA Baseline (2012-2016)	TN Baseline (2013-2017)	KY Baseline (2013-2017)	TN Target 2019	KY Target 2019
Number of Fatalities	24.4	1,000.6	737.4	1,022.0	737.0
Rate of Fatalities (per 100 million VMT)	2.054	1.329	1.521	1.291	1.500
Number of Serious Injuries	203.80	7,227.6	3,124.8	7,374.6	2,991.8
Rate of Serious Injuries (per 100 million VMT)	17.195	9.594	6.451	9.324	6.070
Number of Non-Motorized Fatalities and Serious Injuries	11.6	467.7	277.8	546.8	276.0

Source: FARS, TDM, KYTC, TITAN (2012-2016)

Table 6.45 FTA Transit Performance Measures

Asset Class/ULB	NTD Reporting Year FY- 2018			Performance Target Year FY- 2019		
	Current Year Number of Assets in SGR	Current Year Number of Assets in SGR Backlog	Current Year Percent of Assets in SGR Backlog	Target Year Number of Assets in SGR	Target Year Number of Assets in SGR Backlog	Performance Target
CLARKSVILLE TRANSIT SYSTEM						
Rolling Stock State of Good Repair (SGR)						
BU Bus/ 14 years	12	0	0.00%	12	0	0.00%
CU Cutaway/ 10 years	4	0	0.00%	7	0	0.00%
MV Minivan / 8 years	2	0	0.00%	2	0	0.00%
RT Rubber-tired vintage trolley/8 years	0	0	0.00%	0	0	0.00%
VN Van/ 8 years	7	0	0.00%	7	0	0.00%
Facilities:						
Admin-Maintenance/40 years	4	0	0.00%	4	0	0.00%
Transit Station/40 years	1	0	0.00%	1	0	0.00%
Equipment State of Good Repair (Support Vehicles Only)						
AO Automobile/8 years	11	6	35.29%	13	4	23.53%
MID-CUMBERLAND HUMAN RESOURCE AGENCY						
Rolling Stock State of Good Repair (SGR)						
BU Bus/ 14 years	0	0	0.00%	0	0	25.00%
CU Cutaway/ 10 years	0	0	0.00%	0	0	25.00%
MV Minivan / 8 years	10	19	65.52%	22	7	25.00%
RT Rubber-tired vintage trolley/14 years	0	0	0.00%	0	0	25.00%
VN Van/ 8 years	64	32	33.33%	72	24	25.00%
Facilities:						
Admin-Maintenance/40 years	0	0	0.00%	0	0	25.00%
Transit Station/40 years	0	0	0.00%	0	0	
Equipment State of Good Repair (Support Vehicles Only)						
AO Automobile/8 years	0	0	0.00%	0	0	25.00%

Source: FTA

The CUAMPO has chosen to support all of the state targets listed above. The state safety targets are established in a state's HSIP, which is submitted to the FHWA annually. The remaining performance measure targets are submitted in a state's Baseline Performance Report; the first of which must be received by the FHWA on October 1, 2018.

The CTS maintains a TAM Plan through its Strategic Plan, which contains information on the service's inventory and performance. Information about the MPO's baseline performance can be obtained from TDOT, KYTC, and CTS. However, the CTS and MPO have chosen to support the recommended "state of good repair" performance measures established by the FTA.

The MPO meets all of the established state performance targets, with the exception of safety targets for Rate of Fatalities and Rate of Serious Injuries. For the MPO to support the state targets, it must keep the MPA's roadways and bridges maintained and as congestion-free as possible. To address safety, the MPO will need to work with state and local officials, as well as other safety stakeholders, to reduce the fatalities and serious injuries on the MPA's roadways. This will be possible with coordination between the MPO and their state DOT partners as they update their SHSPs and HSIPs, as well as identifying safety programs that may be implemented within the MPA.

The MTP also supports the state targets through the use of the project scoring criteria (discussed in Chapter 10) to determine project rankings for the purposes of developing the Staged Improvement Program (discussed in Chapter 11). These criteria consider the MPA's needs for safety, reduced congestion, and well-maintained roadways. The criteria are based upon the goals and objectives that were developed from the public outreach survey, which was meant to address the required FHWA performance measures.

Further support for the state targets for pavement/bridge conditions and system performance can be achieved by:

- Prioritizing maintenance, overlay, and bridge line item funds (Chapter 11) for roadways and bridges that are in "poor" condition.
- Working with State and local stakeholders to identify and repair pavement cracking, rutting, potholes, etc.
- Using the regional ITS structure to monitor roadway conditions and redirect drivers to less congested routes.
- Employing Travel Demand Management Strategies, discussed in Chapter 8.

In addition to the project scoring criteria, in an addendum to the 2040 MTP, the MPO addressed support of the state HSIP targets by stating that it would:

- Work with each State and safety stakeholders to address areas of concern for fatalities or serious injuries within the metropolitan planning area.
- Coordinate with each State and include the safety performance measures and the State's HSIP targets for those measures in the metropolitan transportation plan (MTP).
- Integrate into the metropolitan transportation planning process the safety goals, objectives, performance measures, and targets described in other State safety transportation plans and processes such as applicable portions of the HSIP, including the SHSP.
- Include a description in the TIP of the anticipated effect of the TIP toward achieving HSIP targets in the MTP, linking investment priorities in the TIP to those safety targets.