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1.0 Introduction

1.1 Regional Transportation Plan

The greater Nashville area is growing fast; some say too fast, while others work hard to attract more jobs and investment. What most agree on is that traffic congestion is getting worse. More people, more vehicles, and more construction make it a difficult journey for even the most experienced commuter. Today, Nashville and its surrounding counties is home to 1.8 million people who travel on average 33 miles and 48 minutes per day over 1,600 bridges and more than 13,000 miles of roadway. Between now and 2045, the region is projected to see an additional one million residents. That 76 percent increase in population is expected to translate into 86 percent more volume on area roadways, 26 percent slower travel speeds, and 162 percent increase in the share of miles traveled in congested conditions.

Finding the right solutions is critical to quality of life and continued economic prosperity. But what are the right solutions? What is the right mix of investments that will address the challenges that many Middle Tennesseans face with respect to transportation? This document represents a collective response to those questions from State and local officials who have collaborated on a major update to the region's transportation plan.

Shared Priorities among TDOT, Cities, Counties, and Transit Agencies

Transportation planning is a complex process that involves many organizations charged with making coordinated decisions that will have a lasting impact on quality of life in Middle Tennessee. Prepared by the Greater Nashville Regional Council (GNRC or Regional Council) and adopted by local mayors and transportation officials who serve on the region's Transportation Policy Board, the Regional Transportation Plan (RTP or Plan) represents the shared goals, objectives, and priorities of city and county governments, transit agencies, and the Tennessee Department of Transportation (TDOT).

The purpose of the Plan is to identify how governmental partners intend to allocate current and anticipated funding to improve transportation options across Davidson, Maury, Robertson, Rutherford, Sumner, Williamson, and Wilson counties. Projects identified in this Plan were proposed by city and county governments, public transit agencies, and TDOT in response to a call-for-projects issued by GNRC in 2019.

A Federally Required Document

All urbanized areas of the United States, including the seven-county Nashville metropolitan area, are required by federal law to prepare a long-range transportation plan as a prerequisite to the use of federal transportation grants. This plan serves to satisfy federal regulations outlined in Title 23, Part 450 of the Code of Federal Regulations (23 CFR 450) and ensures that TDOT, transit agencies, and local governments are eligible to use federal transportation funds to construct or implement improvements to roadways and transit routes.

The RTP serves as the official gateway to federal transportation grants that are distributed through the United States Department of Transportation Federal Highway Administration (FHWA) and Federal Transit Administration (FTA). The Plan also represents the region's top priorities for state funding as the Tennessee Governor and TDOT prepare the statewide transportation work program for the Tennessee General Assembly.

The GNRC is required by federal law to update its regional transportation plan every five years to account for changes in transportation needs that result from shifts in the demographics, market preferences, real estate development trends, funding availability, and public policies. As such, upon adoption, the 2021-2045 RTP will supersede the 2016-2040 RTP adopted in February 2016.

Driven by Broader Community Goals

The Plan is guided by a policy framework adopted by local and regional leaders that recognizes their role in helping Middle Tennessee achieve a broader set of community goals and objectives.

- Livability - Enhance quality-of-life by prioritizing initiatives that increase opportunities for housing, learning, employment, recreation, and civic involvement while maintaining affordability.
- Prosperity - Contribute to the region's economic well-being by targeting solutions that attract talent, connect workforce with jobs, and reduce the cost of doing business and leverage additional investment.
- Sustainability - Support growth and prosperity without sacrificing health, the natural environment, historical and cultural assets, or financial stability of this or future generations.
- Diversity - Respect the multitude of backgrounds and variety of perspectives of Middle Tennesseans by pursuing an array of strategies that are customized to local community needs and character.

Fiscal Constraints and Continued Funding Shortfalls

The RTP includes a balanced budget. It presents a list of transportation improvements that can be constructed or implemented over the next 25 years with more than $10 billion in anticipated funding, based on a 2 percent annual increase in current appropriations. While there are approximately 200 individual projects scheduled for implementation throughout the life of the Plan, there are another 100 projects submitted by local jurisdictions that cannot be implemented at current levels of funding during the next quarter century. In order to speed up project delivery and to address more of our transportation challenges, legislators at all levels of government should consider their options for plugging the gap between revenue and costs.

Over recent years, the call for Congress to address the nation's transportation funding crisis has continued to grow. The current funding issues are due in part to the declining purchasing power of the federal gas tax, which has not been increased since 1993. Declining gas tax revenues and buying power means fewer projects, slower progress, and less benefit to communities and economies—thus forcing local governments to find other means to meet funding needs.

Ongoing Impacts of COVID-19

The global pandemic has led to dramatic changes in transportation patterns and behavior through the sudden and widespread adoption of telecommuting, increased demand for home delivery services, and surge in active transportation activity. In addition, the pandemic has had a disproportionate impact on the region's vulnerable residents such as seniors or those with respiratory diseases. The pandemic continues to impact the economy, causing layoffs and decreased pay, which has led to financial strain on households across the region. Given the ongoing uncertainty associated with the pandemic, it is not yet clear which emerging trends are likely to remain into the future. Although the adoption of this RTP helps ensure continued eligibility for federal transportation grants, GNRC recommends that transportation planning partners reconvene with community leaders in the coming year to reassess transportation needs and strategies for a post-pandemic world.

1.2 Federal Requirements

Since the 1960s, federal law has required local and state officials to work together to make collaborative decisions for the use of federal transportation funds within America's metropolitan areas through a continuing, cooperative, and comprehensive planning process. This process requires coordination among the Tennessee Governor, local elected officials of municipal and county governments, and transportation agencies that are responsible for maintaining and improving area roadways and public transit systems.

This federal requirement for urban or metropolitan transportation planning emerged, in part, as a response to the controversies stemming from the construction of the U.S. Interstate Highway System and the broader issue of race and urban renewal across the nation's larger cities. The Federal-Aid Highway Act of 1962, passed by Congress during the John F. Kennedy administration, created the first federal requirement for urban transportation planning.

The Intermodal Surface Transportation Equity Act (ISTEA) of 1991, and subsequent acts, strengthened the metropolitan planning process, further empowered local decision-making, increased requirements for public and

stakeholder involvement, and encouraged movement away from a highway construction-emphasis toward a more integrated multi-modal transportation system to improve efficiency, mobility, and access.

Federal legislation, such as the current law created through the *Fixing America's Surface Transportation Act* of 2015 (FAST Act), is codified in the U.S. Code of Federal Regulations (CFR) and published in the Federal Register by executive departments and agencies of the federal government. Title 23 of the United States Code (U.S.C.) contains rules and regulations for the regional transportation planning carried out by GNRC on behalf of the Nashville Area MPO (23 CFR Part 450, subpart C) with additional provisions provided in Title 49.

Figure 1-1 Major Milestones in Federal Transportation Legislation (Selected)

Landmark Legislation	U.S. President	Key Initiative(s)	Enacted
Federal Aid Road Act of 1916 (Bankhead-Shackleford Act)	Woodrow Wilson	First federal act to provide funding to states to improve roadway conditions across the nation.	1916
Federal-Aid Highway Act of 1944	Franklin D. Roosevelt	Created a national system of Interstate highways; Expanded federal funding assistance to secondary roads; Established construction and operational standards	1944
Federal-Aid Highway Act of 1956 (National Interstate and Defense Highways Act)	Dwight D. Eisenhower	Authorized construction of 41,000 miles of Interstate Highway System; Largest public works project in American history at the time; Established the Highway Trust Fund.	1956
Federal-Aid Highway Act of 1962	John F. Kennedy	Established the first requirements for a "continuing, comprehensive, and cooperative" transportation planning process in America's metropolitan areas to address the controversies and dislocation caused by Interstate construction.	1962
Intermodal Surface Transportation Equity Act of 1991 (ISTEA)	George H.W. Bush	Created a new intermodal approach to transportation and established new requirements for collaborative planning; Provided authority to Metropolitan Planning Organizations to coordinated decisions among state and local governments; Authorized the rails to trails program.	1991
Transportation Equity Act for the 21st Century (TEA-21)	Bill Clinton	Expanded requirements for regional transportation plans developed by Metropolitan Planning Organizations.	1998
Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)	George W. Bush	Expanded funding opportunities for transit and other multimodal solutions; Provided additional flexibility in the use of federal funding according to state and local priorities.	2005
Moving Ahead for Progress in the 21st Century (MAP-21)	Barack Obama	Consolidated the number of federal transportation grant programs by two-thirds; Reformed the environmental review process to speed up projects; Provided more flexibility to toll highways; Established performance-based planning requirements.	2012
Fixing America's Surface Transportation Act	Barack Obama	Expanded the number of planning factors to be considered by Metropolitan Planning Organizations from eight to ten in order to provide increased alignment with the economic goals; Strengthened Buy America requirements; Required USDOT to designate national electric vehicle charging corridors.	2015

Metropolitan Planning Requirements

In carrying out the federal urban transportation planning process, federal law prescribes the designation of a formal Metropolitan Planning Organization (MPO) to manage transportation planning activities. An MPO is the organization of policymakers collectively empowered to facilitate the programming of federal grants to improve transportation within the respective region. MPOs are required to represent localities in all urbanized areas (UZAs) with populations over 50,000, as determined by the U.S. Census. MPOs are designated by agreement between the governor and local governments that together represent at least 75 percent of the affected population (including the largest incorporated city, based on population) or in accordance with procedures established by applicable state or local law.

There are more than 300 designated MPOs in the United States with 11 within the State of Tennessee. Each is responsible for the following activities in their respective metropolitan planning areas:

- Monitor the conditions of the existing transportation network;
- Identify existing capacity or safety problems through detailed planning studies to develop candidate transportation improvements;
- Forecast future population and employment growth for the region;
- Evaluate the effects that future land use plans will have on transportation infrastructure within major growth corridors throughout the region;
- Develop alternative growth scenarios to evaluate the affects that land use and transportation choices made today will have on the region's future;
- Estimate the impact that an expanding transportation system will have on air quality;
- Develop a financial plan that identifies the costs and revenues associated with the continued operation and maintenance, and future expansion of the region's transportation system;
- Work with the public and stakeholders to determine the region's priorities for improving the transportation system with the anticipated revenue; and
- Track progress through performance-based planning.

Federal regulations require that the FHWA and FTA of the U.S. DOT jointly review and evaluate the transportation planning process carried out by MPOs in areas with an urbanized area population of 200,000 or more people, no less than every four years. The FHWA and FTA last certified the region's metropolitan planning process in August 2018.

Major Planning Products

Metropolitan Planning Organizations are required to produce a Regional Transportation Plan (also known as a metropolitan transportation plan or long-range transportation plan), a Transportation Improvement Program, and a Unified Planning Work Program. In addition, federal law requires a locally adopted Public Participation Plan be in place to communicate to members of the public and interested stakeholders the opportunities for involvement in the planning process.

- Regional Transportation Plan (RTP): a long-range multimodal strategy and capital improvement program developed to guide the effective investment of public funds in transportation facilities to help manage congestion, increase regional mobility options, and conform to national air quality standards. The RTP is updated every five years and may be amended as a result of changes in anticipated federal, state, and local funding; as well as major investment studies, congestion management systems plans, interstate interchange justification studies, and environmental impact studies.

- Transportation Improvement Program (TIP): a four-year work program that lists all regionally-significant and federally funded transportation projects and services in the metropolitan planning area. This includes highway and street projects, public transit projects, as well as bicycle and pedestrian projects that are implemented by TDOT or local governments, or transit agencies. All projects included in the TIP must be

consistent with, or selected from, the adopted regional transportation plan. Additionally, the TIP must be fiscally constrained by federal appropriations or estimated revenues.

- Unified Planning Work Program (UPWP): updated every one or two years, the UPWP provides citizens and stakeholders the necessary transparency to understand how federal transportation planning funds are being used by the MPO, local governments, transit agencies, and TDOT in order to meet federal metropolitan planning requirements. The UPWP is developed by MPO staff in consultation with partner agencies and input from local citizens and stakeholders. It may be amended to account for changes in funding or project needs.
- Public Participation Plan (PPP): provides the general public and interested parties with an overview of the public involvement process for the transportation planning program. This includes information about the strategies deployed to engage the public and stakeholders, and the specific timelines and requirements for public comment during the development and adoption of transportation plans and programs.

Regional Transportation Plan Requirements

The federal requirements for the development of a "Metropolitan Transportation Plan" are listed in Title 23 of the Code of Federal Regulations Section 450.324 (23 CFR 450.324). GNRC uses the terms "Regional Transportation Plan" to refer synonymously to the "Metropolitan Transportation Plan." Some metropolitan areas refer to their plan as the "Long Range Transportation Plan."

Figure 1-2 List of Transportation Plan Requirements

Requirement	Description
Effective Date	The effective date of the Plan shall be its date of adoption by the Transportation Policy Board.
Periodic Update	The Plan shall be updated every 5 years to confirm validity and consistency with current and forecasted transportation and land use conditions and trends and to extend the forecast period to at least a 20-year planning horizon.
State and Federal Copies	Though approval from the state and Federal government is not necessary, copies shall be submitted for information purposes to the Governor and the Federal Highway Administration and Federal Transit Administration.
Online Access	The Plan shall be made available for public review in electronically accessible format and means on the Internet.
Data & Assumptions	GNRC, TDOT, and public transit agencies shall validate data used in preparing other plans for use in the development of the Plan; GNRC shall base the Plan on the latest available estimates and assumptions for population, land use, travel, employment, congestion, and economic activity.
Interagency Consultation	GNRC shall consult with State and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation in the development of the Plan.
Community & Stakeholder Involvement	Members of the public, affected agencies, transportation related organizations, and other interested parties must be provided reasonable opportunity to comment on the Plan according to the adopted Public Participation Plan.
Highway and Transit Safety Planning	The Plan should integrate the priorities, goals, countermeasures, strategies, or projects for the metropolitan area contained in the Highway Safety Improvement Program, the State Highway Strategic Plan, and the safety plans of public transit agencies.
Transportation Demand	The Plan shall include current and projected transportation demand of persons and goods in the metropolitan planning area over the period of the transportation plan.
Existing and Proposed Facilities	The Plan shall include an overview of the existing and proposed transportation facilities that should function as an integrated transportation system, giving emphasis to the facilities that serve important national and regional functions.

Performance Measures and Targets	The Plan shall include a description of the measures and targets used in assessing the performance of the transportation system in accordance with 450.306(d).
System Performance Report	The Plan shall evaluate the condition and performance of the transportation system with respect to the targets described in 450.306(d) including progress achieved in comparison to previous reports.
Pedestrian and Bicycle Facilities	The Plan shall include walkway and bicycle transportation facilities in accordance with 23 USC 217(g).
Operational & Management Strategies	The Plan shall include strategies to improve the performance of existing transportation facilities to relieve vehicular congestion and maximize the safety and mobility of people and goods.
Congestion Management Process	The Plan shall consider the results of the region's congestion management process.
Assessment of Capital Investment	The Plan shall assess strategies to preserve the existing and projected future transportation infrastructure, provide for multimodal capacity increases, and reduce the vulnerability of the existing transportation infrastructure to natural disasters.
Transportation and Transit Enhancement Activities	The Plan shall consider the role that intercity buses, public transit, and other transportation alternatives may play in achieving various goals.
Project Design/Scope	The Plan shall provide design concepts and project scope descriptions sufficient enough to develop cost estimates.
Environmental Mitigation	The Plan shall consult with applicable agencies to include a discussion of the potential environmental mitigation activities and areas with potential to be affected.
Financial Plan	The Plan must include a financial plan that includes system-level estimates of costs and revenue that are reasonably expected to be available and recommendations for any additional financing strategies. Cost estimates must use an inflation rate to reflect "year of expenditure dollars" based on reasonable financial principles.

Title VI of the Civil Rights Act of 1964

The section of the Civil Rights Act of 1964 that prohibits discrimination on the basis of race, color or national origin in programs that receive federal financial assistance, including transportation projects (42 U.S. Code §2000d).

Americans with Disabilities Act (ADA) of 1990

The Americans with Disabilities Act (ADA) prohibits discrimination on the basis of disability in employment, State and local government, public accommodations, commercial facilities, transportation, and telecommunications. Title II of Act requires all public agencies – regardless of size – to ensure that their services, programs and activities are accessible to persons with disabilities. Compliance includes conducting a self-evaluation of building facilities, rights-of-way facilities and communications to identify any accessibility obstacles or issues that need to be addressed. In addition, public entities that employ 50 or more persons are required to:

- Designate an ADA Coordinator,
- Establish a grievance procedure to allow for prompt resolution of accessibility concerns,
- Establish a transition plan for taking the steps necessary to achieve compliance with the Americans with Disabilities Act, and
- Monitor implementation of the transition plan, and update the plan periodically as needed.

Clean Air Act Amendments of 1990

Federal law passed in 1970 that prescribes the national air pollution control program. The 1990 Clean Air Act amendments are the most far-reaching revisions of the original law. The Clean Air Act is administered by the Environmental Protection Agency (EPA). The Act requires the EPA to set limits on how much of a particular pollutant can be in the air anywhere in the United States by establishing National Ambient Air Quality Standards (NAAQS).

EPA sets these standards then designates areas as either in attainment of the NAAQS or as nonattainment of the NAAQS. Since 2009, the Nashville metropolitan area has been designated as attainment for the 1997 8-hr. ozone NAAQS and the 2008 8-hr. ozone NAAQS and is not required to produce emissions analysis associated the proposed improvements.

Executive Orders

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," was issued in 1994 to reinforce Title VI. The Executive Order states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

Issued in 2000, Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency," requires Federal agencies to examine the services they provide, identify any need for services to those with limited English proficiency (LEP), and develop and implement a system to provide those services so LEP persons can have meaningful access to them. The Executive Order also requires that the Federal agencies work to ensure that recipients of Federal financial assistance provide meaningful access to their LEP applicants and beneficiaries.

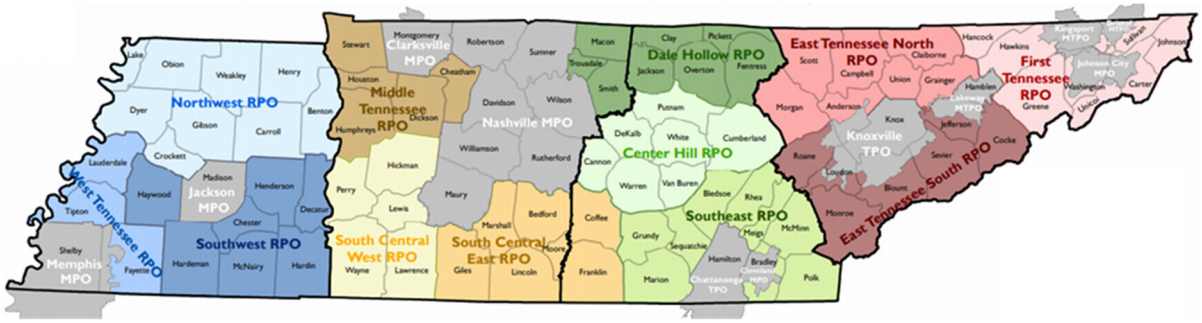
1.3 Role of the GNRC

The Greater Nashville Regional Council (GNRC or Regional Council) was established in 1965 by the TN General Assembly as not for profit government agency. GNRC is a council of governments empowered by State law to convene local and state leaders for the purposes of planning and programming state and federal investments into a range of social services and public infrastructure across a thirteen county region. The 93-member governing body of the Regional Council includes 13 county mayors, 52 municipal mayors, 2 state legislators, a private citizen from each county representing issues of business and commerce, and a private citizen from each county representing issues of social equity and inclusion.

GNRC carries several designations as it works on behalf of State and local governmental partners. GNRC is designated by the U.S. Department of Health and Human Services Administration for Community Living and the TN Commission on Aging and Disability as the region's Area Agency on Aging and Disability (AAAD). The U.S. Dept of Commerce has designated GNRC as a regional Economic Development District (EDD) for the purposes of convening officials to develop the region's Comprehensive Economic Development Strategy. The U.S. Small Business Administration has designated the Mid-Cumberland Area Development Corporation, GNRC's non-profit small business lending entity, as a Certified Development Company authorized to administer federal small business loans.

Since October 2017, GNRC has served as the administrator of the MPO program for the seven-county Nashville metropolitan area to include Davidson, Maury, Robertson, Rutherford, Sumner, Williamson, and Wilson counties and has coordinated with TDOT and adjacent planning organizations to ensure a seamless planning process across the State of Tennessee.

Figure 1-3 Map of Tennessee Regional Transportation Planning Organizations

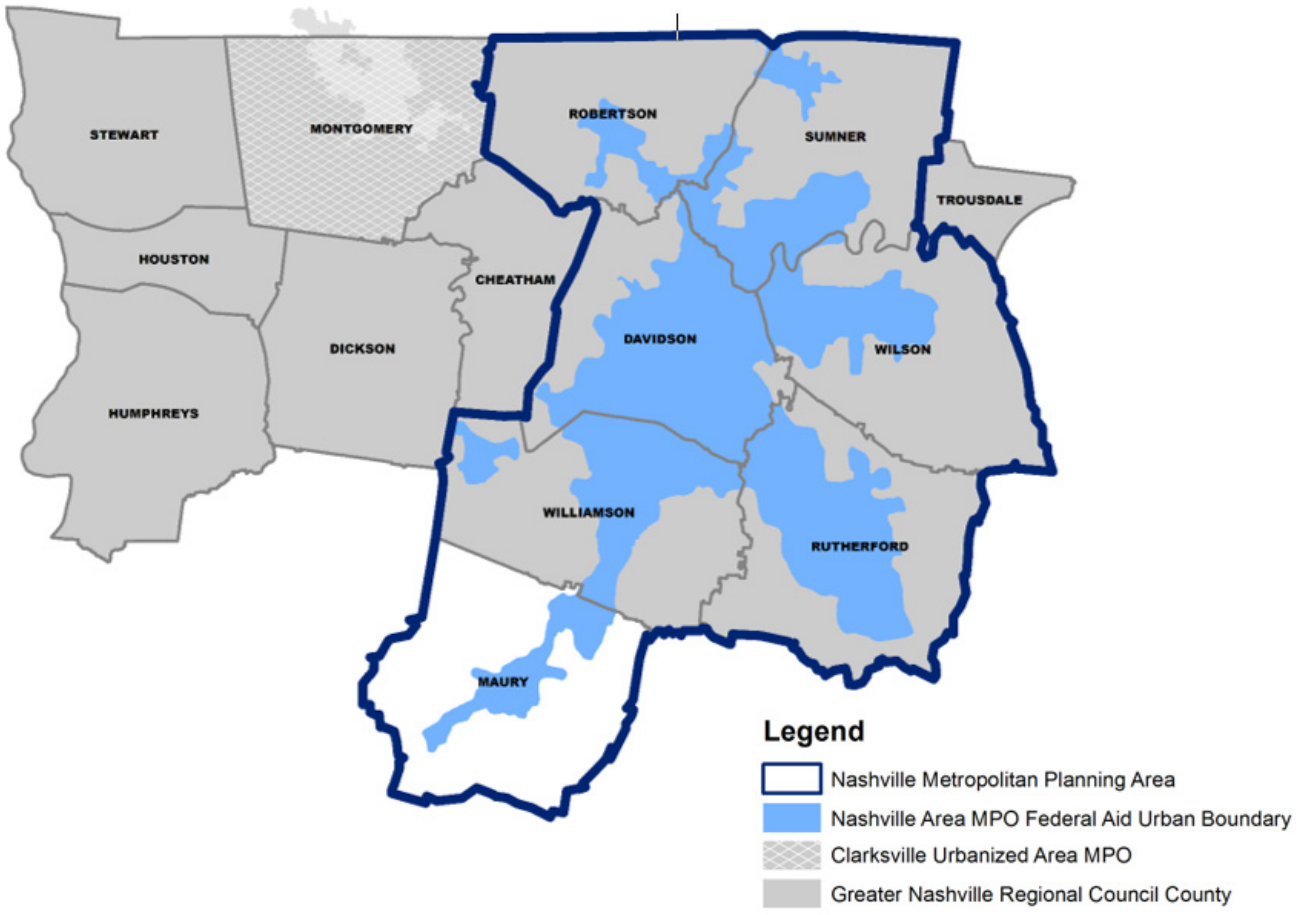


The GNRC region is served by the three additional regional planning organizations. GNRC participates on the technical committees and policy boards these organizations in order to represent a land use and economic development perspective and to assist TDOT with coordination of transportation-related initiatives across Middle Tennessee.

- Clarksville Urbanized Area MPO - the federally designated regional planning organization for Montgomery County, Tennessee and the portion of Christian County, Kentucky including and adjacent to the U.S. Census Clarksville Urbanized Area. Staffing and administrative support is provided by the Clarksville/Montgomery County Regional Planning Commission.
- Middle Tennessee Rural Planning Organization – the regional transportation planning organization for Stewart, Houston, Humphreys, Dickson, and Cheatham counties. Staffing and administrative support is provided by the Mid-Cumberland Human Resource Agency.
- Dale Hollow Rural Planning Organization – the regional transportation planning organization for GNRC-member Trousdale County along with Macon, Smith, Clay, Jackson, Overton, Pickett, and Fentress counties in the Upper Cumberland Development District.

Rural Planning Organizations (RPOs) serve a similar function as MPOs for the rural areas of the state. The purpose of an RPO is to involve local officials in multimodal transportation planning, through a structured process, to ensure quality, competence, and fairness in the transportation decision-making process. RPOs consider multimodal transportation needs on a local and regional basis, review long-term needs as well as short-term funding priorities, and make recommendations to TDOT. RPOs are advisory in nature and lack the programming authority of MPOs.

Figure 1-4 Map of GNRC Planning Areas



1.4 Document Organization

The RTP document is divided into six chapters and accompanied by technical appendices. The following describes the contents as provided through chapters two through seven and the appendices.

- Chapter 2. Regional Collaboration: Provides and overview of the planning process, public involvement, intergovernmental coordination, and stakeholder engagement.
- Chapter 3. Issues, Trends, and Forecasts: Presents projections of future population and employment, land development patterns, and trends in transportation system performance.
- Chapter 4. Policy Guidance: Describes key regional issues and concerns, the policy making authority of the Transportation Policy Board, and shared regional goals, objectives, and measures of performance.
- Chapter 5. Transportation Needs and Funding Priorities: Presents a forecast of anticipated funding sources and revenue levels to improve the transportation system over the next 25-years, along with a list of projects that represent the region's top priority for the limited funding.
- Chapter 6. Implementation and Monitoring: Describes the general project delivery process, how proposed transportation projects are positioned to advance regional goals, and the potential for adverse impacts on vulnerable populations and the natural environment.
- Technical Appendices: Provides documentation related to regional planning models, GNRC's call-for-projects and project evaluation process, projects proposed on congested corridors, projects with potential social or environmental impacts, public comments documented during the development of the plan, and key terms and acronyms commonly used in the transportation planning process.

2.0 Regional Collaboration

2.1 Organization and Process

Transportation Policy Board

One of the defining strengths of Middle Tennessee lies within its demonstrated ability to effectively organize key leaders to address issues of regional significance. The development of the Regional Transportation Plan is no exception as hundreds of community leaders have spent significant time engaged in the development of goals, objectives, and proposed solutions to improve the transportation system across the greater Nashville area.

The work that GNRC carries out as the Metropolitan Planning Organization is overseen by a 33 member Transportation Policy Board, or TPB, that represents all levels of government and key transportation officials across a seven county metropolitan planning area that is designated in cooperation with the Tennessee Governor. The Transportation Policy Board governs the policymaking and transportation improvement programming decisions of the metropolitan area, and serves as the primary forum for collaboration among local communities, state officials, and interested parties related to regional transportation policies, plans, programs, and funding. The TPB is empowered to act independently of GNRC's governing body (known as the Regional Council) in the adoption of transportation policies, plans, and programs as permitted by state and federal laws and regulations.

Membership consists of the Tennessee Governor, city and county elected officials, a representative from the Greater Nashville Regional Council, a representative of area public transit operators, a representative of area county highway departments, and administrators from the Federal Highway Administration and Federal Transit Administration.

Municipal and County Governments

The Transportation Policy Board consists of the principal elected official (e.g., mayor or county executive) from each of the counties within the formal metropolitan planning area, as well as cities in those counties with a population of 5,000 or more people. Local governments are the primary drivers of the planning process and have the greatest influence on how transportation decisions will affect Middle Tennessee's quality of life.

- City of Brentwood
- City of Columbia
- City of Fairview
- City of Franklin
- City of Gallatin
- City of Goodlettsville
- City of Greenbrier
- City of Hendersonville
- City of LaVergne
- City of Lebanon
- City of Millersville
- City of Mount Juliet
- City of Murfreesboro
- City of Portland
- City of Spring Hill
- City of Springfield
- City of White House
- Town of Nolensville
- Town of Smyrna
- Metropolitan Nashville-Davidson County
- Maury County
- Robertson County
- Rutherford County
- Sumner County
- Williamson County
- Wilson County

State Government

Although the Tennessee Governor occupies a seat on the Transportation Policy Board, the Tennessee Department of Transportation (TDOT) serves as the lead state partner in the planning process. TDOT is responsible for managing, operating, and maintaining U.S. Interstates and the State route system. This includes oversight of the design and construction of transportation improvement projects for those roadways, as well as other federal-aid routes when requested to do so on behalf of local communities. Within the context of planning, TDOT is responsible for the preparation of a statewide transportation plan, administration of a data collection program relative to

transportation modes and needs, and cooperation with local government members of the regional planning organizations in the development of metropolitan area transportation plans.

GNRC also coordinates with the Department of Safety and Homeland Security, the Department of Health, the Department of Economic and Community Development, and the Department of Environment and Conservation, Department of Tourist Development, the TN Commission on Aging and Disability, and the TN Housing Development Agency on matters pertaining to transportation.

Public Transit and County Highway Officials

Public transit operators play a critical role in regional transit planning efforts led by GNRC and are responsible for carrying out short-term capital planning and operational analysis activities. The **Regional Transportation Authority** (recently rebranded to WeGo Public Transit) is responsible for developing, managing, operating, and maintaining a regional transit system across ten Middle Tennessee counties including all seven counties in the Nashville metropolitan planning area. The RTA oversees the largest commuter vanpool program in the Southeast, facilitates thousands of carpools, coordinates Relax & Ride regional bus routes, and operates the area's first regional rail project.

The Nashville Metropolitan Transit Authority, also known as **WeGo Public Transit**, provides transit service throughout Davidson County. The **Franklin Transit Authority** provides local bus/trolley service to residents in the Franklin and Cool Springs area. The **City of Murfreesboro Transportation Department** provides local bus service, known as Rover, to residents in Murfreesboro.

Public transit operators are collectively represented on the Transportation Policy Board by a single appointment made by the Board of Directors of the agency which serves as the designated recipient of federal fund made available through the Federal Transit Administration.

In addition, the Transportation Policy Board includes a seat designated for the representation of count highway officials across the metropolitan planning area. County Highway Departments are often managed by a Highway Superintendent who oversees the location, relocation, construction, reconstruction, repair, and maintenance of the county road system, including bridges.

Federal Government

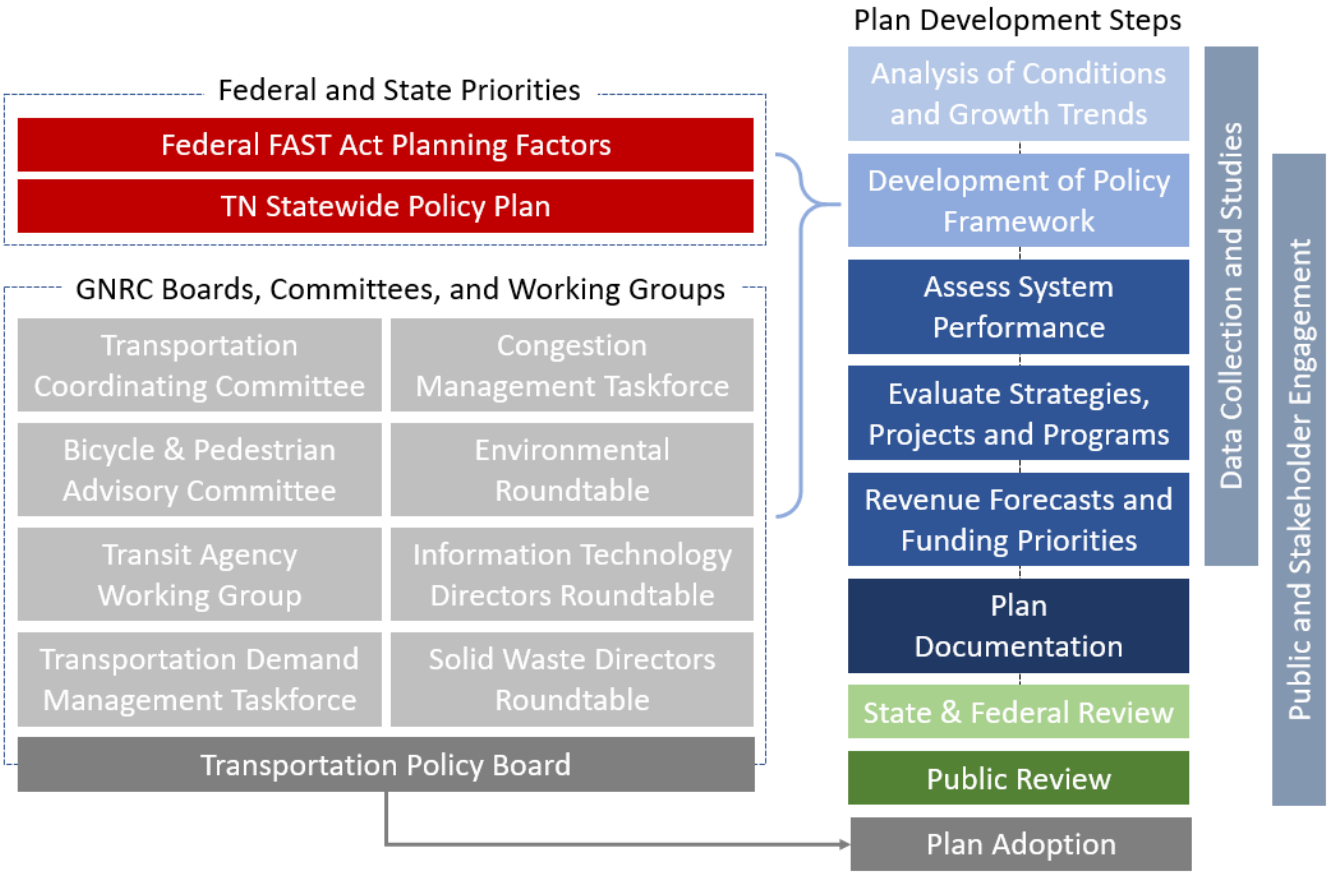
GNRC collaborates with a host of federal on matters related to transportation including the Environmental Protection Agency, Department of Health and Human Services, Department of Commerce Economic Development Administration, Department of Housing and Urban Development, and the Army Corps of Engineers. The Federal Highway Administration and Federal Transit Administration of the U.S. Department of Transportation both serve as non-voting members of the Transportation Policy Board and serve as the lead agencies to represent the federal government in the metropolitan planning process.

The **Federal Highway Administration** (FHWA) administers all federal-aid highway monies available for highway planning and implementation pursuant to the provisions of Title 23, United States Code. The FHWA Tennessee Division Office in Nashville is responsible for monitoring the expenditure of Federal-aid highway monies in Tennessee, including all highway planning, programming and implementation activities.

The **Federal Transit Administration** (FTA) administers all federal-aid monies available through grant allocation for public transportation planning, capital improvement, demonstration and operations pursuant to the provisions of Title 49, United States Code. The FTA Region IV Office in Atlanta is responsible for issuing federal transit regulations and guidelines for use by grant recipient agencies and public transportation agencies, monitoring public transportation planning and demonstration projects, and exercising fiscal controls.

Metropolitan Planning Process

The metropolitan area transportation planning required by the federal government is complex, data intensive, and built upon a foundation of continuous public and stakeholder engagement. In updating the Regional Transportation Plan for the Nashville metropolitan planning area, GNRC followed a process that included several analytical steps that incorporated national, state, and local priorities through ongoing collaboration among key stakeholders and input from members of the general public.



The *Transportation Planning Prospectus* provides more information about the Transportation Policy Board and an overview of how transportation planning is carried out across the seven-county region. The document can be found online at GNRC.org.

Related Plans, Programs, and Public Policy Documents

Tennessee Long Range Transportation Policy Plan

TDOT's Long-Range Transportation Plan (LRTP) is an important document for the Department and its stakeholders, as the Plan allows TDOT to make key long-term funding and policy decisions about transportation investments throughout Tennessee, today and in the future. The LRTP brings together the needs for all modes of transportation, including rail, transit, ports and waterways, aviation, pedestrians and bicycles in addition to highways.

Tennessee State Transportation Improvement Program

As part of the federal requirements for transportation planning, TDOT develops a 4-year short-term improvement program called the Statewide Transportation Improvement Program or STIP. To develop the STIP, TDOT works directly with the

Rural Planning Organizations (RPOs) and MPOs throughout the state to determine project needs. For metropolitan areas, the state participates in the metropolitan planning process to ensure the inclusion of state projects in the appropriate MPO Transportation Improvement Program. All federally-funded and regionally significant projects in the metropolitan area must be programmed in the TIP prior to implementation. Upon adoption by the Transportation Policy Board, the TIP for the Nashville metropolitan planning area is included in TDOT Statewide Transportation Improvement Program (STIP).TDOT Three-Year Work Program

The TDOT three-year work program is an integral part of the State of Tennessee budget presented each year by the Governor and approved by the Tennessee General Assembly. The first year of the work program provides a list of projects and funding programs to be implemented with revenues appropriated by the state legislature, while the second and third years are presented for illustrative purposes only. Projects in the three-year work program slated for federal funding must also be included in the STIP, and the corresponding TIP should the project be located within an MPO area.

Tennessee Strategic Highway Safety Plan

The Strategic Highway Safety Plan (SHSP) guides spending priorities for infrastructure improvements in the state around roadway safety, including utilization of funding sources such as Highway Safety Improvement Program funds. The plan also includes priorities for non-infrastructure spending such as promoting seat belt usage, discouraging distractive driving and reminding motorists not to drink and drive.

Coordinated Human Services Transportation Plan

The Coordinated Human Services Transportation Plan (CHSTP) documents local coordination on the funding and delivery of public transit services aimed at persons with disabilities, older adults, and low-income individuals. The plan sets a regional policy framework and provides a process to evaluate and award federal funds targeted at services that enhance mobility for the traditionally undeserved.

Regional ITS Architecture

GNRC works with federal, state, and local agencies develop a regional Intelligent Transportation Systems (ITS) architecture and deployment plan to ensure that we build a transportation network that incorporates technology and communications systems that work across modes of travel and political jurisdictional boundaries. ITS projects include traffic control systems, camera systems to monitor traffic flow, traffic operations centers, electronic signage and messaging systems, among others. ITS supports emergency response, law enforcement, freight movement, and the communication of roadway information to the traveling public.

Congestion Management Process

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A congestion management process (CMP) is a systematic and regionally accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs.

Local and Regional Public Transit Plans

The regional transit plan of WeGo Public Transit, known as *nMotion*, was adopted in August 2016. The *nMotion* process outlined a 20-year comprehensive plan designed to meet the Nashville area's needs for transit. The plan presents an evaluation of the existing transit system and identifies opportunities to improve service, attract and

retain new riders, and meet the growing needs of the Nashville area through investment in a program of projects derived from the regional transit vision that was adopted by the Transportation Policy Board as part of the Regional Transportation Plan in 2010.

The RTP also presents recommendations from local transit plans of the Franklin Transit Authority and the Murfreesboro Rover, and its development is coordinated with the federally-required Coordinated Human Service Transportation Plan for the region. That plan, adopted in 2016, is responsible for identifying a strategy for coordinating the various federal grant programs aimed at provided transportation services to the elderly, disabled, and low-income.

Local Land Use Policies and Comprehensive Plans

Nearly every municipality and county government in Middle Tennessee has its own comprehensive plan to help manage local resources and to prepare for future growth. These plans set land use policies and identify strategies to address needs for schools, parks, water and sewer, as well as transportation. Local transportation priorities are usually identified in the transportation element of these comprehensive plans, or as part of a separate local major thoroughfare plan. The development of the regional transportation plan pulls from these plans to unify the region's most important transportation priorities for federal funding into one document.

County	Planning Document
Davidson	• Mayor Cooper's Transportation Plan (2020) • NashvilleNext General Plan • WalkNBike Nashville • nMotion Public Transit Plan • Belle Meade Zoning Code • Goodlettsville Land Use Plan • Ridgetop Future Land Use Plan
Maury	• Maury County Comprehensive Plan • Connect Columbia Comprehensive Plan
Robertson	• Coopertown Land Use and Transportation Plan • Robertson County Comprehensive Plan • Greenbrier Land Use Plan • Millersville Future Land Use Plan • Millersville Zoning Ordinance • Portland Future Land Use Plan • Ridgetop Future Land Use Plan • Robertson County Zoning Ordinance • Springfield Recommended Growth Plan • White House Comprehensive Plan
Rutherford	• Rutherford County Comprehensive Land Use Plan • Murfreesboro 2035 Comprehensive Plan • Town of Smyrna Comprehensive Plan • City of LaVergne Zoning • Eagleville Zoning Ordinance
Sumner	• 2035 Comprehensive Plan: Sumner County's Blueprint to the Future • Gallatin on the Move Comprehensive Plan (PlanGallatin) • Goodlettsville Land Use Plan • Hendersonville Land Use and Transportation Plan • Long Hollow Pike-Station Camp Plan • Millersville Future Land Use Plan

	• Millersville Zoning Ordinance • Portland Future Land Use Plan • Westmoreland Future Land Use Plan • White House Comprehensive Plan
Williamson	• Brentwood Long Range Transportation Plan • Brentwood Zoning Ordinance • Brentwood Comprehensive Plan • Comprehensive Plan for Thompson's Station • Fairview Long-range Growth and Land Use Plan • Franklin Land Use Plan • Nolensville Land Use Plan • Nolensville Comprehensive Plan • Spring Hill Future Land Use Plan • Spring Hill Comprehensive Plan • Thompson's Station Major Thoroughfare Plan • Williamson County Comprehensive Land Use Plan • Williamson County Major Thoroughfare Plan
Wilson	• Lebanon Future Land Use Plan • Lebanon Major Thoroughfare Plan • Lebanon Comprehensive Plan • Mt. Juliet Land Use and Transportation Plan • Mt. Juliet Multimodal Transportation Plan • Wilson County Gateway Land Use Master Plan

2.2 Stakeholder Coordination

Expert Committees and Roundtables

GNRC's network of committees and roundtables brings together industry professionals, public-sector practitioners, and local elected leaders around specific issues of regional interest. The roundtable structure provides opportunities for networking and a forum for collaboration and consultation to support the implementation of programs, plans, and policy initiatives.

Mayors Caucus

The Middle Tennessee Mayors Caucus was formed in 2009 in order to provide leadership on important issues facing a rapidly changing regional landscape. Transportation, and particularly the pursuit of a modern regional transit system, served as the early catalyst, but in its brief history the Caucus has served as an effective forum for building working relationships among mayors and has helped local governments support each other on issues ranging from flood recovery to state and federal legislative and policy priorities. The Caucus is open to nearly 70 city and county mayors from across Middle Tennessee.

Transportation Coordinating Committee

The Transportation Coordinating Committee (TCC) is the lead advisory committee to the Transportation Policy Board. The TCC is responsible for assisting GNRC planning staff with preparing and reviewing data, analyzing trends, and developing recommendations for the Transportation Policy Board. In addition, TCC members often take an active role in coordinating the implementation of transportation improvements within their respective jurisdictions. The committee consists of the administrative and technical leadership of member jurisdictions and agencies

including local planning and public works departments, public transit agencies, public health departments, the Tennessee Department of Transportation, the Tennessee Department of Environment and Conservation, the Federal Highway Administration, and the Federal Transit Administration.

Bicycle and Pedestrian Advisory Committee

This advisory group, also known as the BPAC, guides the region's bicycle and pedestrian planning efforts and helps to evaluate proposed transportation projects to ensure that they are scoped to accommodate all modes of transportation. In addition, the committee plays a key role in the project selection process associated with GNRC's Active Transportation Program which provides dedicated federal funding for the improvement of walking and bicycling conditions across the area. The BPAC consists of representatives from local governments, state agencies, non-profit organizations, local bicycle clubs, and local law enforcement.

Freight Advisory Committee

This advisory group guides the regional freight planning efforts. The primary responsibility of the committee is to help public-sector policymakers, planners, and engineers better understand of the complexities associated with freight movement to more effectively target public investment in the transportation infrastructure. The committee includes experts from the following sectors and industries.

- Trucking companies
- Rail transport companies
- Airports and aviation businesses
- Municipal and county planning and engineering departments
- Academia
- Large manufacturers and warehouses
- Federal and State planning and environmental agencies
- Law enforcement agencies

Congestion Management Taskforce

GNRC hosted regular meetings with local, State, and federal partners to update the region's federally-required Congestion Management Process (CMP). Participants included staff from GNRC, FHWA, TDOT, and WeGo Public Transit who gathered to brainstorm performance measures, datasets and analytical methods, and strategies for managing regional traffic congestion.

Transportation Demand Management Taskforce

GNRC coordinated with local governments, TDOT, WeGO Public Transit, The TMA Group, the Transit Alliance of Middle Tennessee, the Nashville Downtown Partnership, Nashville Connector, Vanderbilt University and other interested parties to develop a shared understanding of the current and potential role of transportation demand management strategies to help improve regional mobility.

Public Transit Working Group

This advisory group guides the regional transit planning efforts. It is comprised of representatives from each of the fixed-route public transit agencies operating within the planning area including WeGo Public Transit, Franklin Transit Authority, Murfreesboro Rover, and the Mid-Cumberland Human Resource Agency.

Environmental Roundtable

The Environmental Roundtable convenes local experts, practitioners, and advocates from non-profit organizations and State and federal public agencies to collaborate on issues and challenges related to the environmental quality of Middle Tennessee. The group was established by GNRC in 2020 to assist in a major update to the regional

transportation plan and to help establish the Council's first regional strategy for the preservation and conservation of natural and socio-cultural resources.

Information Technology Directors Roundtable

The Information Technology Directors Roundtable convenes chief information officers (CIOs) and information technology (IT) directors from local jurisdictions and agencies to brainstorm on a variety of challenges related to rapidly changing technologies and information systems. The group works collaboratively to identify trends related to technology deployment and adoption, cyber-security, data sharing and management, and IT workforce skills. Together, they research best practices for the use of technology and information to improve a variety of community outcomes, most notably transportation and mobility. The Roundtable has been actively engaged in GNRC's recent Regional Smart Mobility Assessment and ITS Architecture update.

Solid Waste Directors Roundtable

This working group convenes solid waste directors, or their equivalent, from cities and counties across Middle Tennessee to brainstorm strategies for preparing local solid waste systems for the future. The Roundtable works together to assess trends related to growth and development, understand the ever-changing recycling markets and technologies, and monitor landfill capacity issues. Their research into area needs coupled with their review of national and global best practices are currently shaping recommendations for the state's first locally-driven regional-scale solid waste master plan. The group helps GNRC understand the nexus between solid waste and transportation issues.

Aging Advisory Committee

The Aging Advisory Committee advises GNRC as it fulfills its duties as the federally-recognized Area Agency on Aging and Disability, or AAAD, for Middle Tennessee. In this role, GNRC coordinates the prioritization and implementation of a range of social and legal services for older and disabled adults. The committee convenes local experts to formulate strategies and recommendations to address unmet community needs with available funding. Transportation is a key issue for the older adult population in Middle Tennessee as senior citizens strive to remain socially connected to the community and ensure continued access to healthcare.

Ad Hoc Study Committees

In addition to its standing committees, GNRC establishes ad hoc committees to provide guidance to the staff and consultant partners during the conduct of regional planning studies. Ad hoc committees typically include subject matter experts, local and state agency staff, local elected officials, and other regional public agency or non-profit partners.

Non-Profit Partners

GNRC has an ongoing partnership with each of the following non-profit organizations that help connect additional private-sector partners to the transportation planning process.

Nashville Area Chamber of Commerce

The Nashville Area Chamber of Commerce and GNRC co-produce an annual indicators report entitled, "Nashville Region's Vital Signs" to help draw attention to the area's strengths and weakness through ongoing tracking of various performance measures that relate to quality of life. The organization also helps GNRC coordinate with other chambers across the region to ensure that local businesses have a voice in the transportation planning process.

Nashville Civic Design Center

The Nashville Civic Design Center (NCDC) works with the GNRC on a variety of projects to integrate urban design considerations into the transportation planning process. Over the last several years, the NCDC has partnered with

the University of Tennessee at Knoxville School of Architecture and Design to produce booklets that illustrate case studies, best practices, and student ideas for the implementation of transportation concepts.

Cumberland Region Tomorrow

Cumberland Region Tomorrow (CRT) was formed in 2000 to advocate for quality growth and to support local communities in their comprehensive planning efforts. Through its work, CRT brings people together to address the challenges and opportunities that come with growth and development in Middle Tennessee. Its mission is to foster communication, collaboration, and action as the region plans for long-term livability, economic vitality and sustainability.

Conexión Américas

Conexión Américas is uniquely qualified to orchestrate public engagement on transportation plans, programs, policies and projects as it has the staff and resources to connect with populations, especially local Latino communities, that would not be reached through traditional outreach and communications methods.

The TMA Group

The TMA Group works with local employers to promote transportation demand management strategies such as transit and ridesharing, telecommuting, flexible work schedules, among others. The organization also operates local bus service under contract to Franklin Transit Authority and the regional vanpool program under contract to the Regional Transportation Authority.

Transit Alliance of Middle Tennessee

Comprised of representatives from the business community, the Transit Alliance is a non-profit organization committed to communicating the value of regional mass transportation needs and options. The Alliance fosters education across the region about the economic value of mass transit investments.

Leadership Middle Tennessee

A leadership institute founded in 1999 to provide a regional perspective to a diverse array of public and private-sector community leaders. Through networking, collaboration, and strategic thinking, LMT develops regional leaders who can contribute to long-term solutions that sustain and balance the quality of life and economic growth across Middle Tennessee.

2.3 Public Involvement

Public involvement is an essential element of the Regional Transportation Plan. Community engagement ensures the planning process is responsive to the day to day needs and transportation challenges of Middle Tennesseans. GNRC regularly seeks input from:

- Members of the general public;
- Traditionally-underserved populations and communities of color;
- Non-profit organizations and advocacy groups focused on quality of life issues;
- State and local political leadership;
- Transportation and logistics companies including private transit operators;
- Local businesses and business associations including chambers of commerce;
- Real-estate developers and economic development officials;

These groups provide necessary input into the planning process. Specifically, GNRC engages the public in order to document:

- Levels of satisfaction with the condition and operation of existing transportation facilities and services,
- Local expectations for improving transportation infrastructure and services,
- Feedback on recommendations developed through studies and planning, and
- Comments on federally-required planning documents prior to their adoption.

Federal regulations (23 CFR 450.316) require the development of a formal public participation plan (PPP) to define the process for citizens to be engaged in the metropolitan transportation planning process. The PPP describes the opportunities available to members of the general public and other interested parties to participate in planning activities and decision-making process pertaining to the local expenditure of federal transportation grants.

The current version of the Public Participation Plan for the Nashville metropolitan planning area was adopted by the Transportation Policy Board in June 2019. The plan sets forth guidelines that will be followed by GNRC for public noticing, the conduct of public meetings, and the adoption of federally-required transportation plans and programs. Specifically, the adopted PPP serves to:

- Inform the general public and interested parties of their role in transportation planning and decisions.
- Identify opportunities for public participation in the development of transportation plans and programs.
- Provide explicit guidelines for public noticing, public meetings, and the adoption of plans and programs.
- Provide examples of strategies and techniques that can help ensure meaningful community engagement.
- Describe a process for evaluating and improving the public participation plan and outreach methods over time.

Website and Online Applications

The GNRC's website at gnrc.org provides an overview of the Greater Nashville Regional Council, the MPO program, its responsibilities, staff contacts, policy board leadership, regional planning efforts, regional data and forecasts, meeting information, and items for public review and comment. The RTP website at www.solvethistogether.org is dedicated to the development of the Plan and contains news and videos, opportunities to participate in planning activities, and resources to explore.

Application	Description
Geographic Information Systems (GIS) Portal GNRC.org/Maps	Interactive maps of transportation system, population and growth forecasts, and other data used in the transportation planning process.
Data Dashboards GNRC.org/Dashboards	Interactive charts and tables showcasing analytics and trends from local, statewide, and national datasets.
Transportation Improvement Program TIP.NashvilleMPO.org	A web-based application that provides real-time programming information about projects scheduled over the short-term.
Unified Transportation Plan SolveThisTogether.org	A one-stop shop for information about the regional transportation plan including opportunities to be involved.

Social Media Channels

The GNRC uses social media platforms to engage community members in the planning process, gather feedback and provide information relevant to the region's economic prosperity. The GNRC's twitter account reaches more than 3,360 followers and its Facebook page nearly 1,500. Since 2010, the reach of the MPO's social presence has expanded significantly making these platforms a vital part of the organization's public engagement.

- Twitter.com/TheGNRC
- Facebook.com/TheGNRC
- Instagram.com/TheGNRC
- Linkedin.com/company/greater-nashville-regional-council/

Mailing List and Email Alerts

GNRC maintains a list of interested parties who have indicated an interest in receiving news, announcements, and notices about its plans and programs including those related to the transportation planning process. Members of the public with an interest in joining the lists can do so by visiting GNRC, by emailing a request to comments@gnrc.org, or by indicating such on any public comment card made available at GNRC public meetings.

Regional Symposiums and Summits

The GNRC hosts a variety of public workshops, events, and working group meetings in support of the transportation planning process and products including planning studies identified in the adopted Unified Planning Work Program.

Public Opinion Surveys

GNRC conducts various telephone, mail, in-person, and web-based surveys to gather input from specific audiences or to measure general attitudes toward planning issues and concepts. While much of the survey research performed in support of planning studies is conducted with random-sampling to yield statistically-valid results, GNRC provides opportunities for anyone to share their opinions and attitudes about transportation and regional growth and development issues at GNRC.org.

Speaker's Bureau

GNRC staff members have been active over recent years providing presentations aimed at communicating proposed plans and programs as well as soliciting input through facilitated conversations. GNRC continues to receive presentation requests from local civic clubs, business and industry associations, non-profit organizations, and advocacy groups.

Transportation Planning Studies

GNRC administers a variety of regional and corridor level studies, each with significant opportunities for the general public and interested parties to participate in the development of recommendations. Planning studies are identified each year in the adopted Unified Planning Work Program. More information on these planning activities is available at https://www.GNRC.org/transportation-studies .

Solve This Together Community Engagement Campaign

On October 30, 2019, more than 200 leaders from across Middle Tennessee gathered at the Frist Art Museum to join forces in pursuit of solutions to the region's toughest transportation issues. Participants included elected officials, agency leaders from local, state, and federal level of government, business and corporate leaders, non-profit partners, and community advocates.

The event kicked off a 9-month community engagement process to develop a unified plan to address Middle Tennessee's transportation challenges. The new strategy will replace the plan adopted by area mayors and transportation officials in 2016. Following the event, GNRC launched a dedicated website at SolveThisTogether.org to serve as a central clearinghouse for information about transportation planning efforts.

Formal Meetings and Public Hearings

The Transportation Policy Board generally meets on the third Wednesday of each month to discuss regional transportation priorities and to oversee the development of regional transportation plans and programs. Certain

meetings of the TPB are designated as formal public hearings for the purposes of receiving public comments on the adoption or amendment to the Regional Transportation Plan, Transportation Improvement Program, Unified Planning Work Program, and Public Participation Plan. Public comments are accepted at all public meetings in one form or another. Since March 2020, public meetings have been held online as a result of the COVID-19 pandemic and in accordance with the Executive Orders of Tennessee Governor Bill Lee.

All meetings of the Transportation Policy Board are open to the public pursuant to the Tennessee Open Meetings Act (T.C.A. § 8-44-101, et seq). In addition, GNRC plans and related documents are presumed to be open for inspection in accordance with State law (T.C.A. § 10-7-501, et seq). Tennessee residents may request to inspect or to receive copies of public records by completing the records request form available at GNRC.org or by emailing publicrecords@gnrc.org.

More information about Transportation Policy Board meetings is available online at GNRC.org/Calendar.

3.0 Issues, Trends, and Forecasts

3.1 Key Issues and Concerns

Over recent years, the Nashville region has received national recognition for its rapid growth and vibrant economy. While growth has brought increased prosperity for the region, communities and businesses in Middle Tennessee have begun to feel the growing pains in the form of worsening congestion, rising cost of living, and growing socioeconomic inequities. To manage the challenges associated with rapid growth, coordination among government, business, and community advocates is essential in order to address those issues and more.

Uncertain Impacts of the COVID-19 Impact

The global pandemic has led to dramatic changes in transportation patterns and behavior through the sudden and widespread adoption of telecommuting, increased demand for home delivery services, and surge in active transportation activity. In addition, the pandemic has had a disproportionate impact on the region's vulnerable residents such as seniors or those with respiratory diseases. The pandemic continues to impact the economy, causing layoffs and decreased pay, which has led to financial strain on households across the region. Given the ongoing uncertainty associated with the pandemic, it is not yet clear which emerging trends are likely to remain into the future.

Worsening Traffic Congestion

Traffic congestion is often the first visible sign of economic prosperity as more people commute to work and school and make more trips to spend their increased discretionary income. The region's rapid growth has led to additional traffic volumes and increased demand on the existing transportation system. As a result, the duration of congestion has increased and the reliability of congestion has worsened in recent years. Based on NPMRDS (INRIX) data, the duration of congestion, measured by person hours of excessive delay, has increased two percent annually for the Nashville area.

In the future, the region will need to move people more efficiently than driving alone. According to Transportation for America's The Congestion Con report, the region has added freeways faster than population has grown, but it has not prevented congestion. Over the last 25 years, the Nashville urbanized area has increased freeway lane miles by 107%, population by 101%, yet increased annual hours of delay by 329%. Transit solutions and safe access to active transportation are necessary in order to maintain mobility across the region and access to economic opportunities.

Rise in Serious Injuries and Fatalities

The Nashville area's Pedestrian Danger Index (PDI) is nearly double the national average, according to Transportation for America's 2019 Dangerous by Design report. Pedestrians represent less than one percent of crashes in the region, yet they are disproportionately impacted by crashes when involved. Pedestrians account for nearly 18% of traffic fatalities in the region, and pedestrian fatalities have nearly doubled from 25 in 2015 to 44 in 2019. In addition, overall traffic fatalities have risen from 156 fatalities in 2015 to 233 fatalities in 2019. One in every 400 crashes is likely to result in the loss of a life and traffic fatalities consistently remain around 200 annually for the region. To address this issue, strategies are necessary to modernize major corridors to allow safe access for all users, reduce crash severity at intersections, and connect active transportation networks.

Diversity and Demographic Shifts

The Middle Tennessee area continues to grow and diversify. The region's total population added nearly 200,000 residents between 2010 and 2018, an increase of more than 12% in just 8 years. Over the same time period, the percentage of ethnic and racial minorities increased by 24% and the elderly population rose by 40% regionwide, both outpacing the total population growth.

The region's recent growth outpaces many of our peer regions such as Indianapolis, Kansas City, and Louisville, and growth is projected to continue. By 2045, the MPO region is expected to reach more than 2.7 million residents - an additional million people in the next 25 years. Over that time horizon, the region's racial minority population is expected to increase at a faster rate than the total population and represent 22% of the region's population by 2045. In addition, the senior population is projected to more than double to nearly half a million seniors by 2045.

As the region's population continues to age and diversify, it is essential to account for the transportation needs of these populations and ensure their participation in the transportation planning process.

A recent report regarding public transit for seniors shows Nashville as the fourth-worst city for senior transit access in the nation among metropolitan areas with a population of one million or more. Commissioned by Transportation for America, "Aging in Place, Stuck without Options" showed that 85 percent of Nashville's citizens aged 65 to 79 had poor transit access in 2015. Only Atlanta, Kansas City and Oklahoma City are worse off. As seniors become a larger share of the population, the MPO region will need to address the unique transportation needs of older adults, particularly when it comes to accessing healthcare, local organizations and support programs, public transportation including paratransit, and opportunities for activity, such as walkable neighborhoods and multi-use paths.

Affordability and Housing Choice

Although cost of living has traditionally been a strength of the Nashville region, recent increases in cost of living, particularly in housing costs have been a burden on residents. According to the Center for Neighborhood Technology and the U.S. Department of Housing and Urban Development, households are cost burdened when they spend more than 45% of household income on housing and transportation. Across the MPO region, the average resident spends 53% of their income on housing and transportation, exceeding the cost burdened threshold.

Rising housing costs have pushed many families to seek housing farther from places of employment. As a result, they may be hindered by longer commutes and/or higher transportation costs, or worse yet, pass on employment prospects due to limited transportation mobility – not only affecting individual households, but the region's economic vitality.

Thus, transportation investments that expand transit service in the region and improve access to employment will be critical to increasing access to economic opportunity and sustaining the region's economy over the long-term.

Rising Costs of Obesity Epidemic

According to the Centers for Disease Control and Prevention, Tennessee is among the top 10 most obese states in the nation, with approximately two thirds of adults and one-third of adolescents considered overweight or obese. Additionally, one-third of Americans do not drive and/or own cars, relying on walking, bicycling, and transit for transportation. Yet of the 30 percent of trips in urban areas that are one mile or less, 65 percent depend on an automobile due to inadequate facilities.

Moreover, 2012 CDC data show that 29 percent of the residents in the Nashville-Davidson-Franklin-Murfreesboro Metropolitan Statistical Area (MSA) were rated as obese. Conditions such as obesity, which is directly related to physical inactivity, combined with injuries from vehicular crashes and diseases related to air pollution, cost the United States hundreds of billions each year in health care costs. Declining public health is due in part to the built environment of cities and neighborhoods; and has led planners and community leaders to reevaluate investments in transportation infrastructure to address public health issues.

Climate Shifts and Extreme Weather

Climate change and its implications has been the focus of ongoing conversation across the globe for more than two decades. Locally, the Nashville region has seen the impact of extreme weather on its communities with unprecedented flooding in 2010, the March 2019 Tornado, increasing periods of drought and rain, as well as

extreme temperature fluctuations. From rolling hills, to lush farms, to meandering streams, Middle Tennessee offers unmatched beauty. But the environment's importance goes well beyond beauty. Its health and vitality is directly tied to the physical and emotional health of its residents, as well as their economic well-being.

Through the Federal Climate Assessment, the Federal government has called for action to plan for and enhance the adaptability of the nation's infrastructure to future climate scenarios. Because of the substantial capital investment and long-life cycles inherent in most transportation infrastructure, it is critical that stakeholders engage in long-term evaluation of how a transportation asset will perform under a range of future climate scenarios. Currently, policy recommendations are being developed and considered at the Federal level to incentivize planning and investment in climate resilient infrastructure. Future transportation bills could include new funding earmarked for this purpose and the region should be ready to compete for this funding and to lead the way in Tennessee.

For most of the region's transportation assets this will implicate the design, engineering and maintenance of bridges and roadways that cross or are near surface water bodies that may experience more frequent and severe flood events. At the same time, potential drought events could cause near-surface aquifer drawdowns that could cause sinkhole formations or other structural impacts. Together, these future impacts could significantly impact the level of service, reliability, and safety of the transportation system.

Future climate scenarios indicate a range of potential conditions across Tennessee that could include alterations to the frequency and intensity of storm events and changes in average and extreme temperatures. These future changes may result in more extreme weather events, such as tornadoes, flooding and drought, and present a significant amount of risk to the communities across Middle Tennessee. Planning for and managing these risks within the context of long-range transportation planning will allow communities across the region to avoid significant economic and environmental disruption. It will be important for the Nashville region's transportation system of the future to be resilient in the face of climate uncertainty to make them less susceptible to significant loss of service or worse, outright failure.

Limited Funding and Financing Options

Over recent years the call for Congress to address the nation's transportation funding crisis has continued to grow. As Congress continues to draw from the general fund to fill holes in the Federal Highway Trust Fund (HTF), cities and states are increasingly willing to find funding solutions for their growing transportation needs. To date, approximately $140 Billion has been transferred from the General Fund to the HTF, including $70 Billion alone for the FAST Act. The current funding issues are due in part to the declining purchasing power of the federal gas tax, which has not been increased since 1993. The value of revenue from this source has fallen by more than 40 percent due to inflation and is compounded by drivers buying less gas as fuel efficiency standards for cars and trucks has significantly improved.

Declining gas tax revenues and buying power means fewer projects, slower progress, and less benefit to communities and economies—thus forcing local governments to find other means to meet funding needs. As a result, nearly three-quarters of states have increased their gas tax rate at the state level since 2010. Tennessee was one those states with the passage of the IMPROVE Act in 2017 that increased the state's tax on gasoline by 6 cents over 3 years, state's tax on diesel fuel by 10 cents over 3 years, increased vehicle registration fees, and authorized a local option transit surtax.

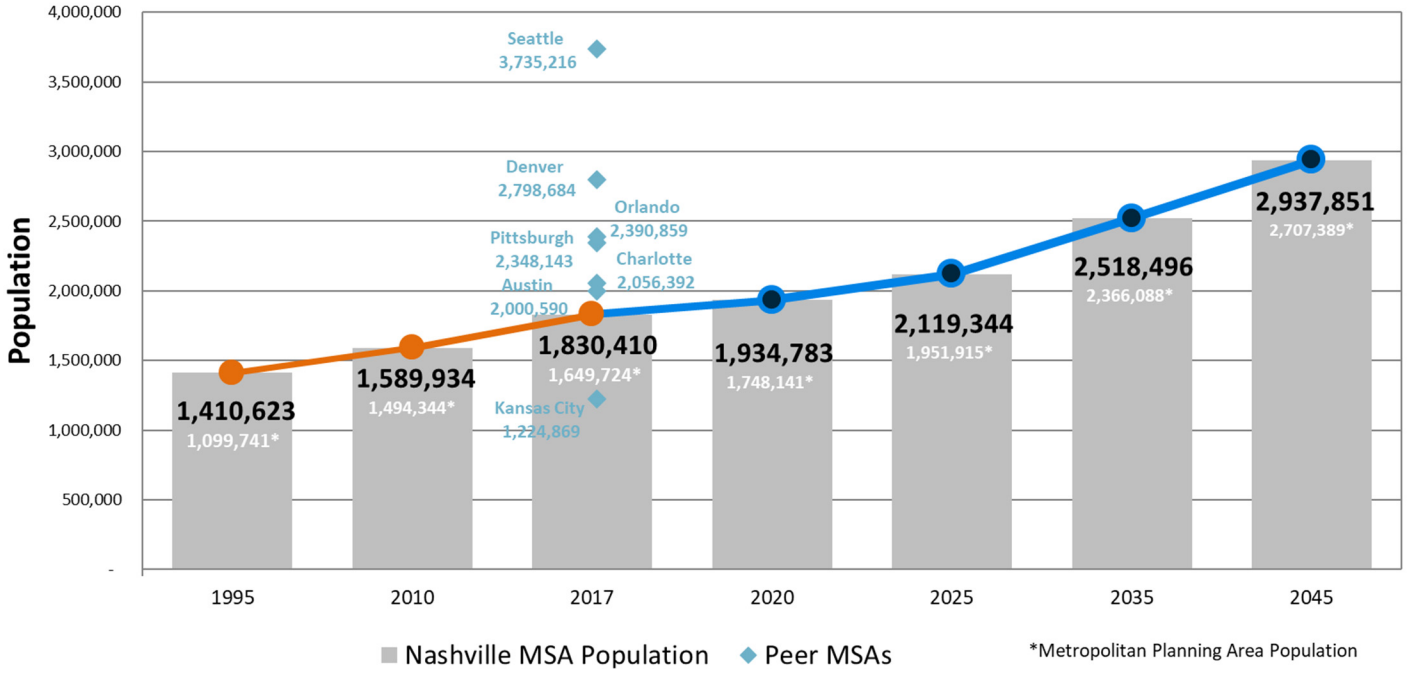
Shifts in demographics and geographic characteristics have led to increasing interest in regional mass transit in Middle Tennessee to improve mobility. Today, the region as a whole has underfunded its existing transit systems and led to the existence of a product that does not meet the needs of potential riders. In 2019, as the Nashville MTA rebranded as WeGo Public Transit, the agency also experienced an $8.7 million budget shortfall, causing the elimination of numerous bus routes and increased fares. In order to avoid service cuts and fare increases in the near-term and to develop a regional system that supports the growth that is expected over the next 25 years in the long-term, dedicate funding for transit is essential.

3.2 Population and Employment Growth

Changes in Population and Demographics

Since 2008, the MPO has relied on population and employment forecasts provided by Woods and Poole Economics, Inc. Those forecasts are based on national economic trends and provide detailed predictions for socioeconomic information at the county level. According to the forecast, nearly 3 million people will call the Middle Tennessee area home by the year 2045. More than 2.7 million of those are expected to reside within the seven counties within the Nashville Area MPO. Where those people live, work, and play, along with their socio-economic characteristics, will significantly influence the need for investments into our region's transportation infrastructure. As we think about future investments in transportation, it is important to realize that by 2045, our region will be larger than the present-day Denver region.

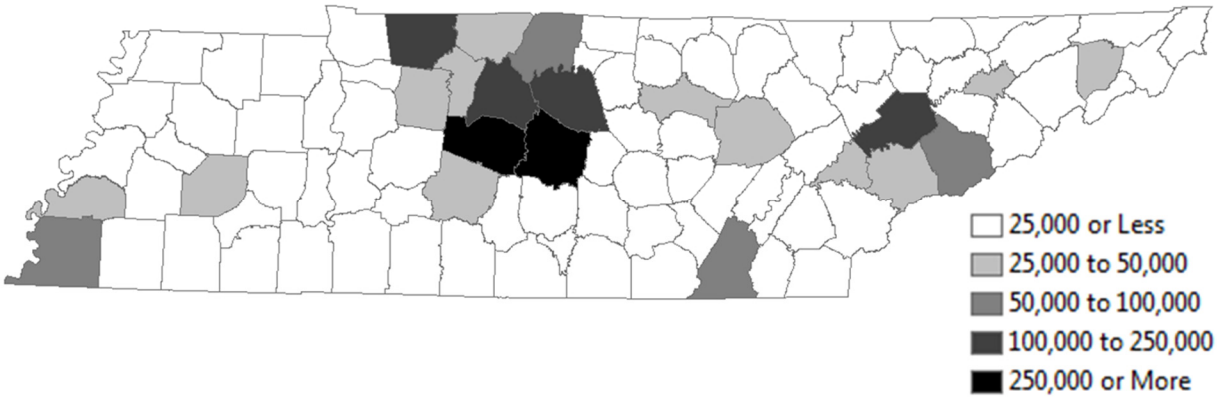
Figure 3-1. Middle Tennessee Population Growth Trend, 1995 to 2045



Source: U.S. Census Bureau, Woods & Poole Economics, Inc. (2017)

The significance of Middle Tennessee's growth is further reinforced when one considers that nearly 60% of the state's projected 2.1 million population increase between 2017 and 2045 is expected to occur within the 10-county area around Nashville. A closer look at those forecasts reveal that by the year 2045 three MPO counties will be ranked in the top 5 most populous across the state including Davidson (#2 with 848,000 people), Rutherford (#4, 555,000), and Williamson (#5, 548,000). Williamson and Rutherford counties are expected to add the most people during that time, leapfrogging Chattanooga-Hamilton County in the rankings.

Figure 3-2. Statewide Net Population Change by County, 2017 to 2045



Within the region, Davidson County is expected to remain the most populous county of the region and the center of the region's job market. Williamson County is expected to see the largest rate of growth, as well as the largest net increase in population, more than doubling its population from 2017 through 2045, from 212,000 people to nearly 550,000– a 158 percent increase.

Figure 3-3. Population Trends by County, 1990-2045

Year	MPO	Davidson	Maury	Robertson	Rutherford	Sumner	Williamson	Wilson	TN	MPO/TN
1990	977,637	510,784	54,812	41,494	118,570	103,281	81,021	67,675	4,877,185	20%
1995	1,099,741	540,388	62,155	47,964	150,297	116,865	103,830	78,242	5,290,452	21%
2000	1,221,741	569,891	69,498	54,433	182,023	130,449	126,638	88,809	5,703,719	21%
2010	1,494,344	626,681	80,956	66,283	262,604	160,645	183,182	113,993	6,346,105	24%
2017	**1,649,724**	**678,322**	**87,606**	**68,575**	**298,456**	**175,730**	**212,161**	**128,874**	**6,597,381**	**25%**
2020	1,748,141	699,326	90,958	72,071	321,842	186,143	237,700	140,101	6,823,883	26%
2025	1,922,728	734,235	96,608	78,095	363,610	204,290	285,527	160,363	7,213,275	27%
2035	2,303,088	798,722	107,493	90,357	455,888	242,234	402,255	206,139	7,996,101	29%
2045	**2,707,389**	**848,072**	**116,676**	**101,888**	**555,516**	**279,686**	**548,266**	**257,285**	**8,716,671**	**31%**
2010-2045	**81%**	**35%**	**44%**	**54%**	**112%**	**74%**	**199%**	**126%**	**37%**	
2017-2045	**64%**	**25%**	**33%**	**49%**	**86%**	**59%**	**158%**	**100%**	**32%**	

Source: 1990, 2000, 2010 decennial Censuses; 2013-2017 ACS 5-year Estimates; Projections from Woods & Poole Economics, 2017

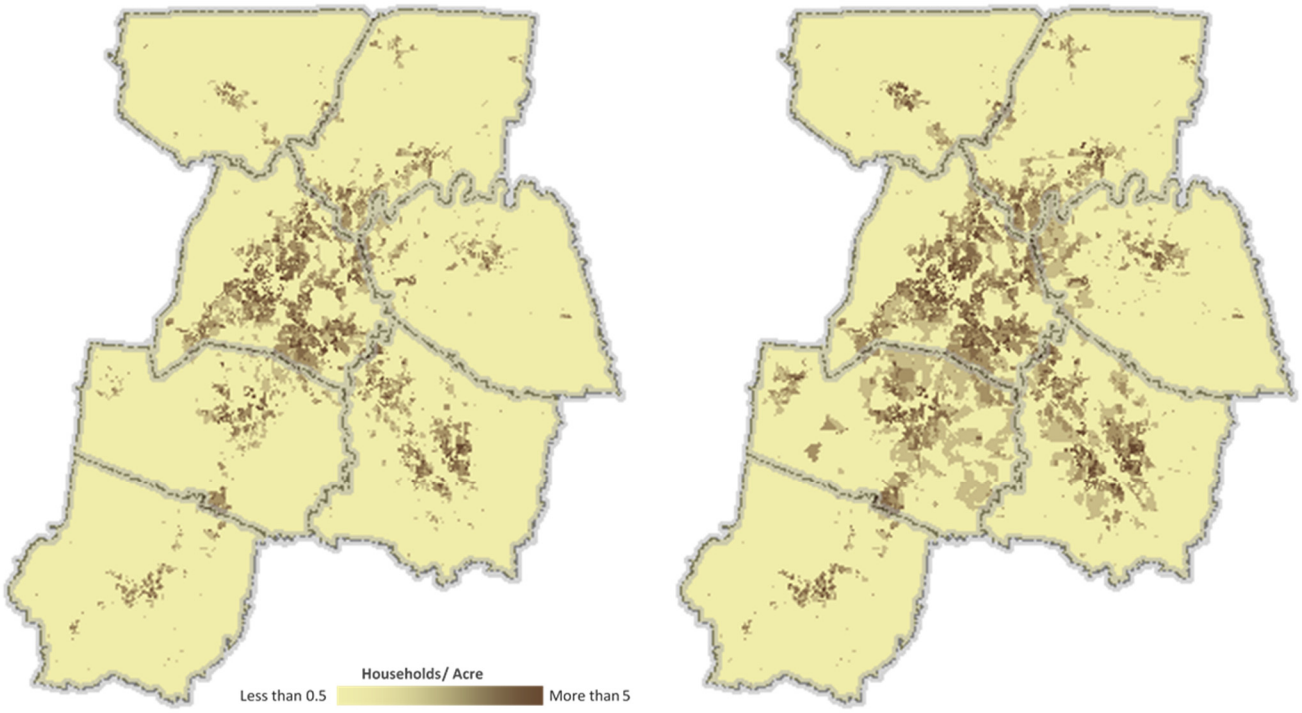
Not only is population increasing at a rapid rate, so too is the demographic diversity of the region, particularly with respect to race, ethnicity, and age. According to forecasts provided by Woods and Poole Economics, the percentage of the population of Hispanic ethnicity will double from 7 percent in 2017 to 15 percent by 2045. Also, by the year 2045, 16 percent of residents in the area will be 65 years or older, compared with about 12 percent today.

Figure 3-4. Ethnic and Racial Diversity by County, 2017 to 2045

	Hispanic Ethnicity		Non-Hispanic, Non-White		Hispanic, Non-White (all minorities)	
County	**2017**	**2045**	**2017**	**2045**	**2017**	**2045**
Davidson	10%	24%	31%	32%	41%	56%
Maury	5%	15%	13%	15%	18%	30%
Robertson	6%	13%	8%	12%	15%	25%
Rutherford	7%	12%	17%	25%	25%	37%
Sumner	5%	11%	9%	14%	13%	25%
Williamson	5%	11%	8%	14%	13%	25%
Wilson	4%	10%	9%	14%	13%	24%
MPO Area	**7%**	**15%**	**20%**	**22%**	**27%**	**37%**

Source: 2013-2017 ACS 5-year Estimates; Projections from Woods & Poole Economics, 2017

Figure 3-5. Residential Growth by Census Block, 2017 to 2045



Changes in Jobs and Employment Characteristics

Since the 1980s, Nashville and its surrounding counties have emerged as a truly metropolitan economy. Over the last two decades, rapid job growth across a variety of sectors has led to a strong and diversified economic base that excels in the healthcare management, automotive, and publishing industries. Still, the region continues to face challenges with manufacturing employment, mirroring trends at the national level as those jobs are automated or sent overseas. The Finance, Insurance, and Real Estate and Service sectors are expected to see significant gains in the coming years.

Figure 3-6. Employment Trends by County, 1990-2045

Year	MPO	Davidson	Maury	Robertson	Rutherford	Sumner	Williamson	Wilson	TN	MPO/TN
1990	640,604	417,239	32,943	16,300	63,122	41,997	41,286	27,717	2,777,416	23%
2000	884,352	530,464	44,323	24,876	104,343	57,324	80,772	42,250	3,459,310	26%
2010	971,904	542,778	39,998	28,066	133,805	55,355	120,263	51,639	3,515,804	28%
2017	**1,242,841**	**638,807**	**49,375**	**34,770**	**171,497**	**85,329**	**195,115**	**67,948**	**4,003,653**	**31%**
2020	1,308,221	663,947	51,937	36,515	181,083	90,000	212,256	72,483	4,173,857	31%
2025	1,431,548	703,343	54,738	36,609	200,261	97,704	256,007	82,886	4,470,323	32%
2035	1,667,376	794,182	61,880	45,567	234,105	113,304	319,091	99,247	5,049,961	33%
2045	**1,913,811**	**864,682**	**68,147**	**51,705**	**272,170**	**128,640**	**408,236**	**120,231**	**5,592,561**	**34%**
2017-2045	**54%**	**35%**	**38%**	**49%**	**59%**	**51%**	**109%**	**77%**	**40%**	

Source: Bureau of Economic Analysis Employment data 2017; Projections from Woods & Poole Economics, 2017; Regional Employment by Industry/ Sector, 2010-2045

Category	Detailed Category	2017		2045		Change
		Jobs	% of Jobs	Jobs	% of Jobs	2017-2045
	Totals	1,242,841	100%	1,913,811	100%	54%
Agriculture	Farm employment	8,741	0.7%	9,546	0.5%	9.2%
	Forestry, fishing, and related activities	1,814	0.1%	2,580	0.1%	42.2%
	Mining, quarrying, and oil and gas extraction	2,447	0.2%	2,971	0.2%	21.4%
	Construction	68,566	5.5%	93,652	4.9%	36.6%
Manufacturing	Manufacturing	79,616	6.4%	76,861	4.0%	-3.5%
Retail	Retail trade	28,698	2.3%	28,179	1.5%	-1.8%
	Accommodation and food services	70,486	5.7%	107,734	5.6%	52.8%
Office	Information	59,577	4.8%	87,838	4.6%	47.4%
	Finance and insurance	94,435	7.6%	166,072	8.7%	75.9%
	Real estate and rental and leasing	23,452	1.9%	48,677	2.5%	107.6%
	Professional, scientific, and technical services	93,549	7.5%	144,745	7.6%	54.7%
	Management of companies and enterprises	35,443	2.9%	58,253	3.0%	64.4%
	Administrative and support and waste management and reme	131,249	10.6%	285,820	14.9%	117.8%
	Educational services	42,789	3.4%	74,681	3.9%	74.5%
	Health care and social assistance	70,352	5.7%	109,411	5.7%	55.5%
	Arts, entertainment, and recreation	13,015	1.0%	13,443	0.7%	3.3%
	Other services (except government and government enterprise	5,331	0.4%	5,555	0.3%	4.2%
	Federal civilian	88,044	7.1%	127,361	6.7%	44.7%
	Military	118,662	9.5%	194,489	10.2%	63.9%
	State and local	100,775	8.1%	159,124	8.3%	57.9%
Transportation & Warehousing	Utilities	1,548	0.1%	1,395	0.1%	-9.9%
	Wholesale trade	42,719	3.4%	50,663	2.6%	18.6%
	Transportation and warehousing	61,532	5.0%	64,761	3.4%	5.2%

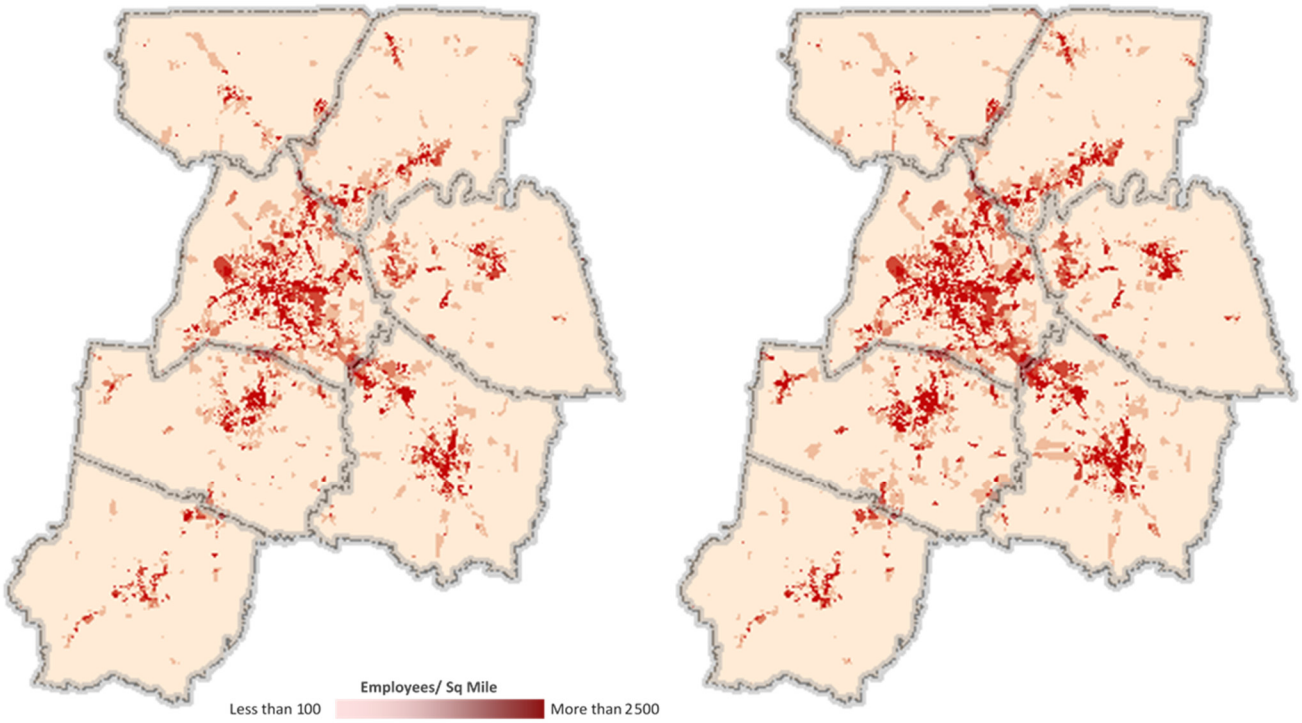
Source: U.S. Department of Labor, Woods and Poole Economics, Inc.(2017)

Figure 3-7. Percentage of Jobs by Sector and County, 2017-2045

Year	Category	MPO	Davidson	Maury	Robertson	Rutherford	Sumner	Williamson	Wilson	TN
2017	Agriculture	6%	5%	9%	12%	6%	9%	5%	9%	8%
	Government	9%	7%	14%	11%	12%	10%	7%	8%	11%
	Manufacturing	6%	4%	13%	20%	15%	10%	2%	7%	9%
	Office	52%	57%	40%	29%	38%	44%	64%	39%	45%
	Retail	18%	17%	18%	16%	19%	18%	17%	22%	18%
	Trans/Warehousing	8%	9%	3%	8%	9%	4%	4%	10%	9%
2045	Agriculture	6%	5%	8%	13%	6%	9%	4%	7%	7%
	Government	8%	6%	12%	12%	12%	8%	6%	9%	10%
	Manufacturing	4%	2%	4%	16%	13%	5%	1%	3%	6%
	Office	58%	65%	53%	31%	39%	52%	67%	40%	52%
	Retail	18%	15%	19%	18%	23%	20%	19%	30%	18%
	Trans/Warehousing	6%	7%	4%	9%	6%	6%	3%	12%	7%

Source: U.S. Department of Labor, Woods and Poole Economics, Inc.(2017)

Figure 3-8. Employment Growth by Census Block, 2017 to 2045

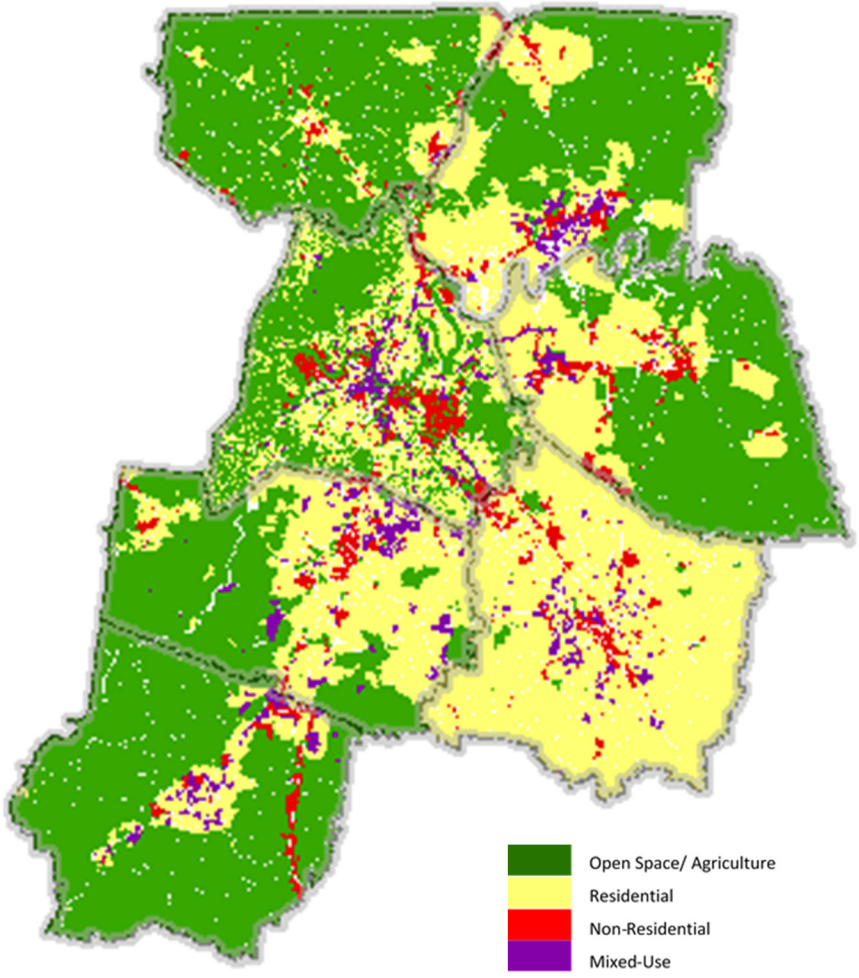


3.3 Land Use and Development Patterns

As suggested by GNRC's projection for a 64 percent increase in population between 2017 and 2045, the Nashville area is expected to see a major expansion of its developed land area. The ability to predict where people will likely live, work, shop, and play is a key ingredient in forecasting future transportation infrastructure needs. GNRC's Regional Growth Allocation Model establishes base year conditions, forecasted development patterns, and expected growth. The outputs document existing and future population, households, and employment by industry across the region at a parcel level. These outputs are utilized to calculate expected demands for public infrastructure from differing development patterns. GNRC uses the UrbanSim modeling platform to predict the future land development patterns of the Nashville metropolitan planning area. More information about the regional growth allocation model is provided in Appendix H.

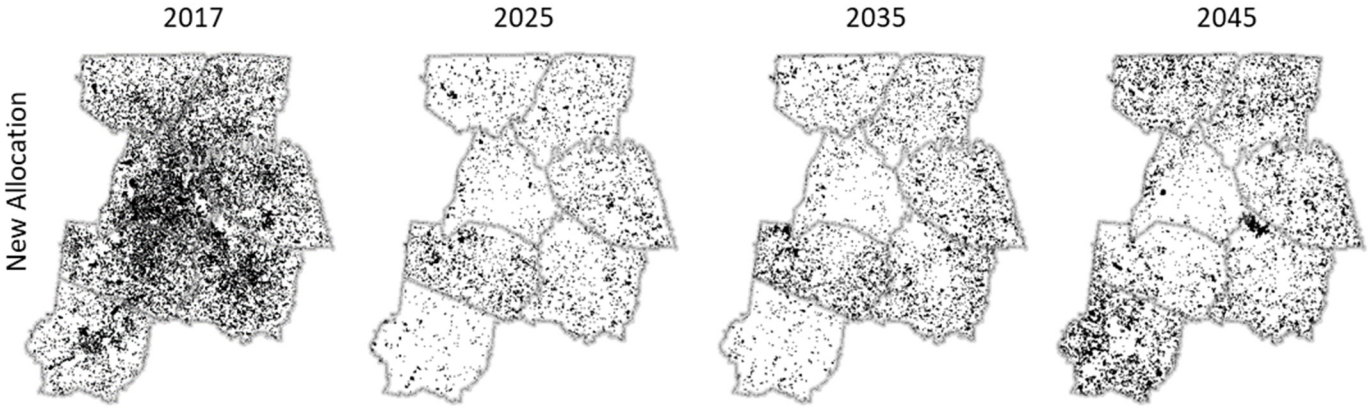
The land use model is built upon the basic relationship between supply and demand. Supply in this case refers to the region's capacity to support additional development and is determined by evaluating the physical constraints of land, the regulatory environment, and market forces that drive private sector decisions. Demand is based on the region's economic outlook as expressed by the area's predicted population and job growth.

Figure 3-9. Current Zoning and Future Land Development Policy



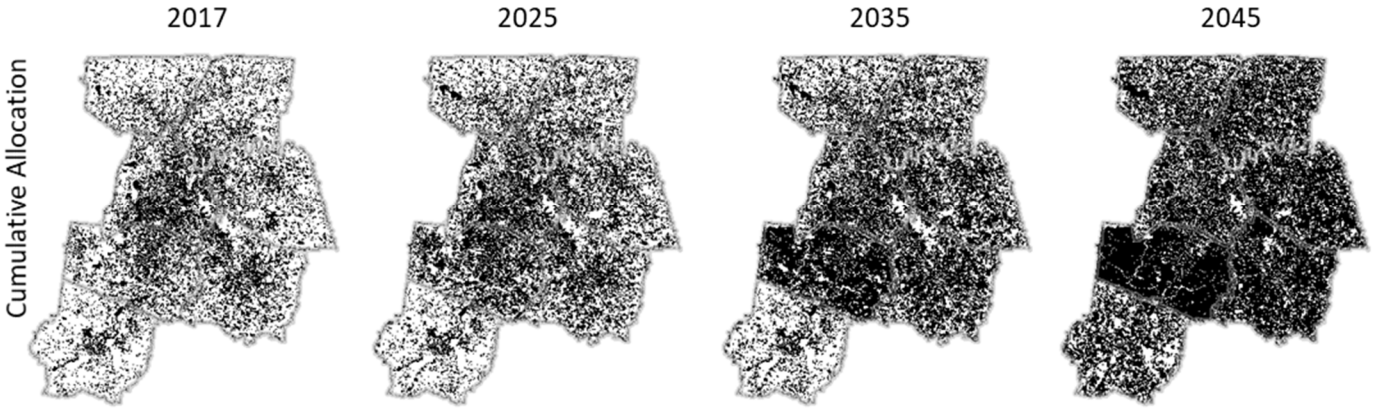
The following figures present a series of maps showing the results of the land use modeling by decade across the seven-county metropolitan planning area. The first map shows the parcels that were developed in 2017. The next three maps show the vacant parcels that are developed in each subsequent decade through 2045.

Figure 3-10. Incremental Land Development Growth by Decade, 2017 to 2045



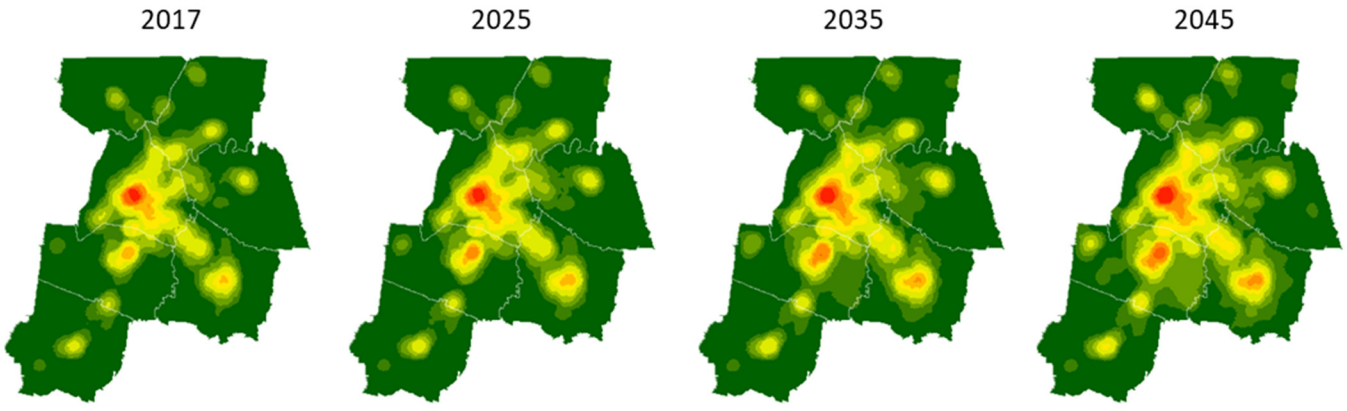
The next figure presents a series of maps which provide a view of the cumulative growth from the year 2017 to 2045.

Figure 3-11. Cumulative Land Development by Decade, 2017 to 2045



Finally, since the previous figures are showing parcels that are either developed (black) or not (white), the following figure provides an illustration of the intensity of that development, cumulatively between 2017 and 2045.

Figure 3-12. Cumulative Land Use Intensity by Decade, 2017 to 2045



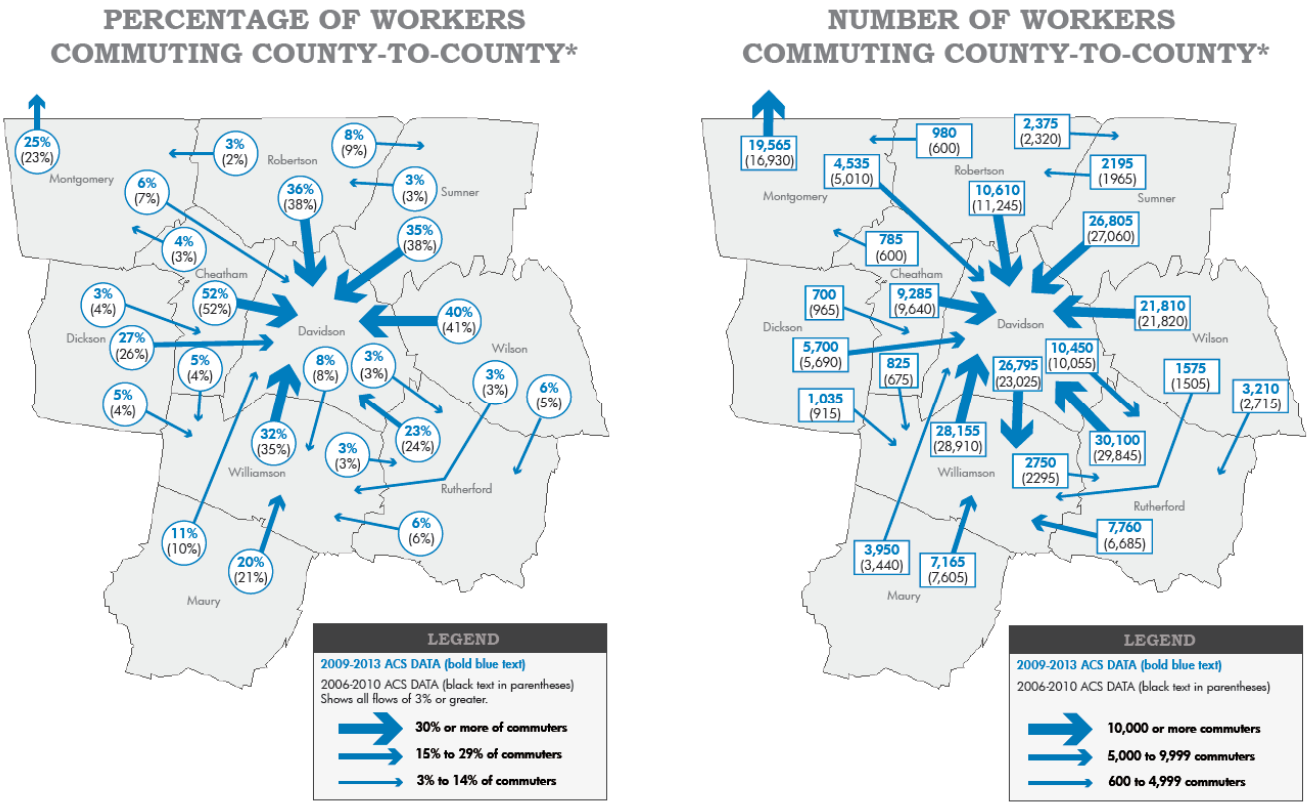
3.4 Transportation System Performance

Regional Travel Behaviors

According to the most recent U.S. Census *American Community Survey* data, one out of every three Middle Tennessean commuter works in a different county in which they live. The number grows to nearly 1 in 2 when looking at residents outside of Nashville-Davidson County and Clarksville-Montgomery County. These strong cross-county commuting patterns are one of the most defining characteristics of Middle Tennessee and clearly demonstrates why regional coordination on issues related to transportation, housing, and economic development is crucial to the long-term success of local communities and major employers.

While Davidson County has been the most significant draw of work trips from the region, reverse commuting and suburban to suburban commuting is becoming increasingly common as major employment centers emerge in the adjacent counties. The most notable being the Brentwood/Franklin Cool Springs area in Williamson County. The figure below shows the cross-county commuting patterns in terms of percent of workers and total number of workers traveling between counties for 2010 and 2013.

Figure 3-13. Cross-County Commuting Patterns, 2010 and 2013



*Source: American Community Survey 2009-2013 (Blue), 2010 Census (Black), *Commuter flows of 3 percent or more of total.*

Thinking beyond the Commute

Most conversations about regional transportation tend to focus on the work commute trip, and justifiably so. The commuting workforce is by far the most pronounced part of area traffic congestion, particularly during peak travel periods which typically occur on weekday mornings, from 6 AM to 8 AM, and evenings, from 4 PM and 6 PM. That

said, it is important to know that only about 20 percent of all trips made by Middle Tennesseans are between home and work locations. The following list highlights travel behaviors observed by the MPO through its 2012 Regional Household Transportation and Health Study. The research project outfitted a sample of more than 6,000 area households with travel logs to record their daily travel.

- Personal Automobiles: 46 percent of personal automobiles are 10 years or older, 19 percent are less than 5 years old, and 96 percent are powered by traditional gasoline engines.
- Trip Making: The average individual makes about 4 one-way trips per day. Of all the trips made on a daily basis by residents of the area, about 19 percent are between home and work, 9 percent are between home and school, 12 percent are between home and retail destinations, 27 percent are between home and some other destination, and 34 percent are between locations outside of the home.
- Travel Mode: While reliance on private automobiles is undoubtedly high across Middle Tennessee, 77 percent of individuals living in urban areas walk for transportation purposes at least once per week, another 12 percent bicycle at least once per week to get to a destination, and 6 percent use transit at least once per week.
- Commuting to Work is dominated by Single-Occupant Vehicles: Census data and MPO surveys show that nearly 8 out of 10 commuters typically drive alone to and from work.

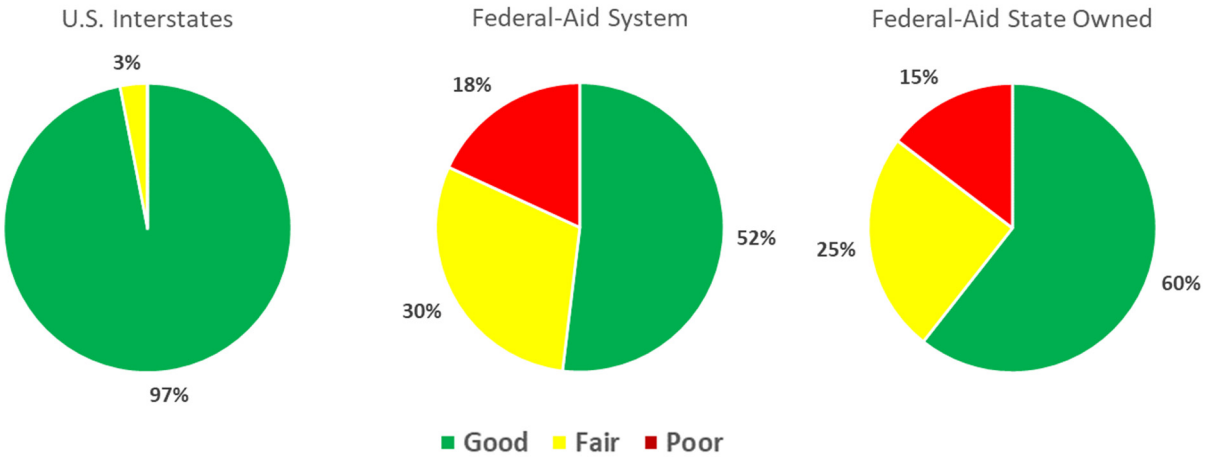
State of Good Repair

Major Roads and Highways

Roadway pavement condition in the MPO region was determined using the latest available information from the FHWA Highway Economic Requirements System (HERS) which uses Highway Performance Monitoring System (HPMS) data submitted by Tennessee DOT to the Federal Highway Administration (FHWA). 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. HPMS data is sample data, collected across the entire Federal-aid eligible system, for interstate, arterial and collector networks.

Pavement condition is reported as percent of lane miles in good/fair/poor condition based on the International Roughness Index (IRI), consistent with the expected pavement condition performance metric to be required via MAP-21. Of the 7,505 lane-miles in the Federal-aid network, 52 percent are in good condition, 30 percent are in fair condition; and 18 percent are in poor condition, for a total of 82 percent of the system in good or fair condition. Because HPMS is sample data, these results are presented as network level summaries.

Figure 3-14. Condition of Area Roadways by Highway System



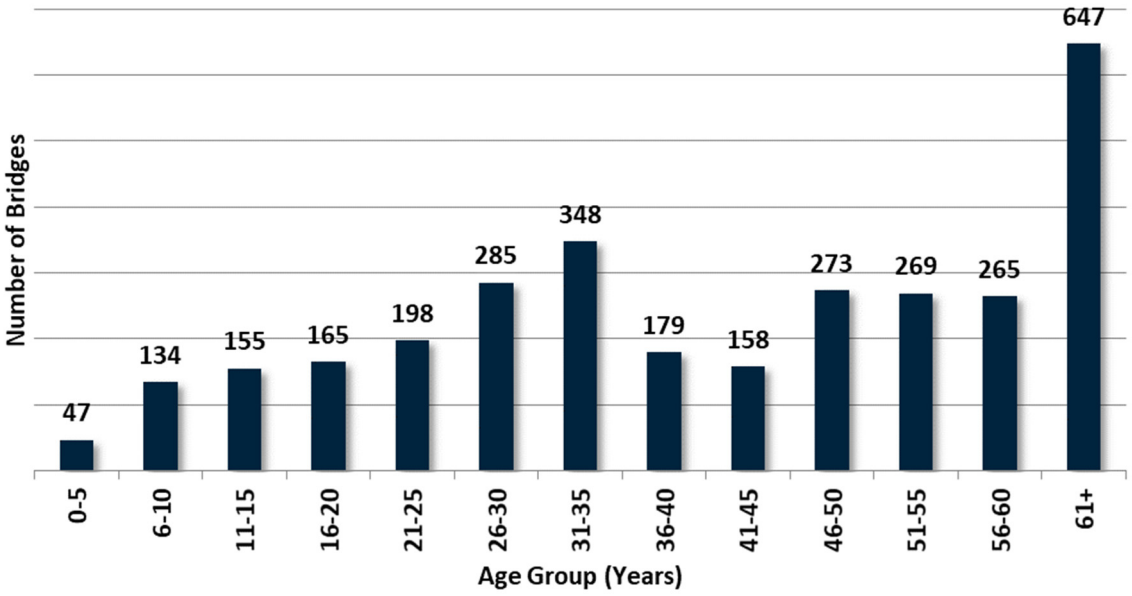
Source: Highway Performance Monitoring System, HERS tool (2018)

Bridge condition data for the Nashville region was collected from the 2018 National Bridge Inventory (NBI) database which represents the most comprehensive uniform source of information available and is used to provide Congress the status of the Nation's bridges. Data are submitted by TDOT to the FHWA as part of the national bridge inspection program.

NBI structures are bridges or culverts that carry vehicular traffic and have an opening longer than 20 feet measured along the center of the roadway. There are more than 3,100 structures within the GNRC area as of 2018, including more than 1600 bridges. The average age of bridges in the region is 44 years. Half of all bridges are greater than 40 years old. Only 16 percent of bridges are less than 20 years old.

Of the 1600 bridges, TDOT owns and maintains 967 bridges (approximately 45 percent of the bridges). Local agencies own 602 bridges (44 percent) and the remaining one percent of bridges are owned by other agencies.

Figure 3-15. Bridges by Age Range

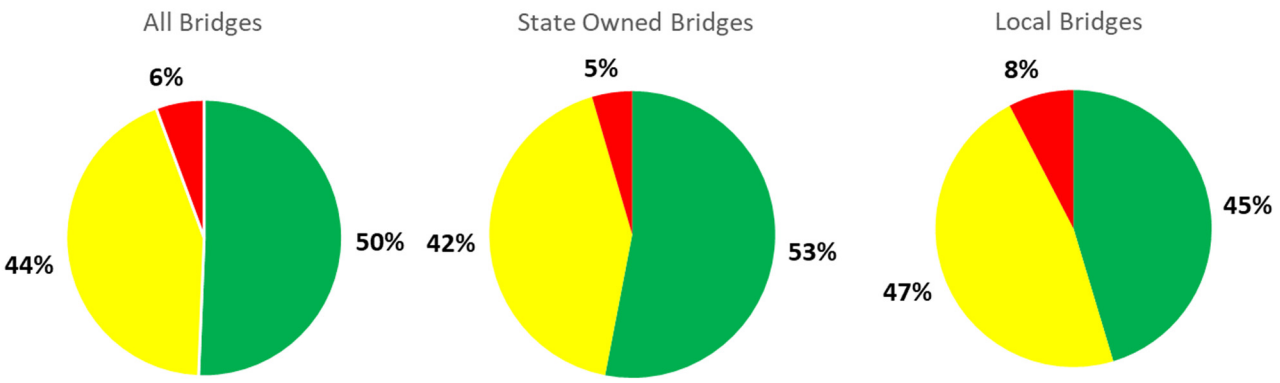


Source: National Bridge Inventory Database (2018)

Bridge Condition is determined by the lowest rating of National Bridge Inventory (NBI) condition ratings for Deck, Superstructure, Substructure, or Culvert. Bridges are assigned a rating of good, fair, or poor based on the thresholds below. Of the bridges in the area, 50 percent are in good condition, 44 percent are in fair condition, and 6 percent are in poor condition.

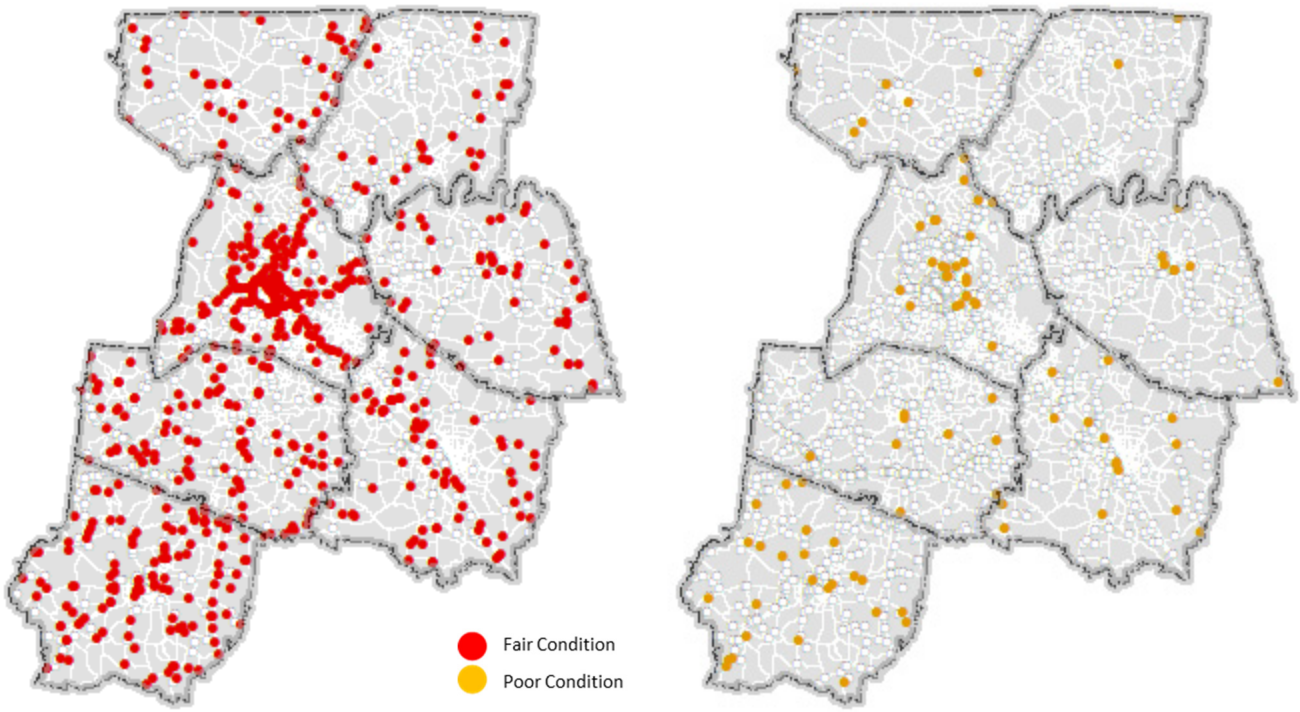
- Good: lowest rating is greater than or equal to 7
- Fair: rating of 5 or 6
- Poor: lowest rating is less than or equal to 4

Figure 3-16. Bridge Conditions by Facility Ownership



Source: National Bridge Inventory Database (2018)

Figure 3-17. Locations of Bridges in Fair and Poor Condition



Source: National Bridge Inventory Database (2018)

Pedestrian and Bicycling Facilities

The active transportation network consists of nearly 700 miles of sidewalks and approximately 240 miles of bicycle facilities, covering roughly 20 percent and 7 percent of the region's arterials and collectors, respectively. While walking and bicycling trips remain a small percentage of overall trips, ongoing maintenance of existing facilities and modernization of intersections and roadways are necessary to improve suitability for walking and bicycling trips. Local governments can play a critical role in ensuring that facilities are ADA compliant through the development and implementation of ADA transition plans to address deficiencies in the network.

Public Transit Facilities and Equipment

Routine maintenance and ongoing renewal of the transit fleet is essential to reliable service. As of 2018, WeGo Public Transit's inventory of revenue vehicle consists of nearly 180 buses with an average age of approximately nine years and 91 AccessRide vans with an average age of 6.2 years. Franklin Transit Authority's inventory consists of 12 revenue vehicles with an average age of 4.3 years. Murfreesboro Public Transit's inventory consists of nine revenue vehicles with an average age of 5.0 years.

Transportation Technology and Communication Equipment

Traffic-control devices are used to inform, guide, and control the flow of traffic (both motorized and non-motorized modes). In order for traffic-control devices to effectively serve their function, they need to be properly maintained and respond to changes in traffic patterns over time. Failure to do so results in delays and unreliable travel time for travelers. In areas with greater intersection density, traffic signal coordination is essential in order to facilitate smooth traffic flow and minimize stops along a corridor. There are more than 37,000 intersections and 13,150 traffic signals across the region that are predominately owned and maintained by local jurisdictions.

TDOT currently operates four Transportation Management Centers (TMCs) 24 hours per day, 7 days per week across the state including one in Nashville. The TMCs utilize a variety of technology including, closed circuit television (CCTV) Cameras, dynamic message signs (DMS), radar detection systems (RDS), video detection systems (VDS), etc. in order to identify and manage incidents as well as work to prevent secondary crashes.

In addition, several cities in the Middle TN region also operate their own Traffic Operations Center (TOC). The TOC's have a similar role as the TDOT TMC in monitoring traffic incidents and congestion along the roadway, but on a smaller scale and with more focus on arterials rather than freeways. Nashville, Brentwood, Franklin and Murfreesboro have existing TOCs and additional ones are planned for Smyrna and Hendersonville.

Transportation Security

The security of the regional transportation system is an essential part of the planning process. Ensuring that security and emergency management are considered in regional transportation planning improves safety for the traveling public and can contribute to the system's resiliency. Increased security of the transportation system for motorized and non-motorized users is a federal transportation planning factor, and it is important that security plans, policies, and programs are in place. Without incorporating necessary security measures into the planning process, the system could face issues such as adverse health effects or casualties, impaired federal departments and agencies, economic failure, and the loss of the public's morale and confidence. For example, geographic proximity to higher security risk facilities identified in this plan (airports, large freight corridors, and emergency evacuation routes), condition of critical bridges, and facilities along the Strategic Highway Network (STRAHNET) are important consideration in the metropolitan planning and programming process.

GNRC actively participates in available emergency management planning opportunities to ensure coordination with transportation planning efforts. Ensuring the security of the regional transportation system requires coordination among federal, state, regional, and local partners. GNRC is committed to coordination with the following partners to ensure that security is incorporated into metropolitan planning activities:

- Department of Homeland Security: The Office of Homeland Security is responsible for enhancing the protection of Tennessee's critical infrastructure and key resources. Working cooperatively with federal, state, and local government agencies, as well as the private sector, the Office of Homeland Security strives to build a safer, more secure environment through its Critical Infrastructure Protection Program.
- Tennessee Office of Homeland Security (TOHS): The primary authority responsible for directing statewide activities pertaining to the prevention of and protection from terrorist-related events. This responsibility also includes the development and implementation of a comprehensive and coordinated strategy to secure the state from terrorist threats and attacks. In addition, TOHS also serves as a liaison between federal, state, and local agencies, as well as the private sector, on matters relating to security.
- Local Transit Agencies: The local transit agencies in the MPO region are responsible for transit security planning, prevention, response and recovery phases. The WeGo Public Transportation Safety Plan details steps the agency takes to ensure transit safety and security. The Office of Passenger Transportation (OPT) also offers various technical assistance and training classes that focus on preventive maintenance, transit safety and security, customer service/ diversity, effective radio communications, ITS, and managing transit emergencies.
- Tennessee Emergency Management Agency (TEMA): The TEMA coordinates emergency management response and recovery to reduce loss of life and property in the State of Tennessee. TEMA is also responsible for the development of the Tennessee Emergency Management Plan (TEMP). TEMP provides the foundation for all disaster and emergency response plans and operations conducted within the State of Tennessee. All local emergency management plans are required to emulate the TEMP in terms of structure and purpose.

Roadway Safety

Roadway safety is a vital aspect of transportation because people should be able to get from point A to point B safely. Whether an individual is riding the bus to work, driving to the grocery store, or walking to the park, they should have confidence that their trip will be safe. When trips are perceived as unsafe, it can discourage trips from happening, and thus limit access to opportunities. To prevent the loss of life, injuries, and other negative outcomes associated with poor roadway safety, the region is committed to improving safety for all users of the system.

National, State and regional crash data by severity are given below to provide a realistic view of the challenges regarding safety problems for varying modes of transportation. Although there have been improvements and the rates of fatalities and injuries have declined on the national level over the years, there are still obviously needed improvements.

The following table presents a summary of crash data for a five-year period from 2015-2019 for the United States, Tennessee, and the Nashville region. At all levels, overall crashes and traffic fatalities have increased between 2015 and 2019, while serious injuries have declined.

Figure 3-18. National, State, and Regional Crash Statistics, 2015-2019

Year	2015	2016	2017	2018	2019	Total
All Crashes						
MPO Area	69,003	72,987	72,798	71,880	73,355	360,023
Tennessee	197,200	206,408	208,239	208,471	204,672	1,024,990
United States	6,296,000	6,821,000	6,453,000	6,734,000	N/A	26,304,000
Fatal Crashes						
MPO Area	150	195	189	187	222	943
Tennessee	962	1,037	1,024	1,041	1,079	5,143
United States	32,538	34,748	34,560	36,835	N/A	138,681
Serious Injury Crashes						
MPO Area	1,647	1,574	1,521	1,013	928	6,683
Tennessee	7,613	7,595	7,129	4,720	4,585	31,642
United States	1,715,000	2,116,000	1,889,000	1,894,000	N/A	7,614,000

Source: Tennessee Department of Safety and Homeland Security, National Highway Traffic Safety Administration

Because raw crash figures can be difficult to understand when comparing different locations, the Tennessee DOT and the MPO both rely on the use of crash rates in order to interpret useful information from the data. A crash rate represents the number of crashes per 1,000 licensed drivers for any given area (county, region, state, etc.). The following table presents the ranking of each MPO county (out of 95 Tennessee counties) for crash rates of various types of crashes. Overall the MPO region ranks fairly well when compared with other counties, statewide. Only two MPO counties are ranked in the bottom 10 for any one category. Davidson County has the highest overall crash rate, highest injury crash rate, highest young-driver related crash rate, highest speed-related crash rate, and senior driver-related crashes, and 2nd worst for motorcycle-related crashes. Rutherford County ranks 5th worst overall, 4th worst for serious injury crashes, 5th worst for young-driver related crashes, and 4th for senior-driver related crashes.

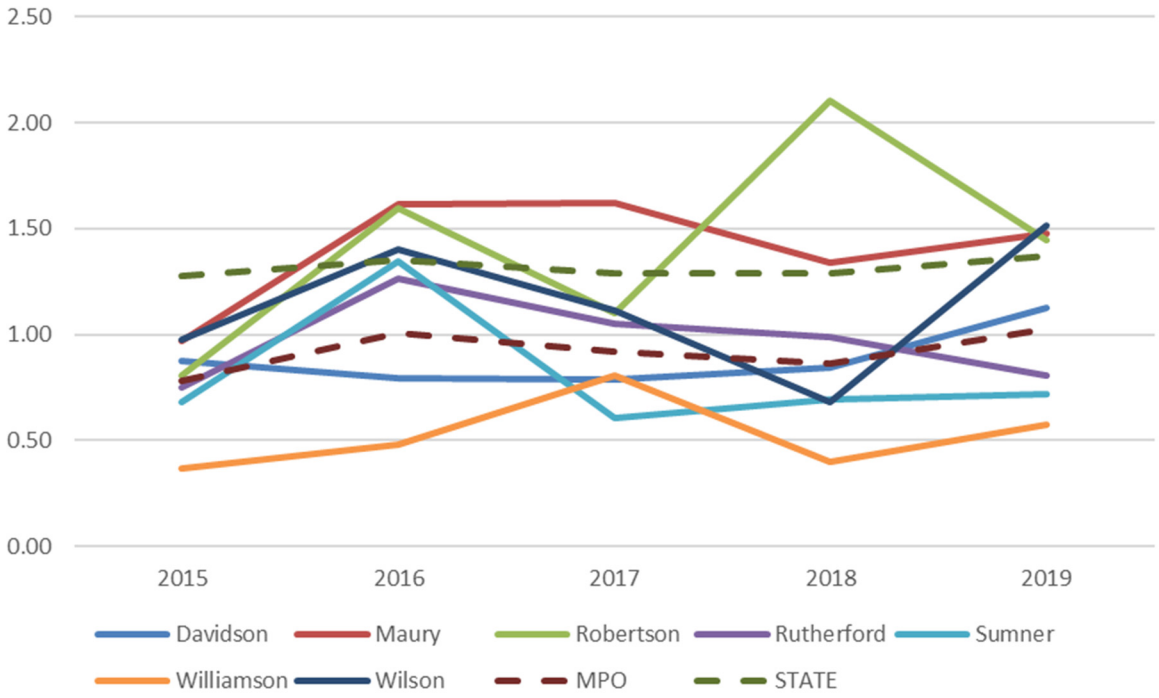
Figure 3-19. Statewide Crash Rate Rankings by County, 2015-2019

County	Total Crashes	Fatal Crashes	Serious Injury Crashes	Motorcycle Crashes	Alcohol Related	Speed Related	Young Driver (15-24)	Senior Driver (65+)
Davidson	1	82	1	2	49	1	1	1
Maury	21	59	14	24	14	25	14	18
Robertson	26	48	23	64	17	29	33	31
Rutherford	5	86	4	23	30	7	5	4
Sumner	54	94	61	63	82	26	42	38
Williamson	39	95	80	85	85	42	50	27
Wilson	30	78	17	46	39	41	28	30

Source: Tennessee Department of Safety and Homeland Security

Within the MPO region, fatality crash rates tend to be the highest in the less populated, or more rural counties. Robertson and Maury consistently see the highest number of fatal crashes per 1,000 licensed drivers. The MPO performs worse than the national average, but significantly better than the state. The following figure presents the fatal crash rates by MPO county for the last five years, 2015 to 2019.

Figure 3-20. Fatal Crash Rates by County, 2015 to 2019



Fatal Crashes per 100 million annual vehicle miles traveled. Sources: Tennessee Department of Safety and Homeland Security.

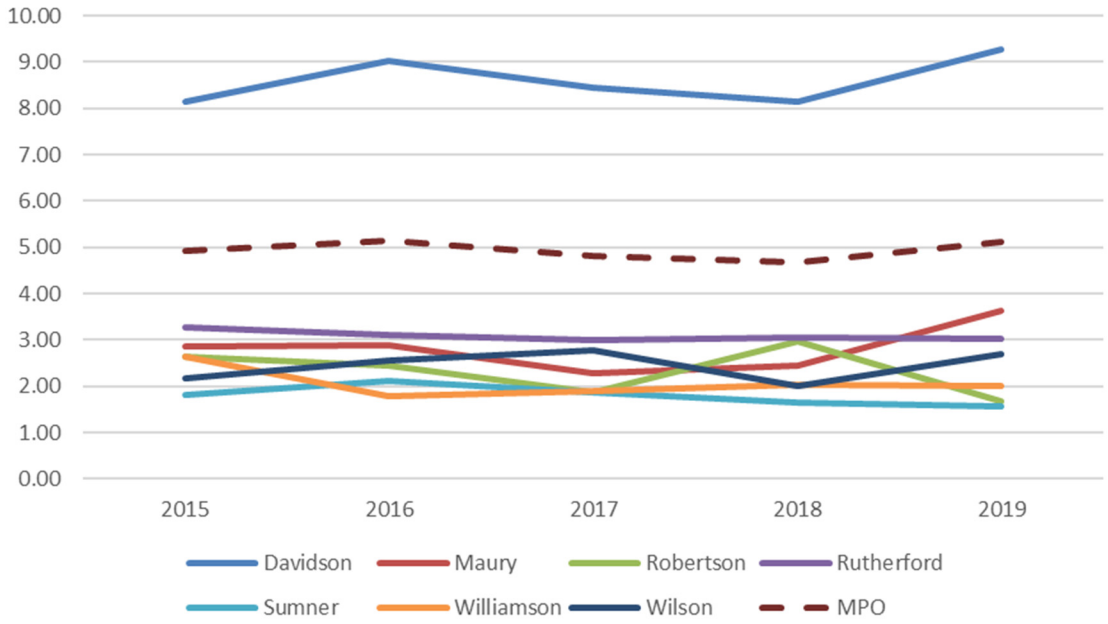
Crashes Involving Pedestrians and Cyclists

Pedestrians are categorized as individuals traveling roadways by foot, wheelchair, or other mobility device, while bicyclists are categorized as riders of two-wheel, non-motorized vehicles, tricycles, or unicycles powered solely by pedals. Pedestrians represent less than one percent of crashes in the region, yet they are disproportionately impacted by crashes when involved. Pedestrians and bicyclists account for 18% of all fatalities despite representing less than 4% of all trips.

The region continues to be an unsafe environment for pedestrians. Between 2015 and 2019, there were 167 pedestrian fatalities and 521 pedestrian-related serious injuries. The majority of fatalities and serious injuries occurred in urban centers where people are more likely to walk and along the major corridors "pikes" in and out of Nashville, where people are more likely to access transit service. The major corridors can be particularly dangerous for pedestrians given the speed of vehicles, number of vehicles, and limited opportunities to safely cross four or more travel lanes.

The figure below shows the number of bicycle and pedestrian crashes by county per 10,000 residents for each year between 2015 and 2019.

Figure 3-21. Pedestrian/Cyclist Involved Crash Rates by County, 2015-2019



Crashes per 10,000 Residents. Sources: Tennessee Department of Safety and Homeland Security.

Crashes on Public Transportation

Local transit agencies have always placed an emphasis on providing a safe, secure, and reliable service for its passengers and employees. While public transit has shown to be a much safer option than driving, crashes do occur. The following table presents collision statistics for area transit agencies.

Figure 3-22. MPO Area Transit Collision Statistics, 2014-2018

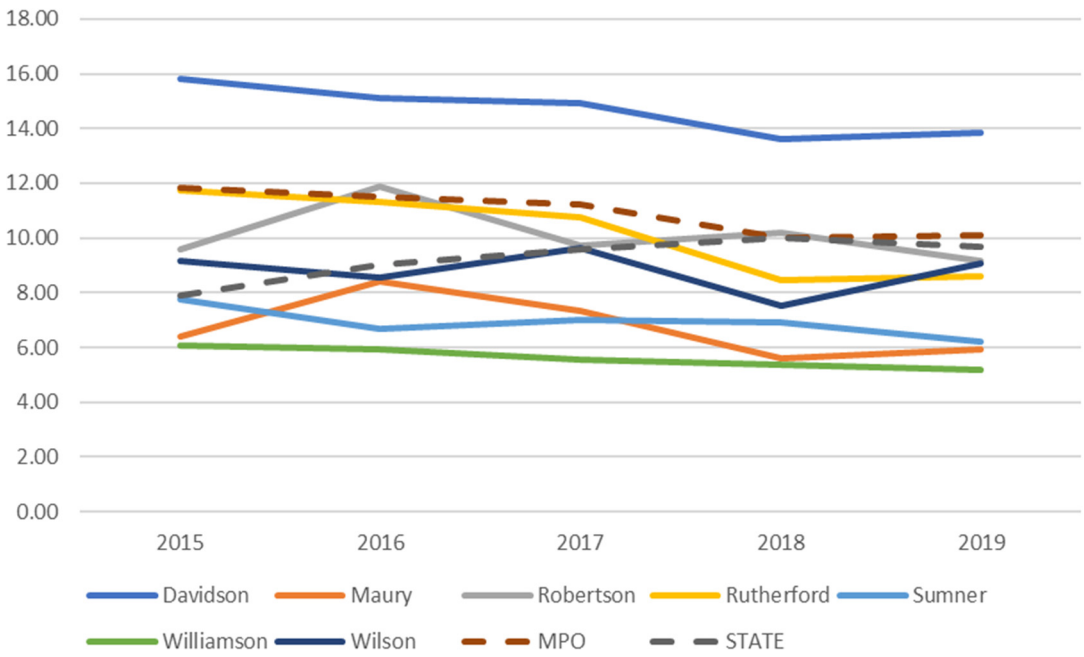
Agency	2014	2015	2016	2017	2018	5-Year Total
Regional Transportation Authority			1			1
Nashville MTA	21	31	19	12	15	98
Franklin Transit Authority			1			1
Murfreesboro Rover	1	1	2	1		5
Mid-Cumberland HRA	8	5	6	7	5	31
Vanpools						

Source: Federal Transit Administration National Transit Database

Freight Truck Crashes

Commercial vehicle crashes have remained constant since 2015. Over that time period, crashes have remained at approximately 2,200 annually. Commercial vehicle-involved crashes are often associated with greater crash severity as more than 14% of the fatalities in the region and 8% of serious injuries are associated with commercial vehicles 9% are interchange related, while 25% are intersection related. These crashes are also likely to cause more delay for motorists and impact system performance.

Figure 3-23. Truck Involved Crash Rates by County, 2015-2019



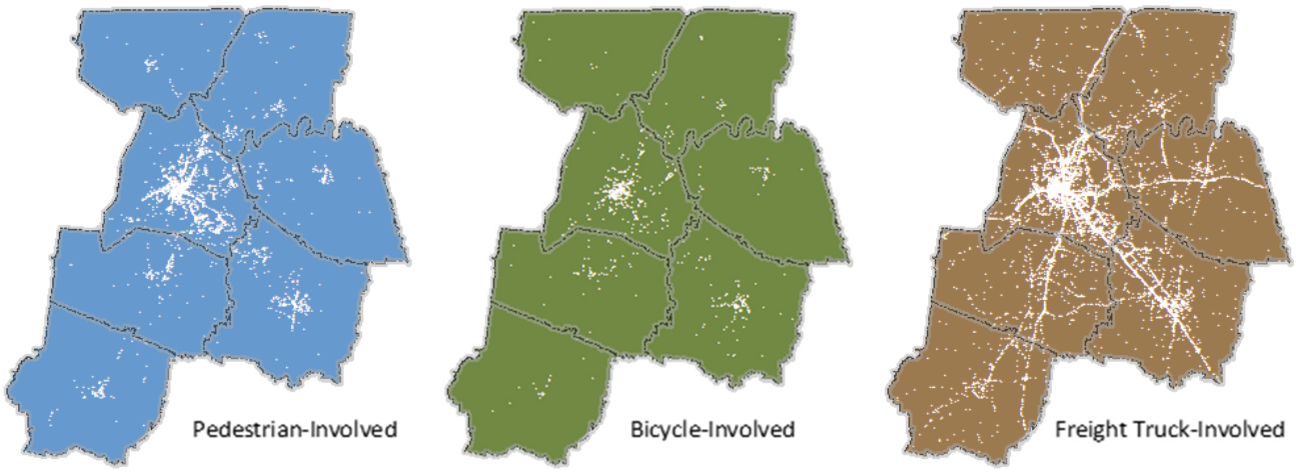
Crashes per 100 million annual vehicle miles traveled. Sources: Tennessee Department of Safety and Homeland Security.

Crash Locations

Since the MPO is involved in a regional-level planning analysis, it is not practical to address all of the individual spot crash locations. That task is left to the state and local jurisdictions as specific improvements are proposed and implemented. The more appropriate means for the MPO to address high crash locations is to reward candidate projects proposing to make safety improvements at known high crash locations with additional consideration for funding, and to advocate safety conscious design principles into roadway improvement projects that are planned in order to promote safe transportation facilities for all modes of travel.

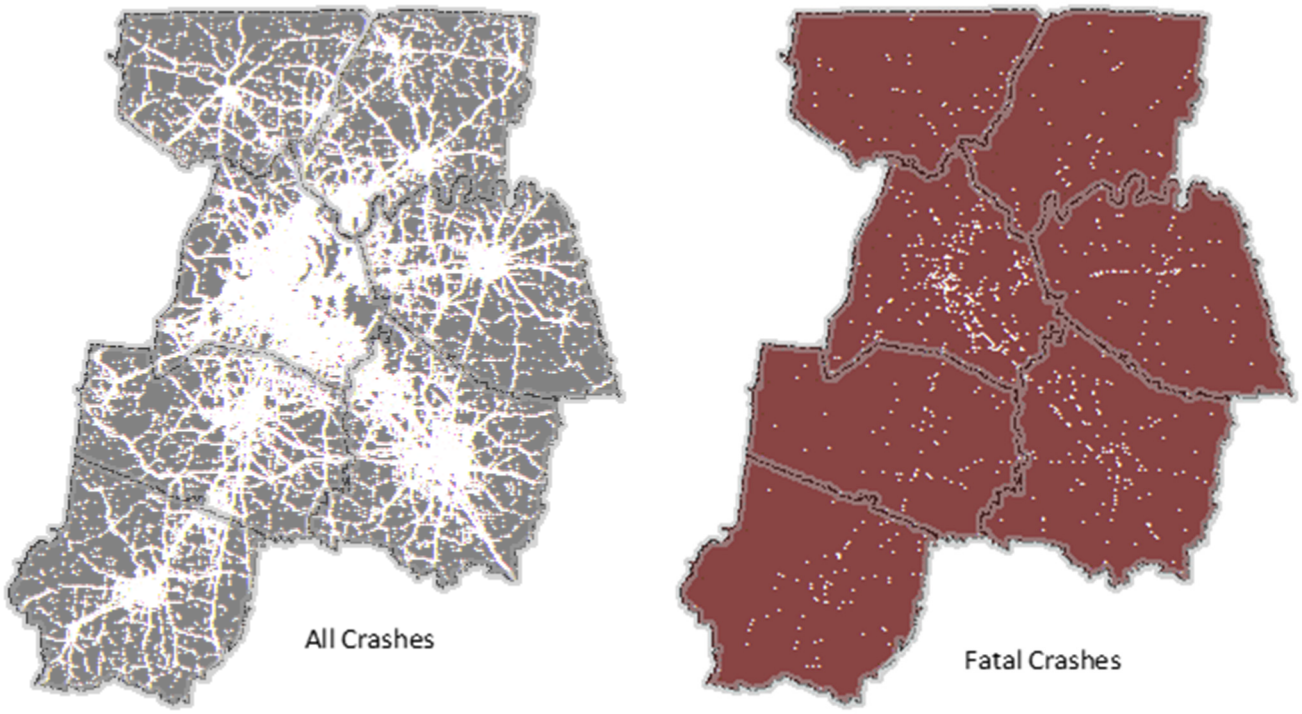
The following figures present the locations of crashes by mode and for all crashes for the last five years, from 2015 to 2019. During those 5 years, there were 360,023 crashes on area roadways. Of those, 943 involved a fatality and 6,581 involved in a serious injury.

Figure 3-24. Crashes by Transportation Mode, 2015-2019



Source: Tennessee Department of Safety and Homeland Security

Figure 3-25. Location of Crashes and Fatal Crashes, 2015-2019



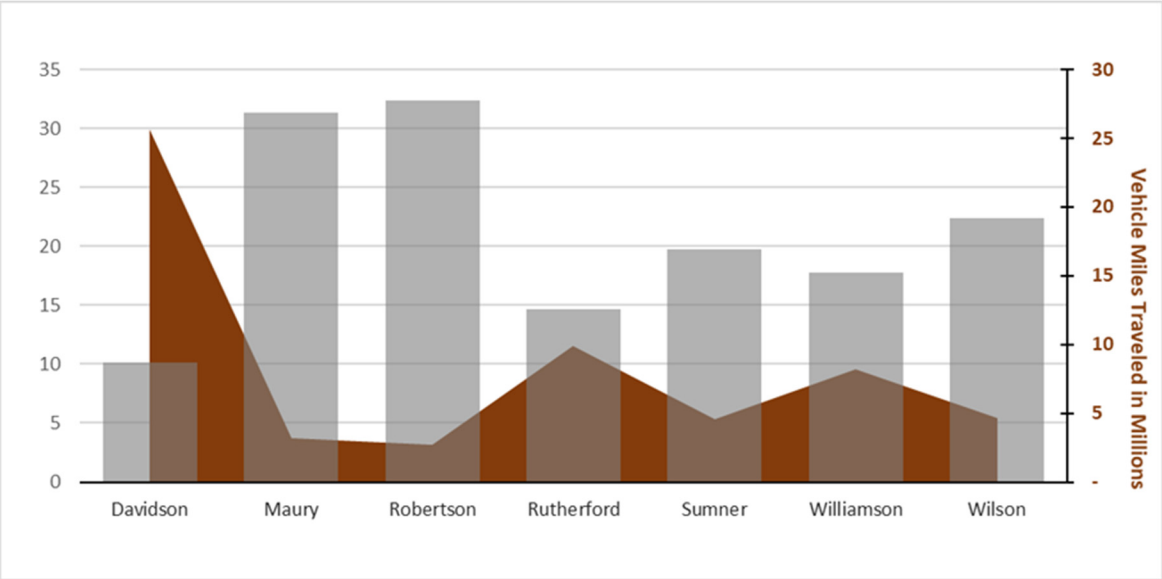
Source: Tennessee Department of Safety and Homeland Security

Roadway Level of Service

Most highway performance indicators are derived from data reported by TDOT to the FHWA Highway Performance Monitoring System (HPMS). Future year roadway conditions are derived from the MPO's travel demand model. The MPO takes the land use forecast (described in Section 3) which identifies the likely locations that people will live and work in the future, feeds that information into the travel demand model which simulates the flow of traffic generated by the residential population, through traffic, and commercial or freight activity. From that simulation, the MPO can determine the expected traffic patterns, vehicle volumes, and travel speeds for each segment of roadway classified as a major collector, arterial, or highway. The future year conditions presented in this chapter are based on the assumption that no additional improvements will be made on the roadway or transit networks beyond those already under construction. This provides a "no-build" scenario which establishes a baseline that is useful for evaluating proposed improvements to the transportation network.

The following graph presents a snapshot of the current roadway supply and demand relationship using two common highway performance measures. Specifically, the bars on the chart indicate the roadway lane miles per capita for each county and the line graph represents the total daily vehicle miles traveled on countywide roadways. In short, urban counties such as Davidson County carry a lot more traffic on a much more limited supply of roadways per residential population, suggesting a significant amount of traffic is being generated from outside the county.

Figure 3-26. Roadway Lane Miles per Capita and Total Vehicle Miles Traveled by County

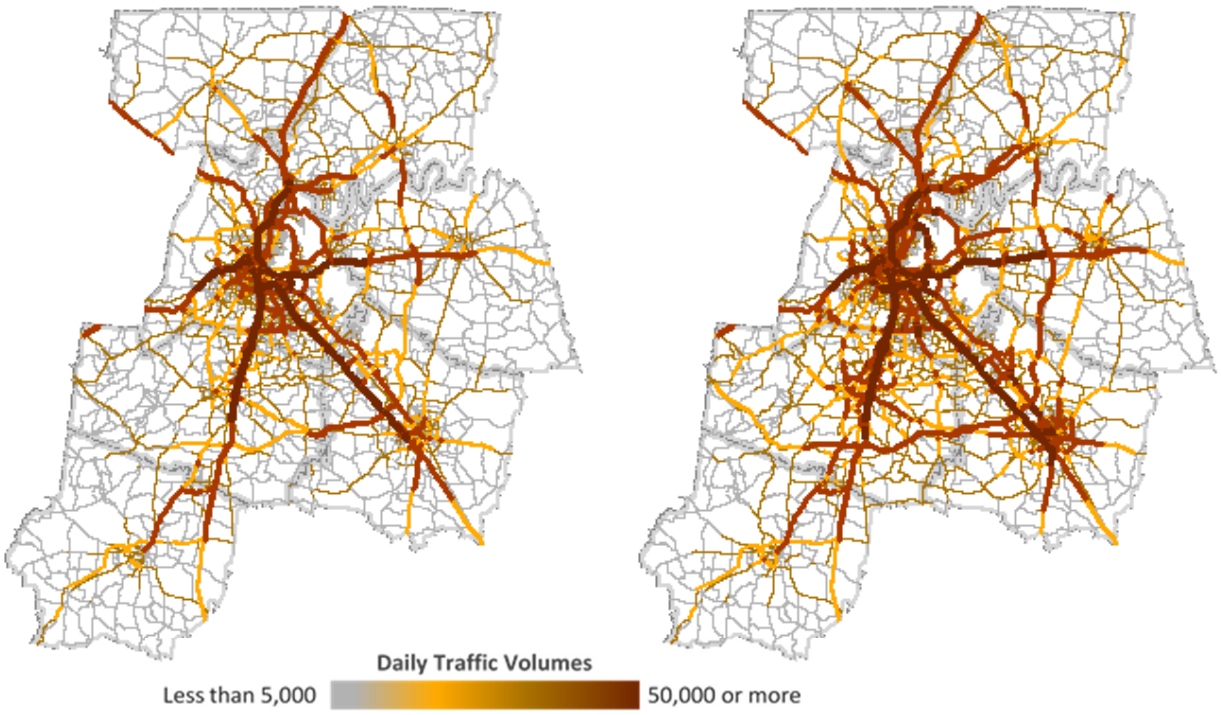


Source: 2017 ETRIMS, ACS, HPMS

As the region's population is set to grow significantly by 2045, so is demand on the transportation system. GNRC uses a custom Activity Based Travel Demand Model (ABM) to predict future traffic conditions and transit ridership across the regional network. The AMB simulates the daily travel behavior of residents and visitors for a typical weekday. Technical documentation for the model and it's validation is provided in Appendix H.

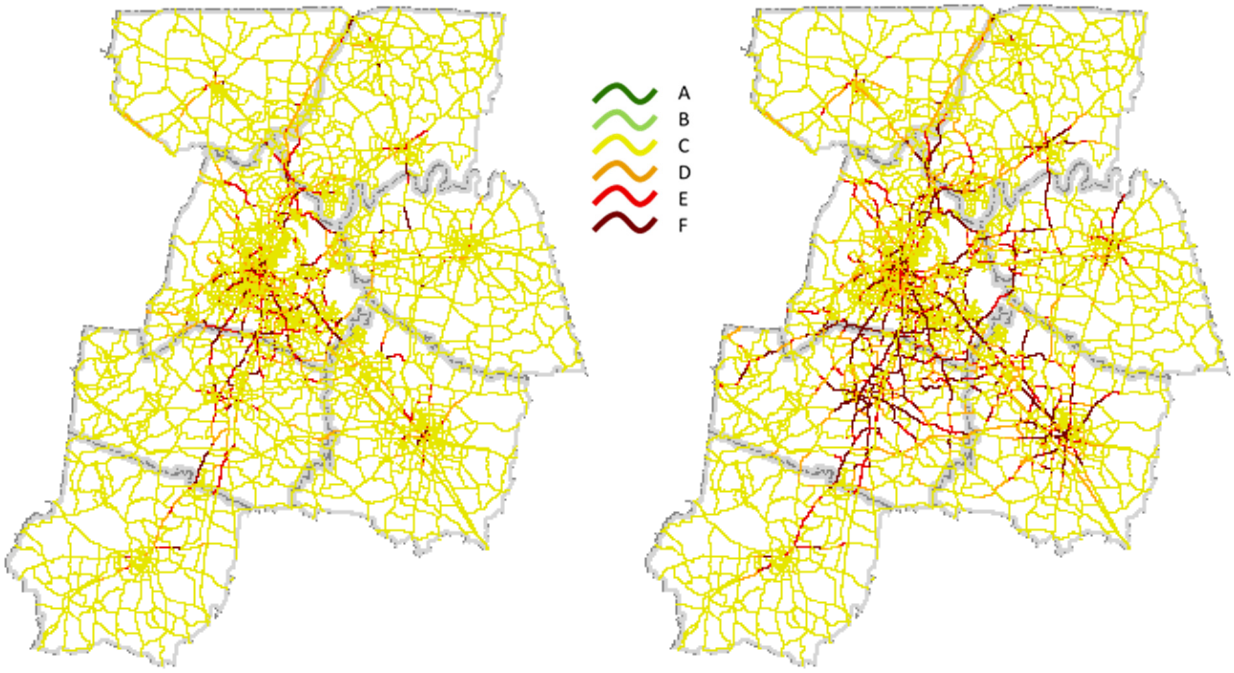
Daily VMT is forecasted to increase from nearly 59 million to approximately 78 million by 2045. The following figures provide a comparison between existing and future vehicle volumes for major roadways throughout the region as well as the resulting level of service. On a typical weekday, the volume of vehicles on a roadway can exceed its designed capacity resulting in congestion. Segments of a roadway with a volume to capacity ratio of 1.0 or greater experience level of service F. Currently, two percent of the region's federal-aid roadway miles experience LOS F. By 2045, the region's federal-aid roadway network experiencing level of service F is anticipated to expand from two percent to seven percent.

Figure 3-27. Vehicle Volumes on Major Roadways, 2017 and 2045



Source: GNRC Regional Travel Demand Model

Figure 3-28. Roadway Level of Service (LOS), 2017 and 2045



Source: GNRC Regional Travel Demand Model

Traffic Congestion and Reliability

As indicated by the MPO's forecasted traffic volumes and LOS, demand for highway travel across the region continues to grow in areas with population increases. Despite the recent decline in traffic volumes due to the pandemic and increase in remote work, traffic volumes are projected to keep growing. The volume of freight movement alone is forecast to exceed the growth rate of total VMT by 2045. As a result, increased traffic congestion will continue to plague metropolitan areas across the country.

The causes of traffic congestion vary by location, time of day, day of week, and month of the year. The causes are generally defined by those events that are more predictable or "recurring" and events that are less predictable or "non-recurring." Recurring congestion includes delays that are predictable in frequency and extent (e.g., morning and evening commutes). Recurring congestion results when traffic demand approaches or exceeds the available capacity of a facility as determined by the physical limitations of a roadway and/or the operation of the facility, often determined by the number of travel lanes, presence of traffic signals, etc. Recurring congestion is somewhat reliably predictable based on analysis of growth in demand and the supply of roadway capacity. Non-recurring congestion is much more difficult to predict -- as it depends largely on factors beyond a transportation planner's control including weather, driver behavior and/or impairment, work zones, and special events.

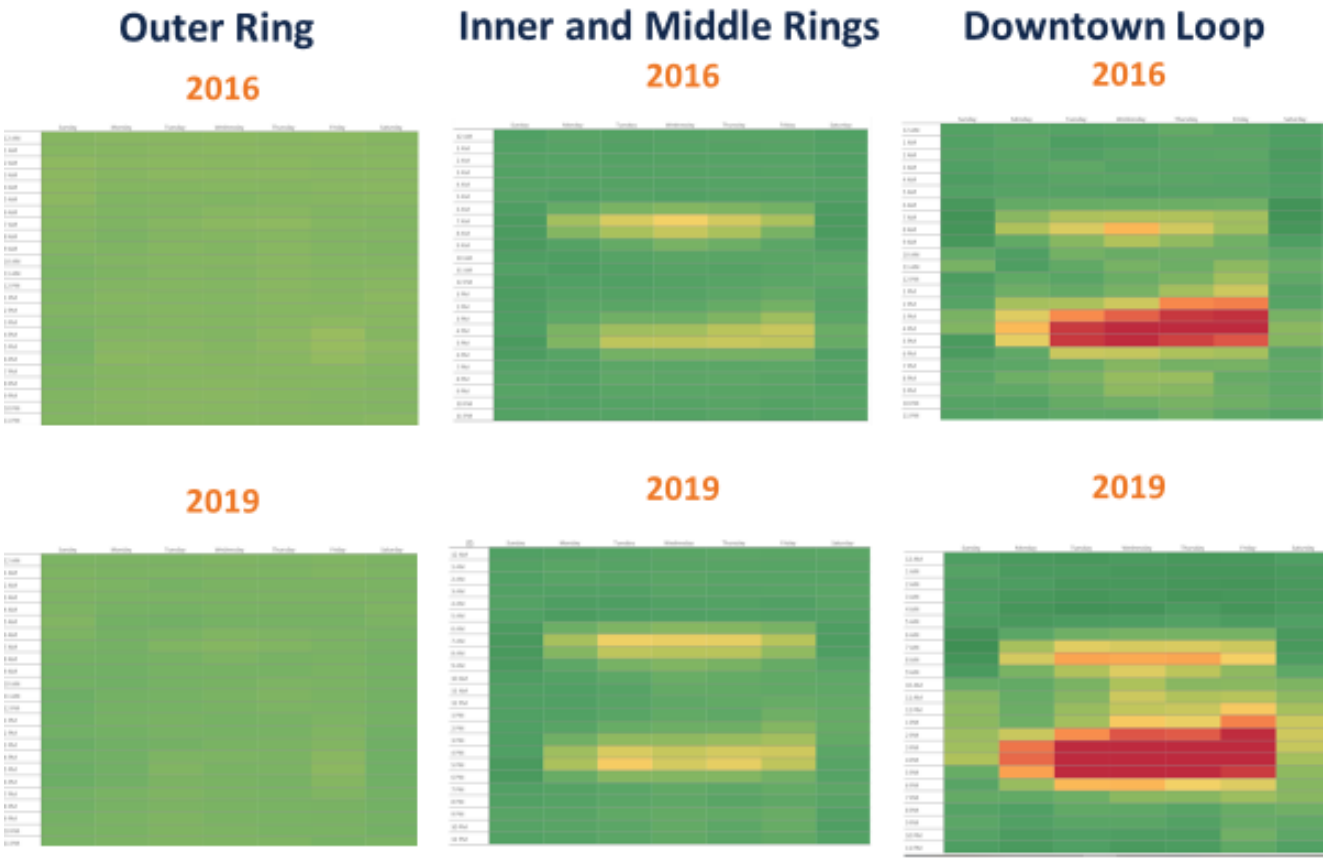
In analyzing congestion, transportation planners and engineers consider four dimensions of congestion: extent, intensity, duration, and reliability, each described further in the following table.

Dimensions of Congestion

Extent	Intensity	Duration	Reliability
The number of people or portion of the system affected by congestion, generally measured by the percentage of lane miles experiencing level of service (LOS) F	The severity of congestion on a particular roadway, generally measured by the average speed in relation to the free flow speed	The amount of congested time on the system, subarea, or particular roadway, generally measured by amount of congested time	The variation of congestion on the system or particular roadway, generally measured by buffer time.

The duration of congestion, or amount of time that congested conditions persist before returning to an uncongested state, varies across the region. Figure 3-30 indicates variation in the duration of congestion by time of day across the week by the outer ring, inner and middle rings, and downtown loop. Based on percent of free flow travel speeds, roadways speeds generally do not fall below the 70% free flow speed threshold throughout the week in the outer ring. In the inner and middle rings, speeds approach the congestion thresholds during the morning and evening commute. As for the Downtown Loop, it experiences congestion over multiple hours during the evening commute throughout most of the work week.

Figure 3-29. Congestion by Time of Day and Day of Week, 2016 and 2019



Congestion varies by time of day, day of week, and season of the year. However, high variability in congestion can be especially frustrating for users of the system because they cannot depend on the transportation system to get them where they need to go dependably. When congestion is highly variable due to non-recurring conditions, such as a roadway with frequent traffic crashes, commuters, truck drivers, or transit riders need to allocate additional time for unexpected delays in order to arrive on time. The additional time is captured in measures such as buffer time of planning time index.

According to NPMRDS (INRIX) data, reliability has decreased on both the Nashville Area's interstate and non-interstate system over the past few years. Between 2016 and 2019, the level of travel time reliability (LOTTR) decreased by three percent on the interstate system and by four percent on the non-interstate system.

Unexpected delays on the transportation system also impacts transit service in the form of on-time performance. As travel time reliability worsened between 2016 and 2019, so did WeGo's bus on-time performance. WeGo's bus on-time performance decreased slightly from 85% in 2016 to 83% in 2019, despite adding both travel time and recovery time to schedules. On the major corridors that have the most service and riders, scheduled recovery time increased by 25% in order to account for the increasing travel time for congestion and keep service as reliable as possible. Thus, congestion costs WeGo more to operate each mile of service even as it gets slower and slightly less reliable, which can cause longer waits and frustration for its riders.

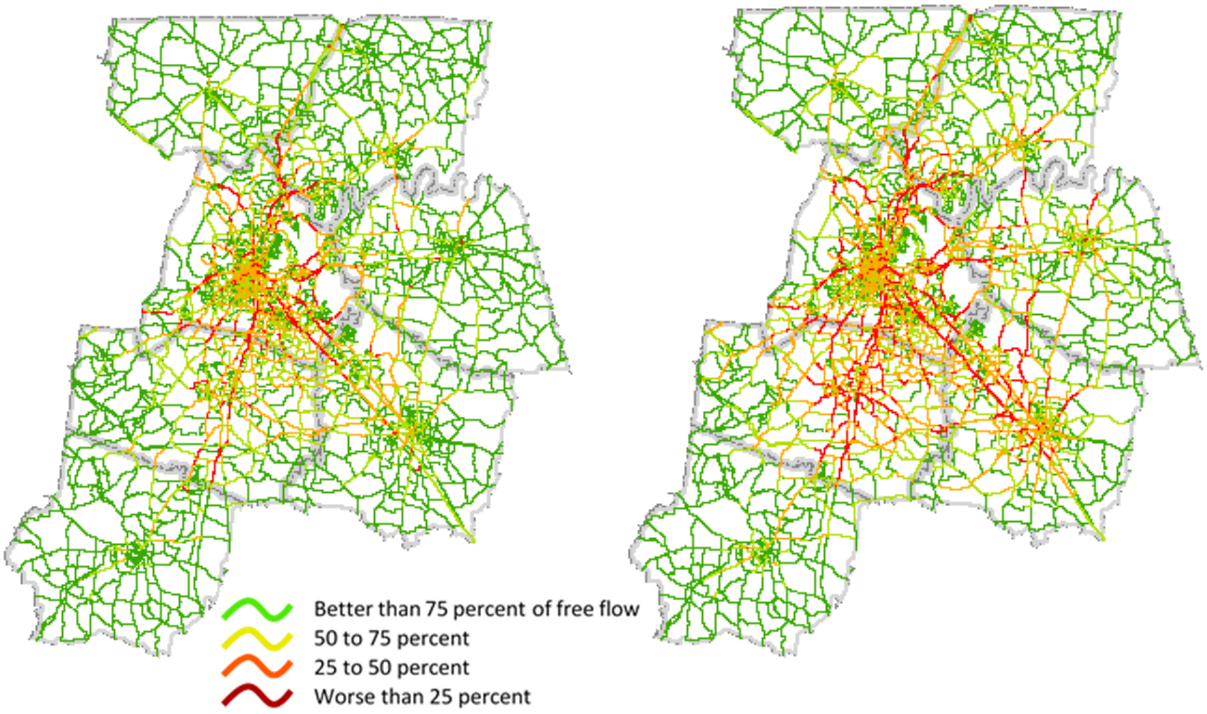
Another measure to gauge the intensity and extent of congestion throughout the region is based on the average roadway travel speeds during the peak hour as a percentage of the expected free flow (non-peak) speed. Segments of roadway are defined as congested if it has a travel speed that is 30 percent slower at any time of day than

expected during free flow conditions. For example, a segment with a free flow speed of 70 mph is defined as congested if average travel speeds during the peak hour drop below 50 mph.

Based on the percent of free flow speeds, congestion is expected to extend from 1,900 miles to 2,800 miles of the region's federal-aid roadways by 2045, impacting nearly half of the region's network on a typical weekday. Between now and 2045, the average travel speeds in the region are expected to decrease from 42 mph to 36 mph. For interstates, the average travel speeds in the region are expected to decrease from 52 mph to 45 mph. On principal arterials, the average travel speeds in the region are expected to decrease from 30 mph to 25 mph.

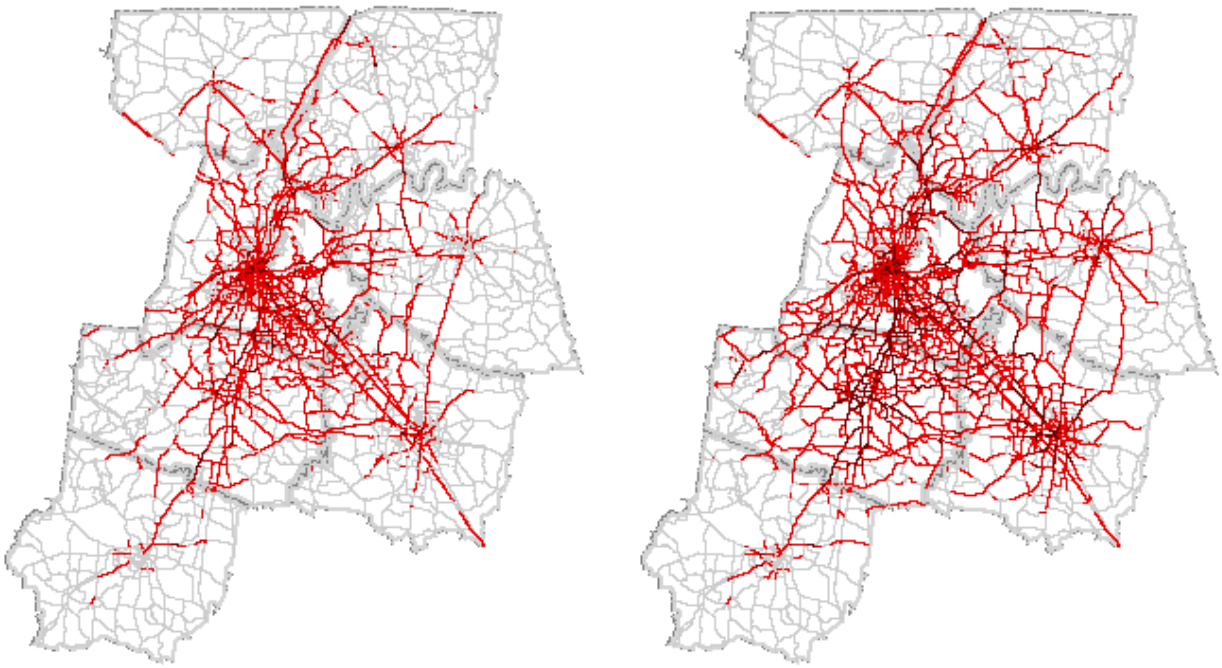
The following figures show average roadway travel speeds during the peak hour as a percentage of the expected free flow (non-peak) speed and the MPO's analysis of recurring congestion on major roadways throughout the region.

Figure 3-30. Roadway Travel Speeds, 2017 and 2045



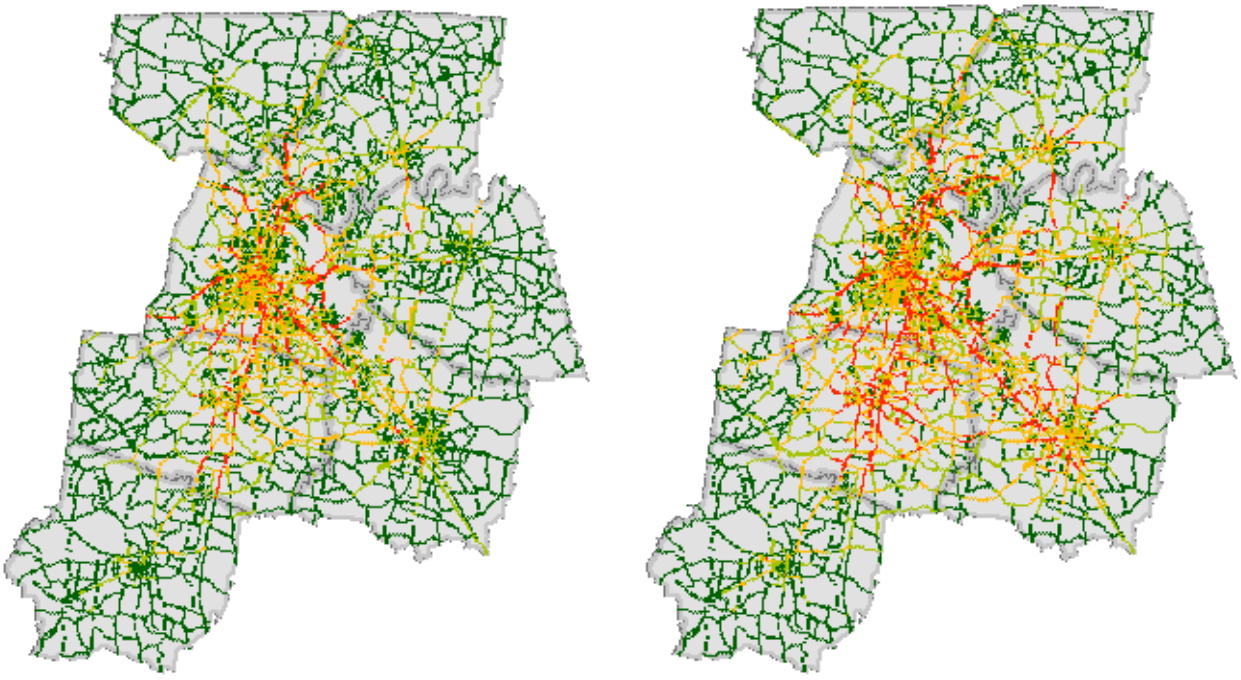
Source: GNRC Regional Travel Demand Model

Figure 3-31. Congested Routes, 2017 and 2045



Source: GNRC Regional Travel Demand Model

Figure 3-32. Area Congestion by Severity, 2017 and 2045



Source: GNRC Regional Travel Demand Model

Regional Travel Times

Traffic congestion can have significant impacts to quality of life including longer travel times for commuters and freight. Based on growth and development trends, longer commutes are in store between key destinations between now and 2045. The figure below compares travel times for the quickest routing between destinations for three separate time periods, 1) Google Maps routing for 11 p.m., present day; 2) Google Maps routing for present-day morning rush hour; 3) the MPO's traffic model's routing during morning rush hour in the year 2045.

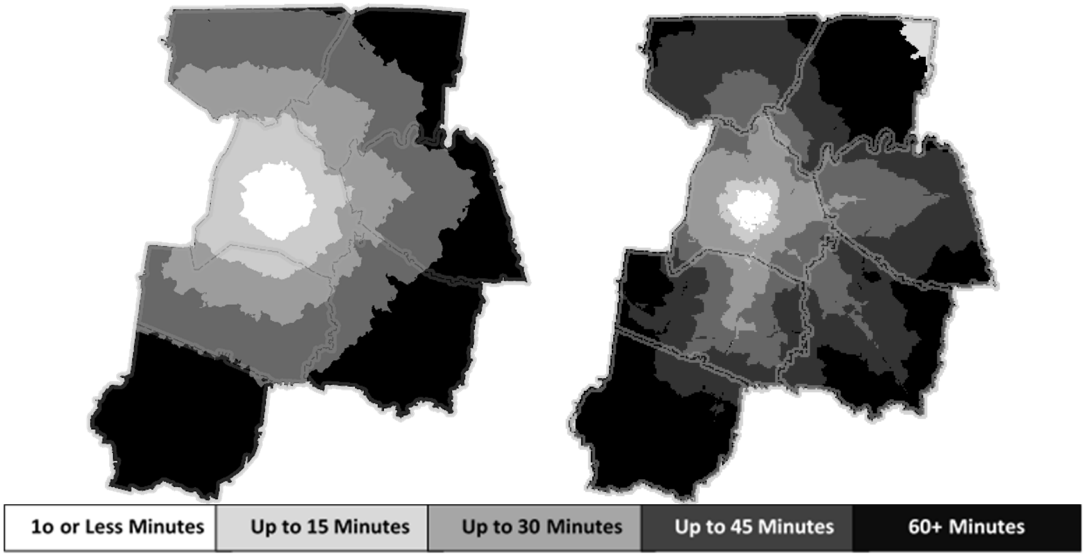
Figure 3-33. Average Morning Rush Hour Travel Times between Regional Centers, 2020-2045

Average Weekday	Google Maps @ 11 PM	Present-Day Morning Rush Hour*	Morning Rush Hour Change by 2045*
Downtown Franklin to Nashville	30 minutes	73 minutes	26% longer
Downtown Franklin to Murfreesboro	45 minutes	54 minutes	62% longer
Downtown Gallatin to Nashville	40 minutes	99 minutes	20% longer
Downtown Lebanon to Gallatin	30 minutes	55 minutes	16% longer
Downtown Murfreesboro to Nashville	40 minutes	126 minutes	15% longer
Downtown Columbia to Cool Springs	40 minutes	91 minutes	40% longer
Mt. Juliet to Vanderbilt University	28 minutes	83 minutes	11% longer
Downtown Murfreesboro to Cool Springs	45 Minutes	80 minutes	81% longer
Downtown Nashville to Downtown Franklin	30 Minutes	53 minutes	44% longer
Downtown Springfield to Nashville	40 minutes	70 minutes	18% longer

*Source: *MPO Travel Demand Model. Based on current transportation system. Morning Rush Hour is 7 to 9 A.M.*

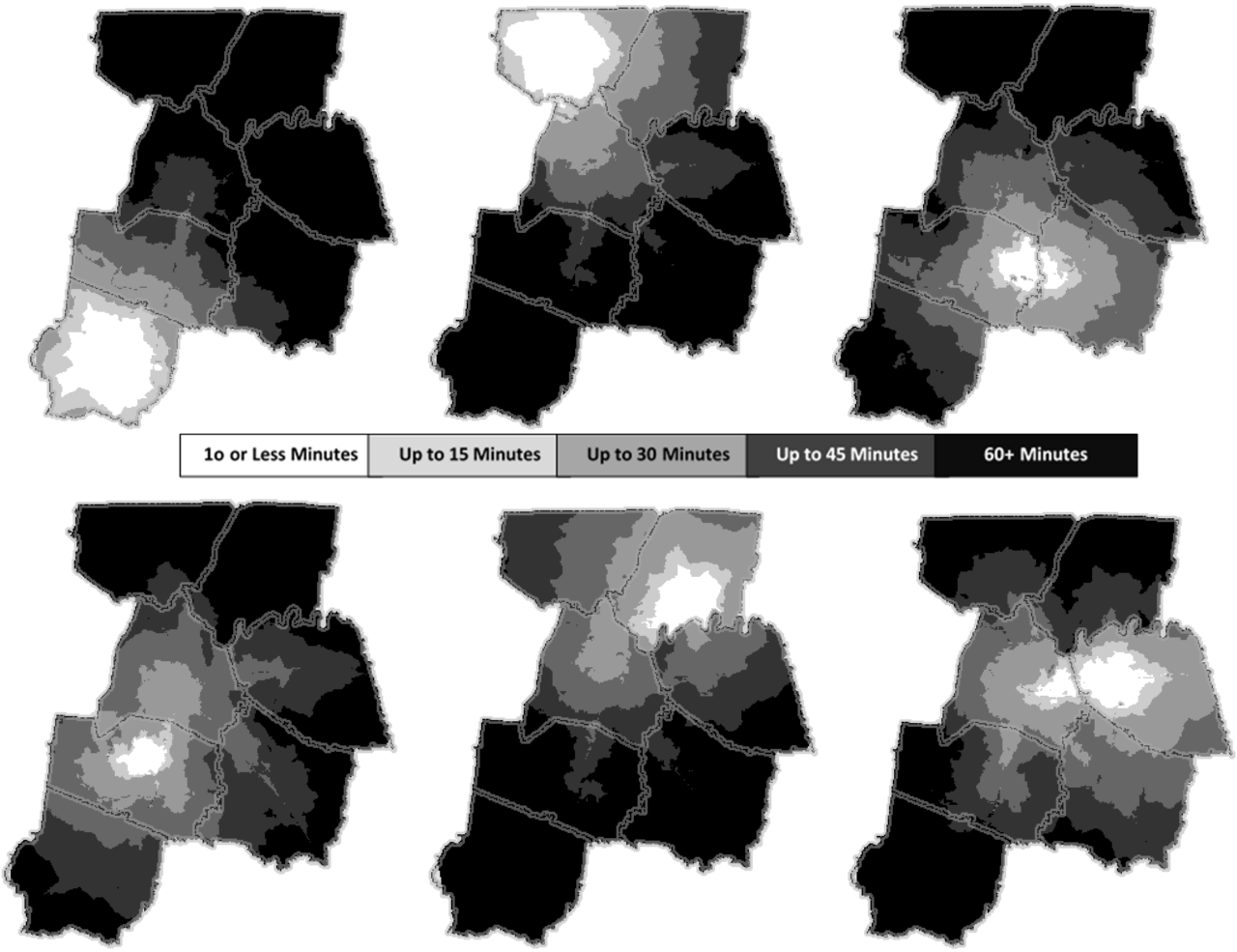
The following series of maps illustrate the changes in travel times from 2017 to 2045 one can expect when traveling from parts of the region to downtown Nashville during the morning rush hour, 7 A.M to 9 A.M. (figure 5-14). Figure 5-15 illustrates the relationship between travel distance and drive times one can expect in the year 2045 from each county seat during the morning rush hour.

Figure 3-34. Travel Times to Downtown Nashville during AM Rush Hour, 2015 and 2045



Source: GNRC Regional Travel Demand Model

Figure 3-35. Travel Times From County Seats during AM Rush Hour, 2045



Source: GNRC Regional Travel Demand Model

Pedestrian & Bicycle Level of Service

Many factors influence one's decision to walk or bike when making a transportation choice. Many of these factors have to do with the physical environment, which includes the presence of adequate walking and biking accommodations. Various tools have been developed in recent years to assist engineers and planners in evaluating the ability of roads to serve pedestrians and bicyclists. Similar to the vehicular Level of Service, there are models that have been developed to evaluate the suitability of the roadway for walking and bicycling. The Level of Service for walking and bicycling is based on the comfort level of the pedestrian and bicyclist on the roadway. Both the Pedestrian Level of Service (PLOS) and the Bicycle Level of Service (BLOS) models were developed using input from actual pedestrians and bicyclists on various roadway segments. There are various factors used to evaluate the comfort level of the users which involve the roadway geometry, motor vehicles using the road, and the presence and condition of pedestrian and bicycle facilities. In addition, the 2010 Highway Capacity Manual includes a multimodal level of service (MMLOS) , comprised of four tools – two of which are the BLOS and PLOS, which evaluates roadway level of service for all modes.

Pedestrian Level of Service

A Pedestrian Level of Service (PLOS) analysis was conducted for roadway segments inventoried in the Nashville MPO based on the National Cooperative Highway Research Program (NCHRP) Report 616 on Multimodal Level of Service Analysis for Urban Streets. A Pedestrian Level of Service (PLOS) analysis was conducted for roadway segments inventoried in the Nashville MPO based on the National Cooperative Highway Research Program (NCHRP) Report 616 on Multimodal Level of Service Analysis for Urban Streets. Pedestrian Level of Service (PLOS) is a nationally-used measure of user comfort level as a function of a road corridor's geometry and traffic conditions. To calculate PLOS is to assign a grade, A through F, to a portion of roadway. This grade is meant to correspond to the perceived level of service that the roadway provides to pedestrians. The evaluation of pedestrian levels of service involves the walking conditions within the shared roadway environment (e.g. sidewalk or path to the side of the roadway) since pedestrians typically do not utilize the roadway unless there is no other option.

Figure 3-36. Pedestrian Level of Service by County

	Davidson	Maury	Robertson	Rutherford	Sumner	Williamson	Wilson	MPO Area
Road Miles	647	462	309	490	449	455	456	3,268
LOS A	3%	2%	0%	1%	1%	2%	0%	1%
LOS B	12%	6%	8%	10%	8%	10%	7%	9%
LOS C	36%	65%	67%	53%	61%	48%	64%	55%
LOS D	32%	24%	21%	29%	28%	30%	24%	27%
LOS E	16%	3%	4%	8%	2%	8%	4%	7%
LOS F	1%	0%	0%	0%	0%	2%	0%	0%

Source: ETRIMS, KCI

Bicycle Level of Service

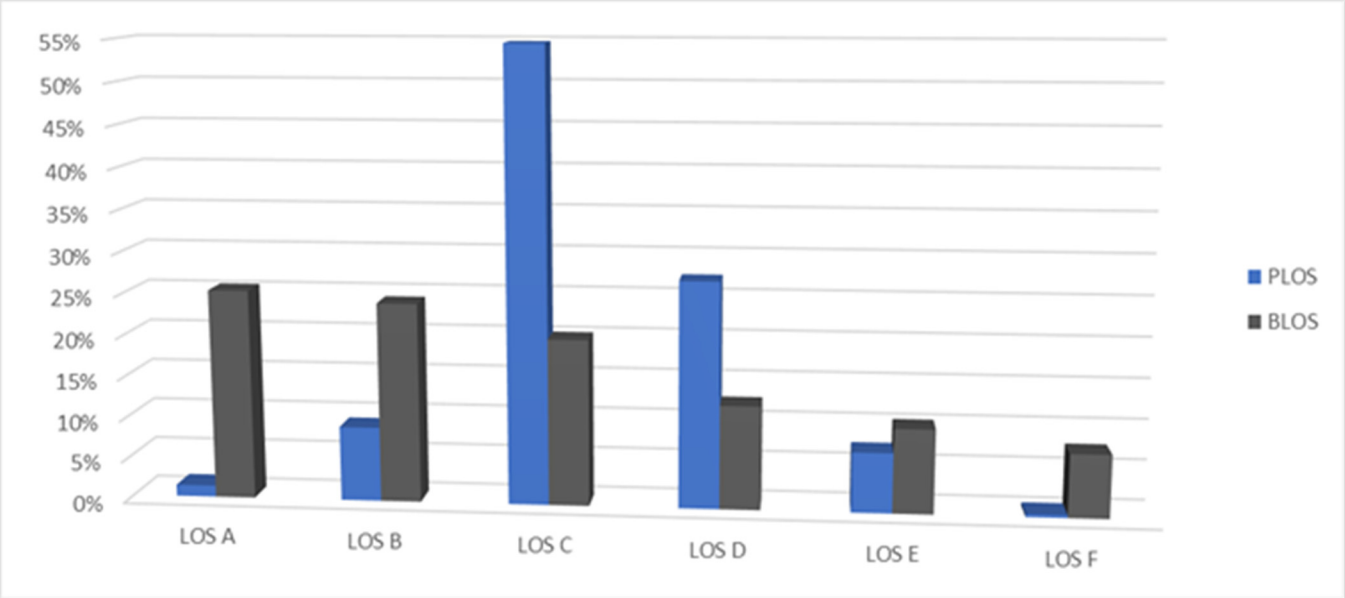
Similar to the PLOS analysis, a Bicycle Level of Service (BLOS) model for the Nashville region was developed based on NCHRP Report 616 for the analyses of the roadway segments inventoried in the Nashville MPO area. Bicycle Level of Service (BLOS) is a nationally-used measure of on-road bicyclist comfort level as a function of a roadway's geometry and traffic conditions. To calculate BLOS is to assign a grade, A through F, to a portion of roadway. This grade is meant to correspond to the perceived level of service that the roadway provides to bicyclists. A BLOS model for bicyclists incorporates "quality of service" by accounting for measures like comfort, safety, and ease of mobility. Roadways with a better (lower) score are more attractive (and usually safer) for cyclists.

Figure 3-37. Bicycle Level of Service by County

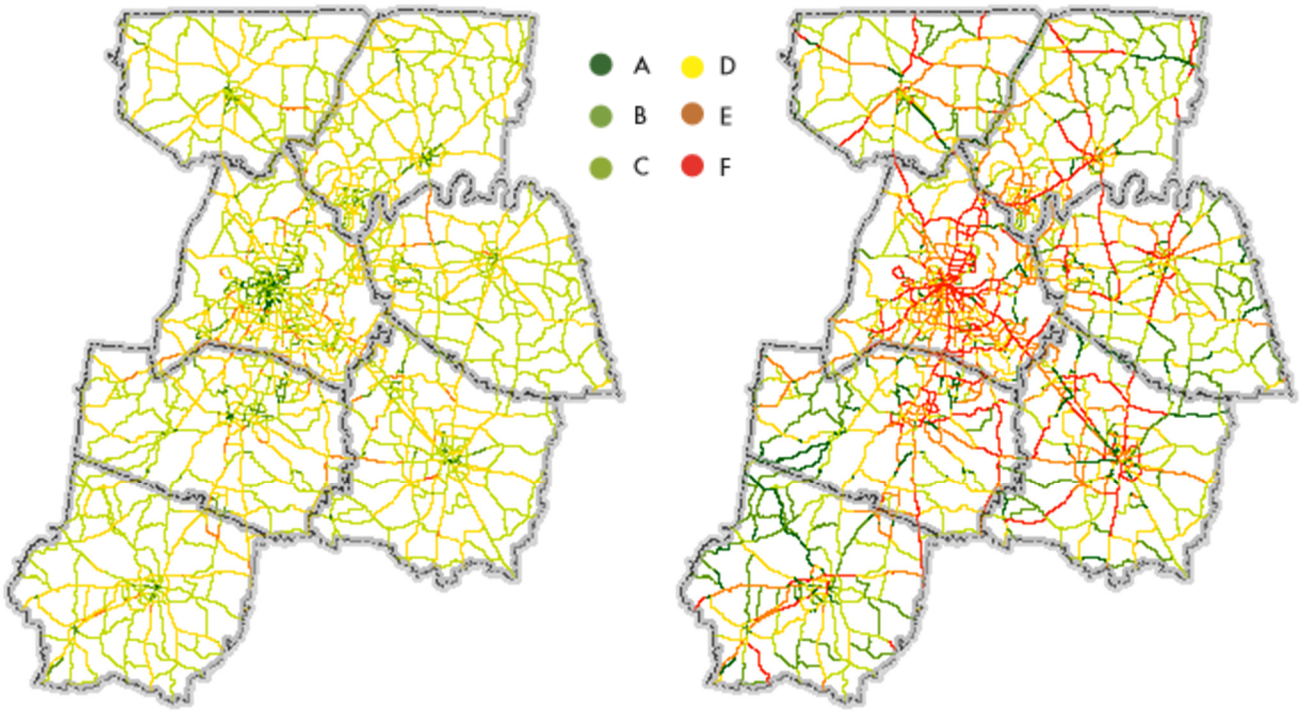
	Davidson	Maury	Robertson	Rutherford	Sumner	Williamson	Wilson	MPO Area
Road Miles	647	462	309	490	449	455	456	3,268
LOS A	5%	21%	7%	14%	12%	40%	81%	25%
LOS B	5%	40%	31%	25%	32%	31%	14%	24%
LOS C	22%	25%	31%	23%	27%	13%	2%	20%
LOS D	21%	8%	14%	21%	14%	5%	2%	13%
LOS E	26%	4%	11%	10%	8%	6%	0%	10%
LOS F	21%	2%	5%	7%	6%	6%	0%	8%

Source: ETRIMS, KCI

Figure 3-38. Summary of MPO Area Pedestrian and Bicycle Levels of Service



Source: ETRIMS, KCI Location of Pedestrian and Bicycle Levels of Service

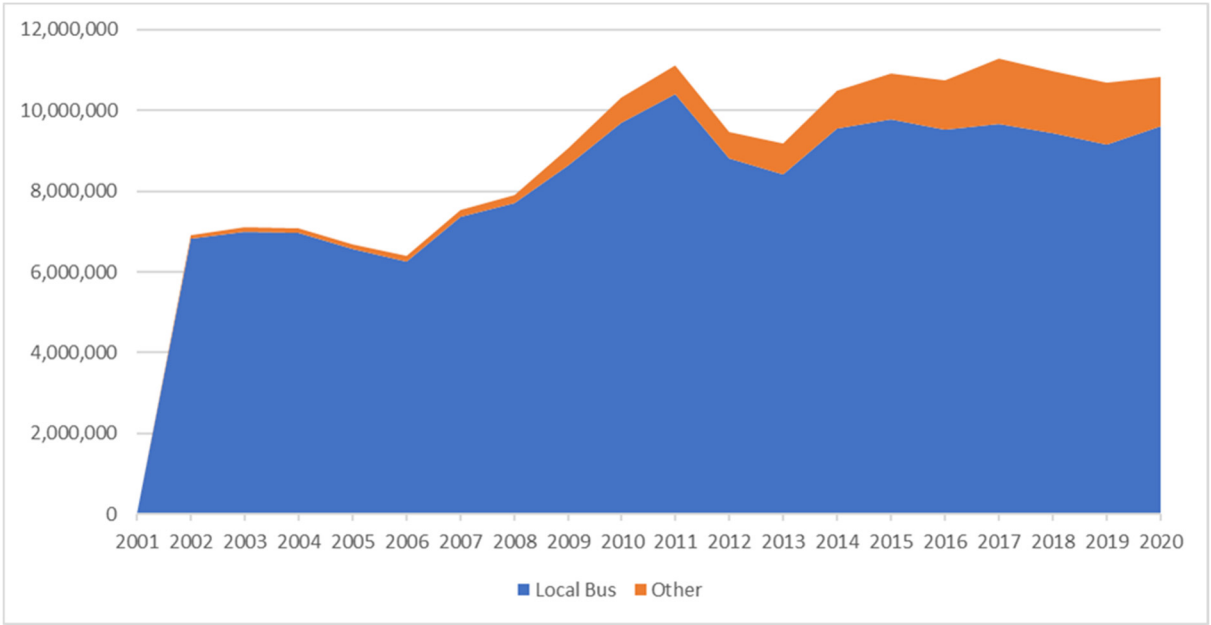


Source: TDOT E-TRIMS, GNRC Regional Bicycle and Pedestrian Study, 2020

Public Transit Performance

Nationally, public transportation ridership in 2019 has been declining every year since 2014. During the year, Americans took 9.9 billion trips on public transportation, compared to 10.6 billion trips in 2014. Regionally, after increasing ridership from the early 2000s to 2010, ridership has been largely stagnant up until 2018. As a result of the pandemic, ridership in 2020 has seem dramatic declines and remain slow to rebound. Still, overall ridership trends since 2004 have been impressive due to the influx of residents and jobs to the urban core, and the introduction of new commuter services to connect suburban areas across the region.

Figure 3-39. Metropolitan area Transit Ridership Trends, 2000-2018



Source: Local Agencies, FTA National Transit Database

As can be seen in the following table, nearly all of the agencies have increased ridership since 2001 or since they were first created. As shown, commuter rail ridership has come close to tripling its ridership since its first year, and the regional vanpool program continues to gain in popularity, providing more than 200,000 rides per year.

Figure 3-40. MPO Area Transit Ridership by Agency and Type of Service, 2000-2018

	Regional Transportation Authority of Middle		Nashville MTA			Franklin Transit Authority		Murfreesboro Rover		Mid-Cumberland HRA
Year	Commuter Bus	Vanpool	Commuter Bus	Local Bus	Access Ride	Local Bus/Trolley	Demand Response	Local Bus	Demand Response	Demand Response
2000	-	-	-	6,826,879	97,816	-	-	-	-	-
2001	-	-	-	7,002,312	118,121	-	-	-	-	-
2002	-	-	-	6,966,103	112,631	-	-	-	-	-
2003	-	-	-	6,567,316	120,656	-	-	-	-	-
2004	-	-	-	6,268,926	141,907	-	-	-	-	-
2005	-	-	-	7,372,388	170,214	-	-	-	-	-
2006	-	-	-	7,708,840	202,057	-	-	-	-	-
2007	-	117,096	-	8,644,456	211,268	-	-	-	-	-
2008	-	127,008	-	9,701,697	315,188	-	-	-	-	-
2009	23,114	154,349	-	10,236,540	336,153	-	-	169,423	6,233	-
2010	43,407	164,592	-	8,623,771	247,173	-	-	180,000	7,500	-
2011	83,086	166,393	-	8,202,260	261,702	-	-	218,648	7,893	-
2012	121,993	200,413	-	9,273,784	291,492	29,511	20,516	254,098	7,104	-
2013	163,733	178,260	-	9,489,110	279,038	42,824	21,427	259,324	-	241,434
2014	197,963	178,493	-	9,213,344	297,944	49,898	25,681	265,345	-	266,653
2015	204,865	161,870	378,938	9,323,778	309,819	56,360	25,895	279,399	-	284,238
2016	193,620	144,751	347,697	9,126,697	292,012	46,468	27,073	271,047	-	247,602
2017	194,948	135,295	328,529	8,859,146	303,423	49,452	33,152	250,808	-	243,340
2018	190,839	120,524	-	9,342,326	316,417	49,340	28,280	232,179	-	237,953

Source: Local Agencies, FTA National Transit Database

Despite ridership gains in recent years, transit agencies across the area continue to offer relatively little service when compared to peer regions across the region. In 2018, each transit agency, except for Nashville MTA provided less than one hour per capita on the average weekday.

Figure 3-41. MPO Area Transit Service Hours per Capita by Agency, 2018

Agency	Service Hours per Capita
Franklin Transit Authority	0.40
Murfreesboro Rover	0.19
Nashville MTA	1.04
Mid Cumberland HRA	0.16
Regional Transportation Authority	0.02

Source: Local Agencies, FTA National Transit Database

The 2015 State of the System reports for the Nashville MTA and RTA produced through the *nMotion* strategic planning effort provides an overview of existing transit services and many additional performance measures. The reports also offer an evaluation of how well current services match transit demand in the region. To date, some of the challenges identified in the reports include:

- **Service is limited, and schedules are not well-suited for "typical" commuters.** RTA commuter services typically provide only two or three trips in each direction that serve a short window of work hours timed for state employees' schedules. Local services operate only during the daytime, and most operate only once an hour.
- **Express bus services are fast, but not fast enough.** Most express routes make only one or two stops in outer areas and then express to Nashville. However, they are stuck in the same traffic as automobiles to and from Nashville, and then are slow within Nashville.
- **Park-and-ride lots are inconveniently located and difficult to find.** Most park-and-ride lots are located at places where an organization has agreed to share use of its lot, rather than at locations that would be most convenient to users. Additionally, many park-and-ride lots provide no indication that they are park-and-ride lots, nor do they provide any information on available services. This makes it difficult for people to learn that services are available, and for first-time riders to find it.
- **New types of services and connections are needed to meet demand and serve reverse commutes.** The growth that is occurring in Davidson County and the surrounding counties will create demand for all-day regional services as well as local services. As employment continues to grow in outer areas such as Brentwood and Cool Springs, more Davidson County residents will begin to commute outward, creating demand for reverse commute service. New types of high-quality services along with connections to other modes will be needed to support RTA services.
- **Nashville MTA provides small city service for an area that is no longer small.** Nashville has grown from a small city to a medium-sized city. The area's population and employment, and associated travel levels, have grown much faster than Nashville MTA services.
- **Nashville MTA needs to catch up with the growth that has already occurred, as well as continue to expand at a faster pace to keep up with projected growth.** Nashville and the region will continue to grow rapidly—much more rapidly than Nashville MTA will be able to expand service based on current funding. In addition to population and employment growth in the region, the area's demographics are also changing in ways that will lead to transit demand increasing faster than population growth.
- **Service is not attractive to most residents.** Because service coverage, service frequencies, and the hours and days of service are limited, transit service is generally not convenient for residents and employees who have other travel options. For those who rely on transit as their sole means of mobility, these limited travel options restrict their access to economic opportunity.
- **More local funding is needed.** While Metro Nashville has significantly increased its general fund spending on public transportation, most cities with robust transit systems have identified dedicated funding sources. Transit investment in the Nashville area is lower than in most of Nashville's current peer cities. Currently, Nashville MTA receives 50% of its funding from non-federal sources, primarily from the Metropolitan Government of Nashville-Davidson County. To build a great transit system, additional funding will be needed for both capital projects and ongoing operations.

Freight Movement

Along with population and job growth, the region is expected to see an increased demand for goods to serve the growing market and for raw materials to feed manufacturing and supply chains. Moreover, the freight and logistics industry itself is a critical component of the Nashville regional economy as the area benefits from the convergences of three major U.S. Interstates, and easy access to national markets. In fact, the Nashville region occupies a strategic location within North America. It is within 650 miles of half the U.S. population and sits at the nexus of major highways and rail routes. This location has made the region a transportation hub for many industries, which have produced enormous benefits to the many communities throughout the area.

Forecasting commodity growth is an important part of planning for future transportation needs across the region. The following figure presents the anticipated tonnage of commodities between 2012 and 2040, reflecting an overall growth of 92 percent over the next couple of decades.

Figure 3-42. Commodities by Weight, Growth Forecasts, 2012 to 2040

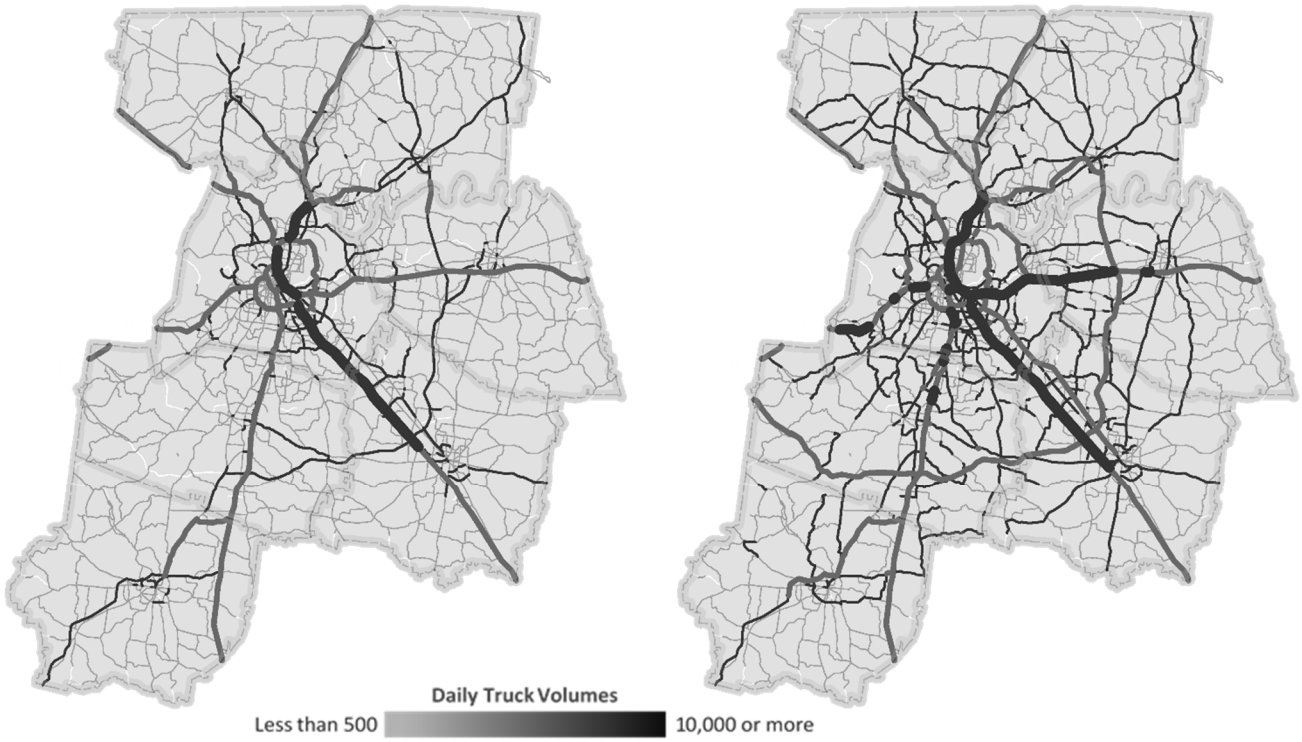
Top Commodities	2012	2040	Total Growth
Gravel and Crushed Stone	19,026,517	36,360,057	91%
Non-Metallic Mineral Prods.	7,497,131	16,212,402	116%
Coal	5,724,330	9,913,285	73%
Gasoline and Aviation Turbine Fuel	3,801,290	4,056,902	7%
Coal and Petroleum Products	3,390,012	3,596,226	6%
Waste and Scrap	3,357,683	6,662,374	98%
Other Prepared Foodstuffs, Fats and Oils	3,338,737	4,640,400	39%
Other Agricultural Products	3,124,533	3,636,334	16%
Natural Sands	2,180,983	5,425,371	149%
Fuel Oils	1,651,676	1,762,740	7%
Motor Vehicles and Parts	1,641,308	5,348,813	226%
Articles of Base Metal	1,371,630	4,024,692	193%
Non-Metallic Minerals	1,170,651	2,182,528	86%
Milled Grain Prod. and Bakery Prod.	1,058,651	1,584,290	50%
All other commodities	19,089,785	43,510,404	128%
Total	**77,424,917**	**148,916,818**	**92%**

Source: MPO 2015 Regional Freight Study. TRANSEARCH Database

There were more than 270,000 daily truck trips across the region in 2010. These high truck volumes are a result of the combination of long-haul truck traffic that are moving through the region on one of the major U.S. Interstates and a high number of local distribution and delivery trucks that also use interstates to connect from regional distribution centers and production facilities to retail outlets. Major freight facilities such as truck terminals can generate several hundred trucks per day. Similarly, warehouses and distribution centers can generate well over 100 trucks per day. The first two figures below illustrate the daily truck volumes on area roadways in 2010 and 2040, as well as the top 50 interstate and non-interstate truck count locations throughout the region.

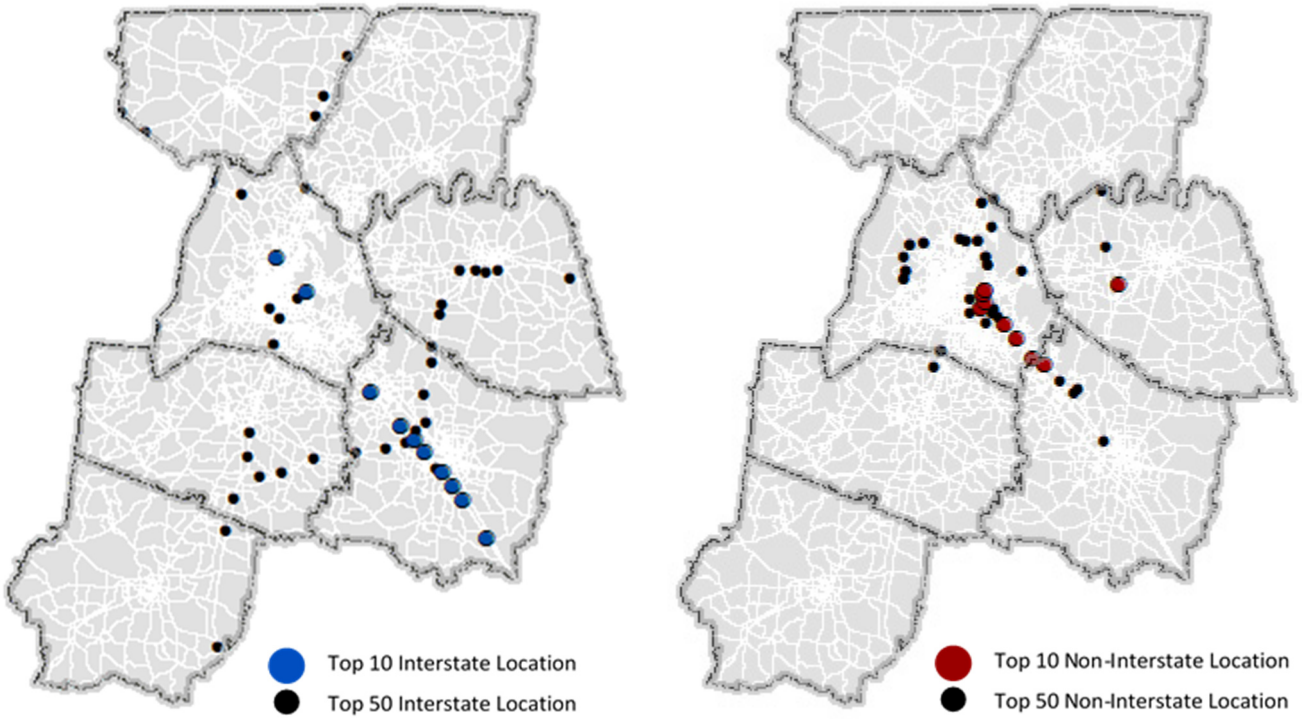
The final figure in this section identifies bridges with vertical or weight limitations that could impede the movement of freight. Most trucks require a clearance of at least 13’ 6”. Deviations in truck height, particularly in the case of oversize loads, will cause further routing restrictions. Should drivers ignore posted limits, they pose a risk to the safety of the load, the bridge infrastructure, and the facility carried by that bridge. Similar to the vertical clearance restrictions, the region has several bridges with posted weight limitations. Many of these bridges are well over 50 years old with an average age of 58 and would require significant investments to improve their condition to present day design standards

Figure 3-44. Major Roadway Truck Volumes, 2017 and 2045



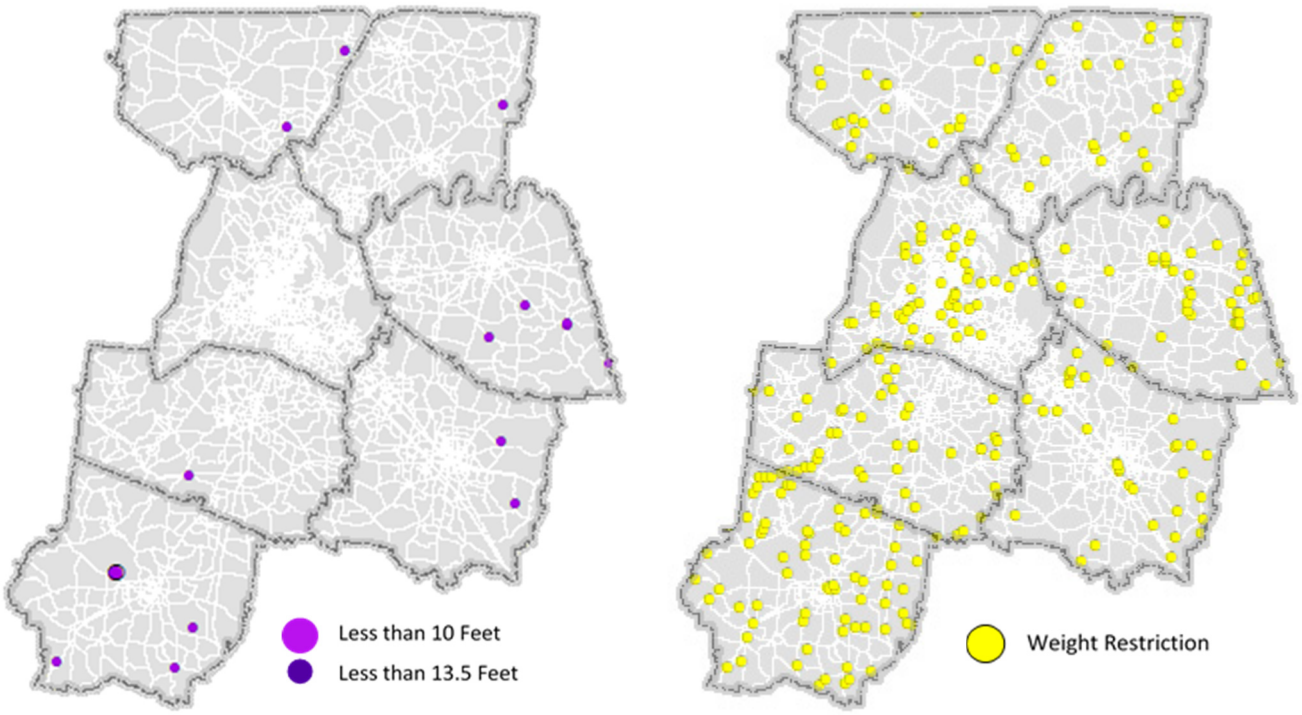
Source: GNRC Regional Travel Demand Model

Figure 3-45. Top 50 Truck Count Locations



Source: TDOT E-TRIMS (2017)

Figure 3-46. Bridge Height and Weight Truck Restrictions



Source: TDOT E-TRIMS (2017)

Summary of Key Performance Measures

The following is an abbreviated list of measures that were used in the development of the RTP. Each are defined below and are based on travel behavior on an average weekday across major roadways and transit systems in the seven-county area. Major roadways include those functionally classified as major collectors, arterials, or freeways.

Figure 3-47. Forecasted Changes in Key Regional Performance Measures, 2017 to 2045

Across the Seven-County Area, Average Weekday	2017	Change by 2045*
Number of People Residing within the Region	1.6M people	65% more
Number of Occupied Jobs across the Region	1.2M jobs	54% more
Total Daily Trips on Major Roadways per Day	4.9M trips	51% more
One-Way Trips per Capita each Day	3.06 trips	-9%
Total Vehicle Miles Traveled per Day	58M miles	33% more
Miles Traveled per Capita each Day	36.6 miles	19% fewer
Time Spent Traveling per Capita each Day	68 minutes	0% longer
Average Speed across all Major Roadways	42 mph	15% slower
Percent of Miles Traveled on Congested Route	38 percent	33% more
Percent of Freight Truck Travel on Congested Routes	41 percent	37% more
Daily Transit Ridership	30K rides	38% more

*Source: GNRC Planning Models. *Based on current transportation system, with no additional capacity improvements.*

As striking as some of these trends are, it is important to note that the 2045 scenario for which these transportation performance measures are calculated is based on the assumption that no additional roadway or transit capacity is provided between now and then. Once these measures are calculated with scheduled investments over the life of the Plan, staff will be able to report on the anticipated impact of projects.

On a positive note, however, if transit capacity were to be expanded over the current services, ridership growth has tremendous potential, particularly if services are built in dedicated lanes which allow buses or trains to maintain travel speeds despite roadway traffic congestion. The 383 percent increase in transit ridership shown in the table of performance measures is the anticipated increase in use of current services without improvement.

Peer Comparisons

Peer comparisons allow a more complete understanding and a higher degree of appreciation for Middle Tennessee's challenges and opportunities. Given that transportation, and in particular traffic congestion, is such a prominent national issue, there are numerous third-party organizations that use publicly available data to rank and track progress of the nation's metropolitan areas. The most popular among these is the Texas Transportation Institute (TTI), a national transportation research center based out of Texas A&M University. Each year, TTI releases its *Urban Mobility Report* which includes rankings of America's urbanized areas on metrics related to traffic congestion. The last such report was release in 2019 and shows the following measures and rankings for the year 2017 for the Nashville Urbanized Area. While most of these measures are pretty straight forward, the Travel Time Index is the ratio of travel time during rush hour to the travel time during off-peak hours. For example, an index of 1.30 means that a trip that would normally take 20 minutes during off-peak, would take 26 minutes during rush hour.

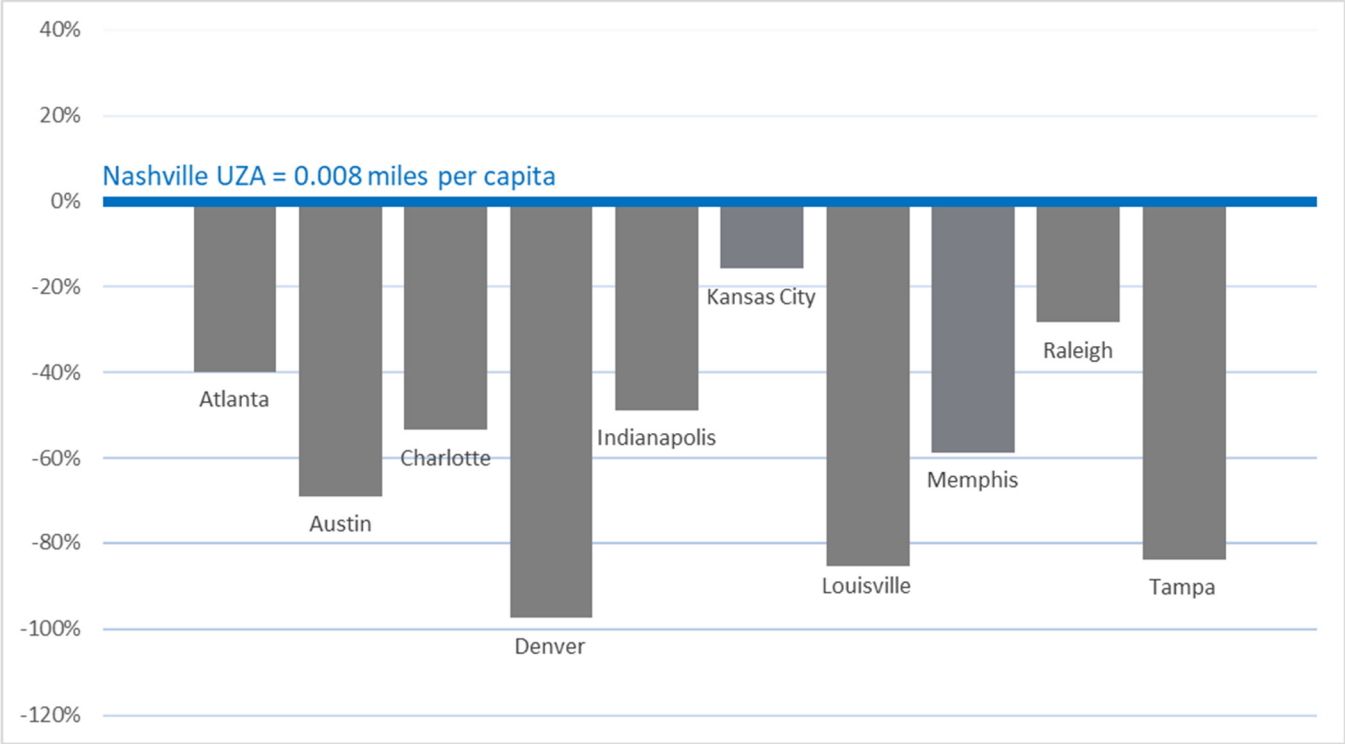
- U.S. Population Ranking: 39th most populated
- Travel Time Index: 33rd worst
- Annual Delay per Auto Commuter: 24th worst
- Cost of Congestion per Auto Commuter: 20th worst

While the TTI focuses primarily on congestion-induced travel delays, there is a growing recognition that travel time, as a whole, is a truer measure of mobility. This measure is the full accounting of one's time, regardless of whether attributed to congestion or by longer distances between destinations. In fact, many groups like Transportation for America and CEO's for Cities argue that automobile congestion in and of itself is not necessarily a valuable measure of mobility. Take for instance urban environments where traffic congestion may be severe, but trip distances are very short or can be made by another mode of transportation not subjected to that congestion. In those cases, delays caused by congestion are not as detrimental to overall mobility or accessibility. Conversely, longer distances between destinations make travelers extremely vulnerable to congestion and fuel prices. Increases in either of those variables can cost commuters dearly in terms of lost time or out-of-pocket expense. According to Texas A&M's Urban Mobility Report in 2019, the metropolitan area saw a 25% increase in congestion delay from 46 hours of delay per commuter to 58 hours of delay per commuter in 2017. That is an increase of almost 4% a year, ranking the area 24th worst in the nation.

In addition to these national reports, the MPO publishes *Nashville Region's Vital Signs* each year in partnership with the Nashville Area Chamber of Commerce. The report tracks Middle Tennessee against a select set of metro area peers that represent economic competitors or serve as models for different approaches to growth and development. Included in the report are key transportation indicators related to the availability (or supply) and usage (or demand) of roadways and transit. Roadway supply is expressed in terms of lane miles per capita, and as seen in figure 5-2, is very high in Middle Tennessee when compared with peer regions across the U.S., while transit service lags behind nearly all peers. This is not surprising considering Nashville has failed to keep up with peer regions in expanding transit.

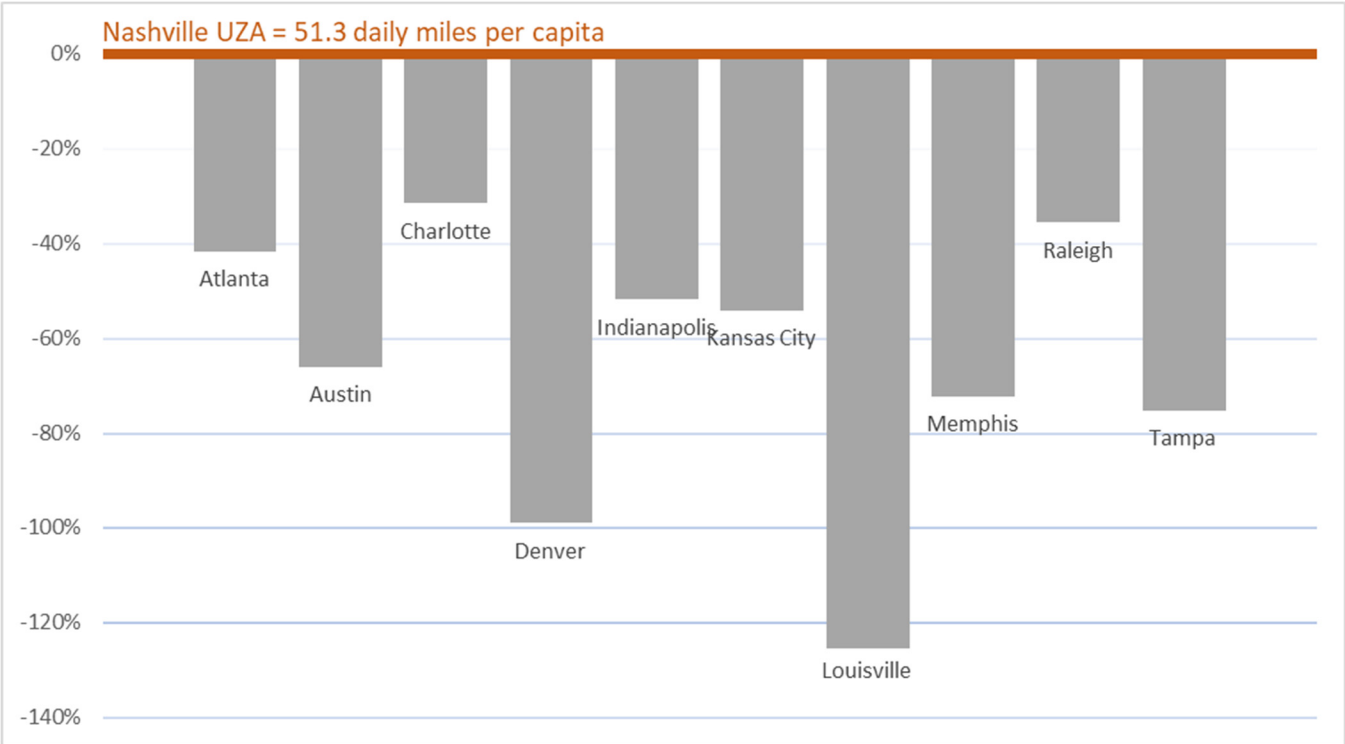
The demand side of transportation is often expressed in terms of vehicle miles traveled or VMT (for roadway users) and passenger trips taken on public transportation. Compared with peer regions, Middle Tennesseans are on the roadways for far greater distances. Transit usage per capita on the Nashville MTA system is slightly below average compared to its peers –due largely to the lack of service options and the longer travel distances between destinations in the area. Transportation is often associated with the concept of induced demand, meaning, the more services are supplied, the more likely travelers are to use those services out of increased convenience.

Figure 3-48. Peer Comparison – Roadway Lane Miles per capita, 2018



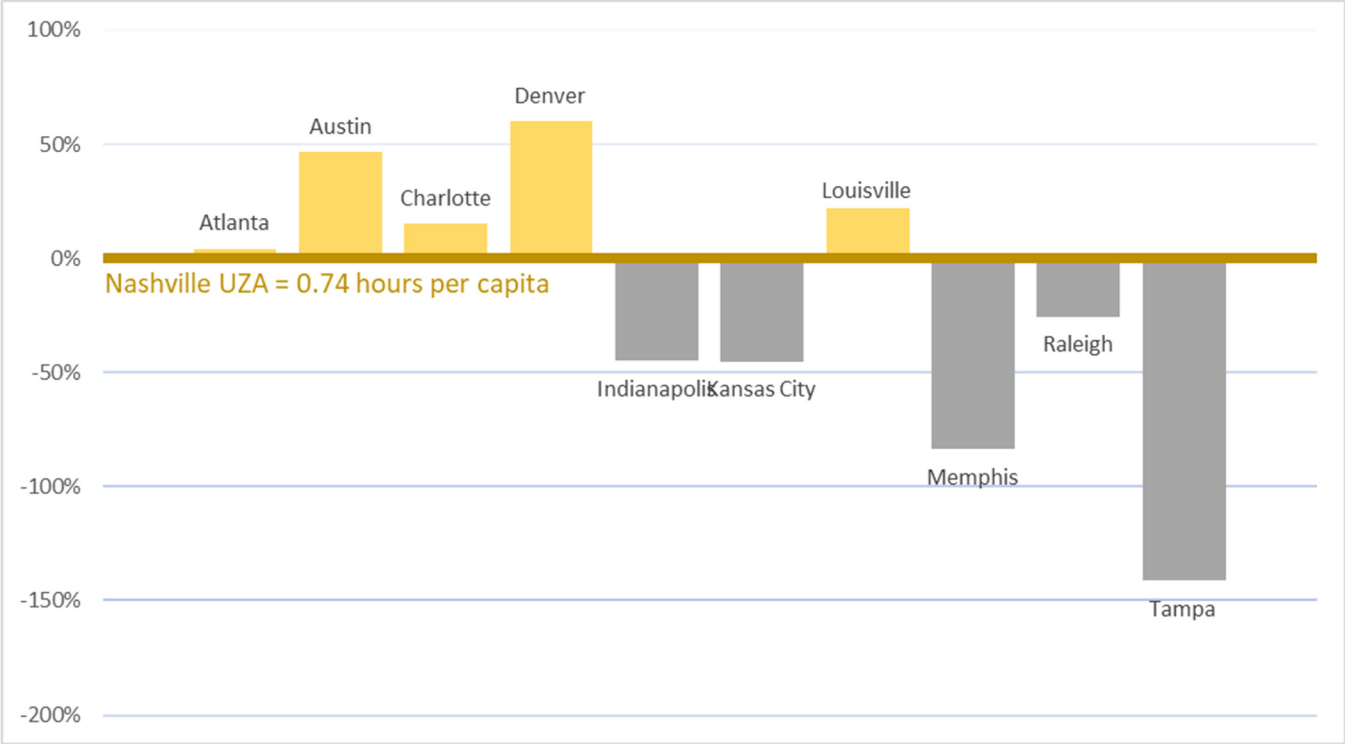
Source: Highway Performance Monitoring System

Figure 3-49. Peer Comparison – Vehicle Miles Traveled per capita, 2018



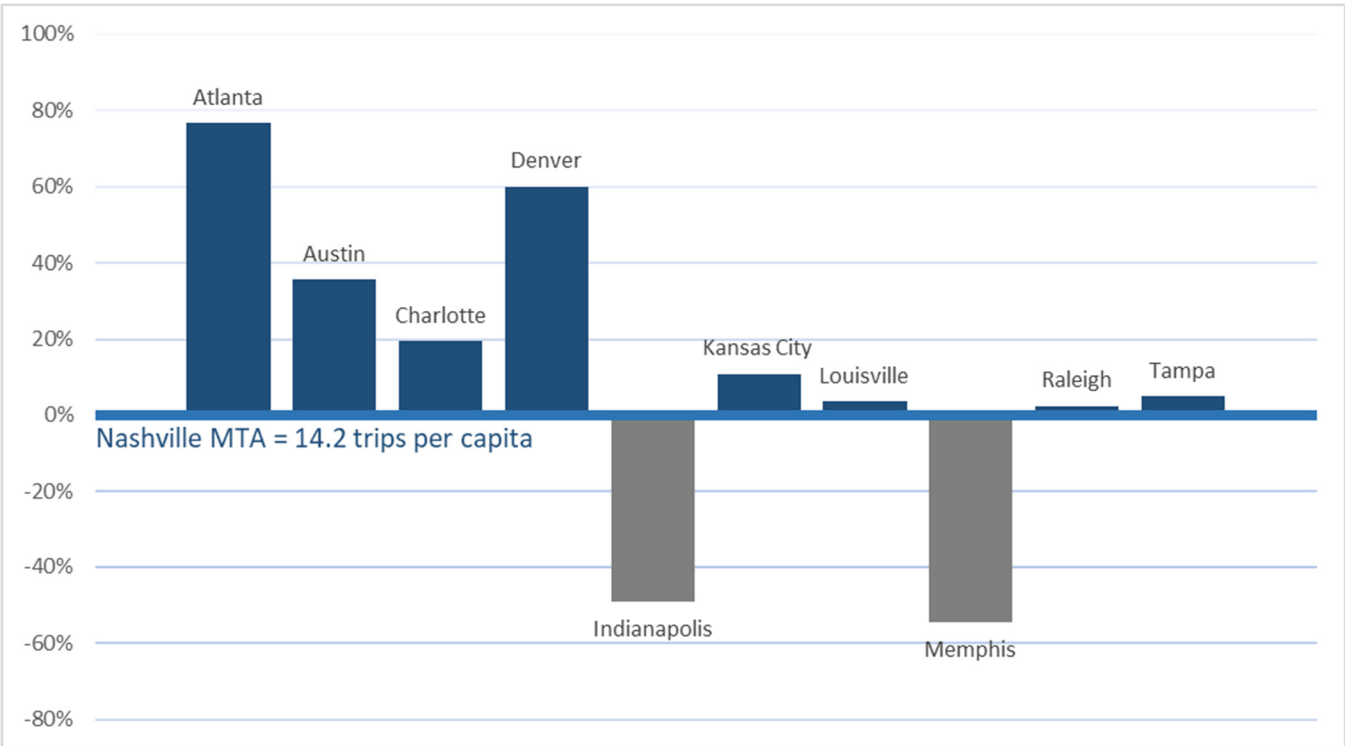
Source: Highway Performance Monitoring System

Figure 3-50. Peer Comparison – Transit Service Hours per capita, 2018



Source: National Transit Database

Figure 3-51. Peer Comparison – Transit Trips per capita, 2018



Source: National Transit Database

4.0 Policy Guidance

4.1 General Framework

On October 16, 2019, the Transportation Policy Board endorsed an Policy Framework intended to articulate its approach to updating the Regional Transportation Plan. The framework provides a general overview of the Board's authority, the purpose of the Plan, shared responsibilities of the participating jurisdictions, guiding principles, and a set of regional goals and objectives to help ensure that the desired outcomes of the Plan are being achieved over the short- and long-term.

Decision-making Authority of the Transportation Policy Board

The Transportation Policy Board is empowered by federal law to serve as the primary forum for collaboration among local elected officials, public transit operators, TDOT, and other state and federal agencies in order to negotiate a mutually beneficial plan to invest in roadways, bridges, public transit, and other transportation facilities across the greater Nashville metropolitan area.

Purpose of the Plan

The purpose of the Regional Transportation Plan is to direct the investment of public funds to provide for a safe and reliable transportation system that helps local communities thrive and contributes to the economic productivity of the region and state.

Shared Responsibilities of Participating Jurisdictions

- Work cooperatively across political boundaries, levels of government, socioeconomic groups, and economic sectors to a identify a shared vision for the region.
- Be willing to prioritize transportation needs according to the known constraints, fiscal or otherwise.
- Identify strategies and resources to overcome anticipated obstacles to success.
- Consider future generations and long-term trends while determining short-range priorities.
- Think comprehensively about the relationship between transportation decisions and those related to housing, the economy and jobs, land use and community design, conservation and preservation, social services, among others.
- Measure performance to monitor progress and improve the effectiveness of future decisions.

Guiding Principles

Working through a collaborative effort which included its member governments, area non-profit organizations, the business community, and citizens, the Transportation Policy Board adopted four guiding principles to ensure regional plans and programs contribute to a broad array of community benefits.

- Livability - Enhance quality of life by prioritizing initiatives that increase opportunities for housing, learning, employment, recreation, and civic involvement while maintaining affordability.
- Prosperity - Contribute to the region's economic productivity by prioritizing solutions that connect workforce with jobs, improve access to markets, and leverage additional investment.
- Sustainability - Encourage growth and prosperity without sacrificing the health, natural or historical assets, or financial stability of this or future generations.
- Diversity - Find solutions that balance the variety of perspectives across Middle Tennessee and ensure local context, community character, and cultural identity are respected in the process.

4.2 Federal Planning Factors and National Goals

Federal Transportation Planning Factors

The Fixing America's Surface Transportation Act (FAST Act) passed by Congress and into law in 2015 defines ten specific planning factors to be considered when developing transportation plans and programs. This directive ensures that federally-funded projects and initiatives within metropolitan areas are consistent with national goals and objectives.

Key Topics	Planning Factor
Economic Vitality	Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
Public Safety	Increase the safety of the transportation system for motorized and non-motorized users.
National Security	Increase the security of the transportation system for motorized and non-motorized users
Accessibility and Options	Increase the accessibility and mobility options available to people and for freight.
Environmental Sustainability, Livability, Planned Growth	Protect and enhance the environment, promote energy conservation, improve quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
Integration, Connectivity	Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
Management and Operations	Promote efficient system management and operation.
Maintenance	Emphasize the preservation of the existing transportation system.
Resilience, Reliability, Storm Water Impacts	Improve the resiliency and reliability of the transportation system and reduce or mitigate storm water impacts of surface transportation.
Travel, Tourism	Enhance travel and tourism.

Performance Based Planning

Pursuant to the Moving Ahead for Progress in the 21st Century Act (MAP-21) Act enacted in 2012 and the FAST Act enacted in 2015, states and metropolitan areas must adhere to a performance management approach in carrying out their federally-required transportation planning and programming activities. The process requires the establishment and use of a coordinated performance-based approach to transportation decision-making to support national goals for the federal-aid highway and public transportation programs. As a result, State DOTs, Transit Providers, and regional transportation planning organizations are required to periodically set performance targets for achieving seven national transportation goals.

National Goal	Description
Safety	Achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
Infrastructure Condition	Maintain the highway infrastructure asset system in a state of good repair.

Congestion Reduction	Achieve a significant reduction in congestion on the National Highway System.
System Reliability	Improve the efficiency of the surface transportation system.
Freight Movement & Economic Vitality	Improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
Environmental Sustainability	Enhance the performance of the transportation system while protecting and enhancing the natural environment.
Reduce Project Delivery Delays	Reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

4.3 Regional Goals, Objectives, and Strategies

Goals and Objectives

The Transportation Policy Board has endorsed six regional goals and 24 measurable objectives to help ensure that the desired outcomes of the plan are being achieved through the implementation of its recommendations.

Regional Goal	Corresponding Objectives
Goal 1. Maintain a State of Good Repair	Objective 1 – Maintain roadway pavement conditions Objective 2 – Maintain bridge deck conditions Objective 3 – Repair or replace deficient bridges Objective 4 – Maintain transit assets
Goal 2. Improve Safety for all Users	Objective 5 – Reduce crashes and traffic incidents Objective 6 – Reduce traffic fatalities Objective 7 – Reduce serious injuries from crashes Objective 8 – Improve safety for pedestrians and cyclists
Goal 3. Mitigate Congestion to Keep Region Moving	Objective 9 – Minimize travel delays Objective 10 – Improve corridor-level travel time reliability Objective 11 – Increase access to non-single occupant vehicles options Objective 12 – Reduce travel distances
Goal 4. Increase Access to Economic Opportunity	Objective 13 – Increase system capacity to support economic growth Objective 14 – Improve connectivity between jobs and workforce Objective 15 – Ensure availability of affordable transportation options Objective 16 – Increase efficiency of freight movements
Goal 5. Minimize Disruptive Impacts of Transportation Projects	Objective 17 – Build resiliency into the transportation network Objective 18 – Minimize pollution from vehicle emissions Objective 19 – Minimize impacts on vulnerable communities Objective 20 – Minimize conflict with environmental assets
Goal 6. Align with Local, Statewide, and National Policies	Objective 21 – Help implement national transportation policy Objective 22 – Support statewide transportation plans Objective 23 – Provide investment to build livable communities Objective 24 – Invest incrementally to implement long-range vision

Core Strategies for Achieving Regional Goals and Objectives

Goal 1. Maintain a State of Good Repair

Transportation assets deteriorate over time due to age, climate and extreme weather, and travel demand and intensity, and ongoing investment in maintenance is necessary to adequately preserve the system. Over the next 25 years, the region's federal-aid network needs $38 million and $420 million annually for bridge and pavement maintenance, respectively, to maintain the current condition level through 2045. The region is committed to maintaining a state of good repair for roadways, bridges, and transit systems. The following approaches can be deployed by transportation stakeholders in the region to maintain the condition of pavement, bridges, and transit assets.

Adopt a Fix-it-First Approach

A commitment to annual maintenance protects the value of the region's more than 26,000 roadway lane miles, nearly 1,600 bridges, 500 roadway miles of sidewalks, and hundreds of transit vehicles that represent the existing transportation system. The prioritization of maintenance of the transportation system over capital expansion projects can help ensure funding levels are sufficient and reliable for the ongoing maintenance of the system.

Reinvest in Existing Infrastructure

Reinvestment in existing infrastructure maximizes the economic impact of limited transportation dollars and ensures that roadway networks are not overextended beyond the region's ability to maintain its assets. Emphasis should be placed on the modernization of the major corridors in the region are predominately designed for motorized vehicles in order to retrofit them to improve access for bicyclists, pedestrians, and transit vehicles. In addition to accommodating nonmotorized users, reinvestment can consist of upgrading outdated traffic signals and technology to leverage emerging technologies.

Implement Pavement Management Systems

Pavement management systems allow asset owners to assess the maintenance needs of their transportation assets to determine the appropriate funding levels and prioritize the most pressing roadway needs. Currently, only a select number of larger cities within the region maintain a pavement management system. Expanded adoption and implementation of pavement management systems by communities across the region can ensure that assets beyond the federal-aid network are also properly maintained.

Shift Maintenance Focus to Non-Interstate Routes

High levels of funding dedicated to Interstates have resulted in an increasing share of the Interstate miles in good condition. Currently, 97 percent of the interstate segments are in good condition while pavement condition on non-Interstate segments have declined since 2008. Shifting the maintenance focus to non-interstate routes can help ensure that pavement condition also improves off the interstate system.

Increase Maintenance for Off System Bridges

A greater percentage of city and county bridges are rated in poor condition than bridges owned by the state. As of 2018, 5 percent of state-owned bridges were rated in poor condition, while the percentage of city and county bridges in poor condition were 9% and 7%, respectively. Increasing maintenance resources on off system bridges can help ensure that overall bridge condition improves in the region.

Explore New Technologies and Recycled Materials

Advancements in technology over the past decade have increased the types and uses of recycled materials in transportation construction as it has been shown to reduce cost, save time, and in some cases superior performance and long-term environmental benefits. Improved coordination with the solid waste providers in the

region can increase the amount of recycled material used in transportation infrastructure, and requires the identification or implementation of suitable processing facilities to refine construction debris, tires, and glass so material is more easily integrated.

Goal 2. Improve Roadway Safety for all Users

As the region continues to rapidly grow and develop, there are more people and more daily trips on the transportation system – increasing the opportunity for conflicts between users. The transportation network has become increasingly dangerous for users of the system, particularly pedestrians. Between 2015 and 2019, there were 167 pedestrian fatalities and 521 pedestrian-related serious injuries. In addition, pedestrians account for a disproportionate share of those fatalities, nearly 20 percent of the region's total annually. The region is committed to improving safety in the region, and the following approaches can be deployed by transportation stakeholders in the region to improve safety for the traveling public and freight haulers.

Set Ambitious Safety Targets

To make progress toward the national safety goal to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, the Transportation Policy Board can do its part by setting ambitious goals and performance targets to reduce crashes, traffic fatalities, and serious injuries from crashes. As part of the 2045 RTP, the Transportation Policy Board endorsed a goal to reduce traffic fatalities by one percent annually over the life of the Plan. Through project evaluation and prioritization, and ongoing monitoring, the region will track progress toward the achievement of safety targets.

Modernize Corridors with Multimodal Accommodations

With decades of auto-oriented investments behind us, the time is now for retrofitting roadways to include options for all. The major corridors in the region are predominately designed for motorized vehicles, yet pedestrians and bicyclists also depend on these pikes to access key transit routes and destinations. The modernization of these major corridors to provide safe access for nonmotorized users will require upgrades to provide sidewalk continuity along the corridor and safe and frequent opportunities to cross the corridor. These solutions depend on additional funding allocations to the Transit and Technology Program and the Active Transportation Program to implement projects that facilitate transit use and improve safety and livability for pedestrians. In addition, these solutions elevate the need to pursue local and regional dedicated funding to build and operate high capacity transit projects and will provide the region with reliable and convenient travel options other than driving alone.

Improve Intersection Controls to Reduce Severity

Intersections are a source of conflict between roadway users and are a common location of severe crashes. Approximately 230% of serious injuries and 20% of fatalities in the region occur at intersections. In additional about one third of all bicycle and pedestrian crashes occur at intersections. Thus, improvements at traffic signal infrastructure, implementation of safer intersection design, and investment in ITS improvements can help reduce the number of severe crashes in Middle Tennessee. Safety countermeasures such as constructing crossing islands, roundabouts, and raised crossings can also reduce crash severity for nonmotorized users at intersections in the region.

Provide Dedicated Facilities for Non-Motorized Users

Investing in safety improvements for vulnerable users can improve safety for all users. Pedestrians and cyclists represent a disproportionate amount of crashes resulting in serious injuries and fatalities. Prioritizing these vulnerable users over drivers through complete streets, vision zero, and policies geared towards people with disabilities can greatly improve the non-motorized user experience and increase the amount of people walking and bicycling, which can alleviate congestion, improve public health, and mitigate environmental issues.

The creation of a connected network for active transportation users that provides separation from vehicles where necessary and possible protects the vulnerable users of the transportation system. Currently, only 14% of roadways in the region have pedestrian facilities and only 3% have bicycle facilities. Building non-motorized infrastructure not only improves the safety of bicyclists and pedestrians using the system currently, but also encourages potential users to make the switch to active transportation modes.

Enforce Motor Carrier Safety

Tennessee has more through trucks on its roadways than any other state in the country. The high prevalence of trucks and their greater potential to result in severe crashes elevates the importance of enforcing laws and regulations of commercial motor vehicles (CMVs). Strategies to update weigh stations, target enforcement, and increase inspections can help reduce the occurrence, frequency, and severity of CMV crashes.

Promote Safety Education

Safety education is necessary to complement engineering improvements to address safety. Through coordination between safety agencies, education stakeholders, and others from the transportation community, education and outreach efforts such as Safe Routes to School can be implemented throughout the region to increase awareness for both drivers and active transportation users.

Enforce Traffic Laws with Technology

The safety consequences of running red lights, speeding, and other dangerous driving practices can be serious, if not fatal. Investing in automated enforcement technologies like Automated Speed Enforcement Cameras and Red-Light Cameras can dramatically improve high crash corridors and save numerous lives. Enforcement technology is critical in changing unsafe driving behaviors and can help prevent severe crashes.

Enhance Safety Data Collection and Analysis

Traffic safety data is vital to in order to analyze and identify locations with greater safety needs in the region. Existing crash data does not account for all crashes, only those reported crashes. Thus, augmenting existing crash data with supplemental databases can provide traffic safety specialists with a more complete and comprehensive understanding of safety needs through Roadway Safety Audits and other safety analysis efforts in order to guide priority high crash locations for safety improvements.

Improve Incident Response

With nearly 200 crashes per day throughout the region, crashes are a frequent occurrence on the transportation system. Roadway traffic incident management can help minimize injury and potential fatalities through swift action and coordination from all first responders. Continued investment in the operation of incident response is essential in Tennessee to improve emergency response and improve safety outcomes in the region.

Goal 3. Mitigate Congestion to Keep Region Moving

Embedded within federal transportation legislation is a requirement that metropolitan areas of 200,000 or more people implement a Congestion Management Process (CMP) as part of the transportation planning process to help ensure that America's larger urban areas are effectively managing traffic congestion with the resources provided by the federal government. Federal guidance encourages regions to examine options beyond traditional roadway widening projects.

Middle Tennesseans are on the roadways for far greater distances than residents of peer regions. In the future, additional traffic volumes will increase demands on the transportation system. Increased congestion will impact mobility within the region as residents will not be able to travel as far in the same amount of time. Based on the percent of free flow speeds, congestion is expected to extend from 1,900 miles of the region's federal-aid network today to 2,800 miles by 2045, impacting nearly half of the region's system on a typical weekday.

GNRC is committed to mitigating congestion to keep the region moving, and looking beyond traditional roadway widening projects to deploy approaches by TDOT, area transit agencies, local public works and planning departments, and employers in the region to manage travel demand, improve operations, and shift to alternative modes.

Transportation Demand Management Strategies

Demand management programs attempt to address congestion at the root of the problem by reducing the number of vehicles on the road. These initiatives work to modify driver behavior by encouraging people to make fewer single-occupancy trips, travel in off-peak hours when possible, and support land use policies that reduce the demand for automobile transportation.

Coordination with Land Use Decisions: In order to preserve that mobility for users of the system, coordination of transportation and land use decisions can be enhanced by establishing corridor management agreements among TDOT and local elected officials along key state routes, encouraging the adoption of local complete streets policies and design guidelines can improve the transportation network for transit and active transportation users, and commissioning a study to identify revenue sources for transportation improvements to manage future growth and development.

Outreach, Incentives, and Rewards: Expand marketing and outreach to employers and schools to manage transportation demand, especially during peak travel by leveraging the existing Transportation Demand Management (TDM) providers that encourage flexible schedules and offer and incentivize alternatives to driving alone.

Telework and Staggered Work Shifts: Encouraging travelers to avoid peak travel periods can help manage demand on the transportation system when it is most burdened. Demand management strategies consist of employer-led efforts to promote telecommuting and flexible work hours. These cost-effective strategies can be implemented in the short term and can avoid costly investments to expand capacity of the roadway system.

Operations and Management Strategies

Operational Improvements are geared toward improving the "supply side" of the transportation system. These efforts are intended to enhance the operation of the transportation system and make it as efficient as possible. Operational Improvements include intersection upgrades, access management, reversible lanes, traffic signal improvements, and Intelligent Transportation Systems. Operational strategies can maximize the performance of the existing transportation system in a cost-effective manner through managed lanes, variable speed limits, intersection improvements, access management, and special event coordination and management.

Remove Capacity Bottlenecks: Capacity of the roadway system is often impeded by "bottlenecks" locations where there are reductions in travel lanes or conflicts at interchanges and junctions. Eliminating capacity constraints throughout the system can address daily delay for motorists. The removal of a physical constriction that delays travel, such as widening of underpasses, providing lane continuity (i.e. replacing a two-lane bridge that connects pieces of four-lane roadway), improving acceleration/deceleration at ramp interchanges, or eliminating a sight barrier can provide consistent capacity and improve traffic flow along key commute corridors.

Improve Traffic Signalization: Optimize traffic management and operations by upgrading outdated devices and investing resources in ongoing staff and equipment to properly maintain traffic-control devices. In addition, commit to developing new policy and practice standards for sharing real-time information, encourage interoperability with regional clearinghouses and other information sites, and support future deployment of "smart corridors" across the region based on the lessons learned from I-24 Smart Corridor improvements implemented by TDOT.

Incident Management and Crash Reduction: With nearly 200 crashes per day throughout the region, crashes are a frequent occurrence that routinely disrupt the transportation system. As the capacity of the roadway network is expected to be further utilized by 2045, it will be less able to recover from crashes – leading to greater variation in

congestion. Incident management technology and programs for detecting crashes, disabled vehicles, or other incidents that impede travel and resolving or removing the obstructions will remain critical to minimize the system disruptions associated with crashes.

Traveler Information and Alerts: Real-time information can help identify where, when, and why congestion is occurring. Access to real-time information through smart phones, in-dash displays, or electronic message boards can benefit all users of the system- allowing transit riders to know when the next bus arrives, bicyclists to locate available bike shares, and motorists to change routes to avoid congestion. Collectively, informed travelers making optimal choices can divert excess traffic to alternate routes and promote the use of public transit options to reduce congestion and maintain reliability of the transportation system.

Implement Managed Lanes: The downtown interstate loop is a source of conflict between local and pass-thru traffic as they navigate the maze of interchanges. Reducing competition between local and pass-thru traffic can help ease congestion on at the biggest bottleneck in the region. Strategies to divert freight traffic around the downtown interstate loop, separate vehicles as they pass through loop, or provide incentives for high occupancy vehicle travel can reduce the duration and intensity experience by users, especially during the weekday morning and evening commutes.

Multimodal Opportunities

Improving access to alternative modes of transportation can help reduce the burden placed on roadways to support travel demand. Multimodal strategies include programs and projects that give people choices beyond just driving alone in their cars.

As the region's roadway capacity is expected to become increasingly overwhelmed by travel demand, travelers will seek options that can get them to destinations timely and dependably. The region will need to move people more efficiently than driving alone. High capacity transit service will be necessary to ensure reliable and convenient travel along the region's main corridors and active transportation investments will help ensure safe access to transit and reduce the need for shorter automobile trips that can be made by walking and bicycling. These solutions will depend on ongoing investment through the Transit and Technology Program and the Active Transportation Program and require future pursuit of local and regional dedicated funding to build and operate high capacity transit projects.

Building dedicated lanes in areas of the region that experience congestion delay and poor travel time reliability can prioritize non-single occupancy vehicle travel and increase transit ridership. Strategies like dedicated transit lanes and transit signal priority along key principal arterial corridors can improve the on-time performance of transit service and reliability for its customers. In addition, strategies to implement managed lanes along interstate corridors can provide incentives for high occupancy vehicle travel such as transit and carpooling

Capacity Improvements

As a last resort, expanding the physical capacity of a roadway can provide relief to traffic congestion, thought this relief is often short-lived due to the induced demand that additional capacity often generates. This includes new roadway and roadway widening projects.

Goal 4. Increase Access to Economic Opportunity

Economic development and transportation infrastructure have a symbiotic relationship. Development locations influence regional travel patterns and infrastructure investments, and in turn, the degree of access provided by the transportation system can influence land development trends. Given the area's rapid growth and limited transportation funding, it is becoming increasingly important that development decisions do not place demand in areas where infrastructure is not planned. It is also important that transportation facilities are built to appropriately serve their markets.

Align the Regional Transportation Plan with the region's Economic Development Strategy

Effective October 1, 2017, GNRC became responsible for carrying out the staffing and administrative functions of the Nashville Area MPO. The integration of the transportation planning program into GNRC is one major step towards improving the efficiency and effectiveness of regional decision-making and to better align transportation planning programs with other regional activities related to economic development, infrastructure investment, and quality of life. GNRC is responsible for the development of a Comprehensive Economic Development Strategy (CEDS). The CEDS is a federally-required document that serves as a regional blueprint for creating a stronger, more diverse economy. It is a strategy-driven plan for regional economic development and is the result of a regionally owned planning process designed to build capacity and guide the economic prosperity and resiliency of the greater Nashville area. The CEDS provides information to serve decision-makers as they determine the region's economic development goals and appropriate plans for action. It allows business and government leaders throughout the region to set priorities for investments in both physical and human capital to solidify how the area as a whole will adapt to a constantly changing global economy.

The development of the CEDS is facilitated by the Greater Nashville Regional Council (GNRC) which is designated by the U.S. Economic Development Administration (EDA) of the U.S. Department of Commerce as the Economic Development District for northern Middle Tennessee. GNRC works on behalf of 13 counties and 52 municipalities across a diverse region which includes metropolitan, urban, suburban and rural areas connected by a single regional economy.

Transportation Projects

The region's population is growing rapidly and projected to reach 2.7 million by 2045, a 64% increase. The region's development pattern poses a threat to the region's environment development pattern as the number of developed parcels is expected to increase by 65,500 parcels. As a result of development, existing open space, forest, and agricultural lands will be lost – leading to disruptions in wildlife corridors and habitat, fragmenting agricultural lands making farming more difficult, increasing infrastructure needs and costs, and contributing to more vehicle miles traveled.

Projected population, development patterns, and transportation investments are likely to threaten environmental assets and resources that are important to the region. The region is committed to minimizing disruptive impacts of transportation systems and improvements by working with project proponents to take advantage of strategies in the transportation project delivery process to help minimize the impacts a specific project or parts of the transportation system have on natural and sociocultural resources. The following strategies span stakeholders, phases of project development, and geographic scale.

Set Ambitious Goals

The region should identify a set of environmental indicators and performance goals or targets that reflect the region's priorities for the conservation and preservation of natural and sociocultural resources. The set of indicators should be capable of providing feedback at the project scale and at the broader landscape or regional scale. Based on the series of environmental assets and conditions, members of the Technical Coordinating Committee and Transportation Policy Board have a strong foundation for baseline conditions and future targets. Additionally, GNRC's Regional Environmental Roundtable can play a significant role in identifying, refining and tracking performance against these targets over time.

Planning and Environmental Linkages

The region should continue its work to implement a formal Planning & Environmental Linkages (PEL) process that connects analysis derived from regional transportation planning processes with ongoing transportation project planning and development. This effort would provide ongoing interagency consultation and support to project sponsors and other stakeholders that should be aimed at two specific and overlapping objectives: 1) improving the environmental performance of specific transportation projects and 2) accelerating work flows tied to National

Environmental Policy Act compliance requirements that can be burdensome to project sponsors and slow the project delivery process. This effort would allow the GNRC, TDOT and FHWA to establish more robust and consistent project-level information sharing that results in more and better environmental information being made available to project stakeholders, including project sponsors, regulators and the public. Additionally, this effort could expand upon and complement the purpose of the Tennessee Environmental Streamlining Agreement (TESA) and the coordination that takes place among its signatory agencies.

Planning for Climate Scenarios

Through the Federal Climate Assessment, the Federal government has called for action to plan for and enhance the adaptability of the nation's infrastructure to future climate scenarios. Because of the substantial capital investment and long life cycles inherent in most transportation infrastructure, it is critical that project sponsors and stakeholders engage in long-term evaluation of how a transportation asset will perform under a range of future climate scenarios. Currently, policy recommendations are being developed and considered at the Federal level to incentivize planning and investment in climate resilient infrastructure. Future transportation bills could include new funding earmarked for this purpose and the region should be ready to compete for this funding and to lead the way in Tennessee.

For most of the region's transportation assets this will implicate the design, engineering and maintenance of bridges and roadways that cross or are near surface water bodies that may experience more frequent and severe flood events. At the same time, potential drought events could cause near-surface aquifer drawdowns that could cause sinkhole formations or other structural impacts to roadbeds or other structural elements. Together, these future impacts could significantly impact the level of service, reliability and safety of the transportation system.

Additionally, port and rail operations may face the same types of challenges described above yet may have their own unique climate adaptation needs. For example, waterfront port infrastructure along the Cumberland River system may require greater operational flexibility to accommodate a broader range of water levels.

Protection/Preservation

Protection and preservation strategies help preserve natural or sociocultural resources by implementing enhanced land protection mechanisms that often go beyond the protections allowed by local land use policy and zoning codes. These strategies typically require public sector programs to fund or administer the land protection mechanisms and/or nonprofit partners and local governments that are willing to own or maintain lands consistent with conservation-oriented objectives. Key protection and preservation strategies include land banking, transfer of development rights, greenbelt exemptions, and historic tax credit programs.

Enhanced Engagement with Environmental Stakeholders

The region should expand the purpose of the Regional Environmental Roundtable to capitalize on its early success and role in strengthening the environmental approach of the 2045 Regional Transportation Plan update. The Roundtable can continue to make significant contributions to regional transportation planning by helping to develop and broker a shared vision for the region's resource conservation and preservation priorities. The Roundtable has indicated strong support for the development of a Regional Conservation Strategy, that could serve as a foundational reference to guide future long-range planning cycles and project-specific decision-making processes. A Regional Conservation Strategy could help broker new conservation-oriented partnerships and collaboration and attract new funding to the region in support of transportation and conservation investments.

Avoidance of Potential Environmental Impacts

Avoidance strategies prevent negative environmental impacts before they happen by implementing projects in places or with features that minimize environmental conflicts or challenges. These strategies are best deployed by project sponsors and their design and engineering teams. Key avoidance strategies consist of: 1) design modifications that may result in raising a transportation asset out of a regulatory floodplain, utilizing a clear-span bridge to cross a river or stream, green infrastructure to improve the quality of stormwater discharge, or culverts

to allow safe crossings for wildlife migration, and 2) alternative alignments to connect logical termini of a project in a manner that reduces the direct overlap or intersection with natural or sociocultural resources.

Mitigation of Potential Environmental Impacts

Mitigation strategies recognize that an environmental conflict may be unavoidable and therefore attempt to compensate for that impact bey investing in resource conservation or restoration within the project vicinity or elsewhere in the region. These strategies likely require significant participation from project sponsors but may also require participation from other project partners or collaborators. Key mitigation strategies include restoration/compensation programs, excavation and relocation, and wetland/stream mitigation banking.

During the RTP update, GNRC enhanced its ability to evaluate proposed transportation projects against a broader set of environmental data sets. As a result, GNRC staff and project sponsors each have more and better information about how each transportation project will interact with its surrounding environment and that puts project sponsors in a stronger position to effectively manage environmental impacts early in the project development process.

Prioritize Vulnerable Communities in Planning and Investments

Transportation systems are intended to serve residents, so having the input of residents in the planning process is critical to developing a system that serves the community. Public engagement is challenging and historically has not been inclusive. Vulnerable populations have specific transportation challenges and are often underserved by transportation systems. To build transportation systems that are equitable and meet the needs of all residents, it is critical to prioritize vulnerable populations in the transportation planning process to both address historical inequities and ensure a more equitable future.

GNRC and its transportation planning partners can expand outreach opportunities to target vulnerable populations and design engagement strategies to meet the specific needs of residents such as providing translation, childcare, and meeting at untraditional places and times. Greater input from residents can help ensure that their priorities are captured in the project scope and help address inequities in safety or access to opportunity.

The Transportation Policy Board also prioritizes investments in highly vulnerable areas through the project evaluation process as projects are assessed based on their ability to improve safety and/or enhance mobility for vulnerable populations. Continual analysis and tracking of these vulnerable population and the burdens they experience are necessary in order to gauge progress toward addressing inequities in the region.

Goal 6. Align with Local, Statewide, and National Policies

The region's ability to manage future growth and development requires effective coordination of land use policies, economic development initiatives, and transportation investments across levels of government. The alignment of plans and policies leverages investments, uses resources effectively, and improves quality of life. Over the next 25 years, the region will add approximately one million new residents and invest nearly $10 Billion in transportation projects to support the safety and mobility needs of the population.

The region is committed to aligning with local, region, and statewide policies and plans. The following approaches can be deployed by cities, counties, transit agencies, and TDOT to align local land use decisions and regional transportation decisions.

Land Use and Urban Design

Land use and urban design policies can help manage development patterns in a way that complement and optimize transportation investments. Through updates to local comprehensive plans, zoning ordinances, and design guidelines, communities can guide new development that supports transportation infrastructure. Areas that are targeted for high-quality transit service must be supported through land use and zoning policies that support transit-oriented development and reflect the benefits of increased access to alternative modes of travel.

Policy examples include appropriate densities and intensities for supporting transit use, parking ratios that reflect reduced reliance on the automobile, and setback and design.

Corridor Preservation for Right-of-Way

As the region looks to a future that increasingly relies on transit solutions, considerations must be taken in the near-term to implement right-of-way preservation strategies to protect future transportation corridors from escalating land acquisition costs.

These additional strategies should be pursued in an effort to ensure the alignment of plans and policies.

- Establish Corridor Management Committees for key state routes to coordinate access management and land development decisions.
- Commission a study to review best practices for land development impact fees for transportation.
- Conduct a comprehensive review of local parking policies, pricing, and management.
- Convene periodic meetings among state and local ECD officials and transportation planners to evaluate potential sites for development.
- Implement right-of-way preservation strategies to protect future transportation corridors from escalating land acquisition costs.
- Update local comprehensive plans, zoning ordinances, and design guidelines to enable transit-oriented development.
- Adopt Regional or Corridor Level Access Management Standards.

4.4 Key Metrics for Measuring Performance

The following table provides a list of key metrics that will be used by GNRC to track performance of the transportation system over the life of the Plan. Each measure corresponds with one or more regional goals and objectives. Additional information about how the GNRC will track performance measures after the adoption of the Plan is presented in *Chapter 6. Implementation and Monitoring*.

2045 Regional Transportation Plan Policy Framework
Initial Set of Performance Measures

ID	Type	Performance Measure	Goals	Objectives	CMP	FED	Modal Element
1	Condition	Percent of Federal-Aid routes in good or poor condition	1	1			Roadway
2	Condition	Percent of Interstate pavement in good or poor condition	1	1		X	Roadway
3	Condition	Percent of Non-Interstate NHS in good or poor condition	1	1		X	Roadway
4	Condition	Percent of NHS bridge decking in good or poor condition	1	2		X	Roadway
5	Condition	Number of bridges that are functionally obsolete	1	3			Roadway
6	Condition	Number of bridges that are structurally deficient	1	3			Roadway
7	Condition	Percent of transit facilities rated < 3 on the Transit Economic Requirements Model Scale	1	4		X	Roadway
8	Condition	Percent of public transit non-revenue vehicles exceeding useful life benchmark	1	4		X	Transit
9	Condition	Percent of public transit revenue vehicles exceeding useful life benchmark	1	4		X	Transit
10	Condition	Percent of track segments that have performance restrictions	1	4		X	Transit
11	Capacity	Roadway vehicle lane miles	1,4	1,2,9,10			Roadway
12	Capacity	Miles of Federal-Aid routes with bicycle facility	1,3,4	11,15	X		Non-Motorized
13	Capacity	Miles of Federal-Aid routes with sidewalks	1,3,4	11,15	X		Non-Motorized
14	Capacity	Number of transit revenue hours	1,3,4	11,13,14,15	X		Transit
15	Capacity	Frequency of transit service (headway)	3,4	11,13,14,15	X		Transit
16	Capacity	Percent of park-n-ride lots with transit service	3,4	11,13,14,15	X		Transit
17	Utilization	Vehicle miles traveled (VMT)	1,3	1,2,12	X		MultiModal
18	Utilization	Roadway volumes	1,3	1,2,12	X		MultiModal
19	Utilization	Percent of roadway volume classified as freight	1,3,4	1,2,12,16	X		Freight
20	Utilization	Number of transit boardings and alightings at stops	3	11	X		Transit
21	Utilization	Number of transit trips (ridership)	3	11	X		Transit
22	Utilization	Number of transit passenger miles	3	11	X		Transit
23	Utilization	Percent of commute destinations within county of residence	3,4	12,14,15	X		MultiModal
24	Utilization	Percent of trips made by non-single occupant vehicles	3,4	11	X		MultiModal
25	Utilization	Number of employers participating in transit pass programs	3,4	11,15	X		Transit
26	Utilization	Number of employers participating in other formal TDM programs	3,4	11,15	X		MultiModal
27	Outcome	Number of crashes (traffic incidents)	2,3	5,9	X		MultiModal
28	Outcome	Fatality rate resulting from crashes	2	6		X	MultiModal
29	Outcome	Number of fatalities resulting from crashes	2	6		X	MultiModal
30	Outcome	Serious injury rate resulting from crashes	2	7		X	MultiModal
31	Outcome	Number of serious injuries resulting from crashes	2	7		X	MultiModal
32	Outcome	Number of traffic crashes involving non-motorized traveler	2	5,8			Non-Motorized
33	Outcome	Number of pedestrian fatalities	2	8		X	Non-Motorized
34	Outcome	Number of seriously injured pedestrians	2	8		X	Non-Motorized
35	Outcome	Number of cycling fatalities	2	8		X	Non-Motorized
36	Outcome	Number of seriously injured cyclists	2	8		X	Non-Motorized
37	Outcome	Number of crashes involving public transit	2	5			Transit

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For Endorsement - December 11, 2019

CMP = Element of the Congestion Management Process
FED = Required by federal performance-based planning regulations

2045 Regional Transportation Plan Policy Framework
Initial Set of Performance Measures

ID	Type	Performance Measure	Goals	Objectives	CMP	FED	Modal Element
38	Outcome	Number of crashes involving freight	2,3,4	5,16	X		Freight
39	Outcome	Roadway volume to capacity ratio	3,4	9,13	X		Roadway
40	Outcome	Travel speed as a percentage of expected free flow	3	9	X		MultiModal
41	Outcome	Peak hour excessive delay	3,4	9,13	X		MultiModal
42	Outcome	Percent of VMT on congested routes	3,4	9,10	X		Roadway
43	Outcome	Percent of Freight VMT on congested routes	3,4	9,10,16			Freight
44	Outcome	Vehicle hours traveled (VHT)	3,4	9,14,15	X		MultiModal
45	Outcome	Interstate reliability	3,4	10	X	X	MultiModal
46	Outcome	Non-Interstate NHS reliability	3,4	10	X	X	MultiModal
47	Outcome	Public transit service reliability (on-time)	3,4	10,15	X		Transit
48	Outcome	Freight reliability on NHS	3,4	10,16	X	X	Freight
49	Outcome	Average commute travel distance	3,4	12,14	X		MultiModal
50	Outcome	Average commute travel time	3,4	9,14	X		MultiModal
51	Outcome	Pedestrian level of service	1,3	1,8,11,15	X		Non-Motorized
52	Outcome	Bicycle level of service	1,3	1,8,11,15	X		Non-Motorized
53	Outcome	Carbon Monoxide (CO) from vehicle emissions	5	18			MultiModal
54	Outcome	Oxides of Nitrogen (NOx) from vehicle emissions	5	18			MultiModal
55	Outcome	Particulate Matter (PM 2.5) from vehicle emissions	5	18			MultiModal
56	Outcome	Volatile Organic Compound (VOC) from vehicle emissions	5	18			MultiModal
57	Outcome	Carbon Dioxide (CO2) levels vehicle emissions	5	18,19			MultiModal
58	Proximity	Percent of households within 1/4 miles of frequent transit service	3,4	11,12,14,15,17	X		Transit
59	Proximity	Percent of households within 2 miles of park-n-ride lot	3,4	11,12,14,15,17	X		Transit
60	Proximity	Percent of jobs within 1/4 miles of frequent transit service	3,4	11,12,14,15,17	X		Transit
61	Proximity	Number of jobs within 30 minute transit commute	4	9,11,12,14,15			Transit
62	Proximity	Percent of jobs within 30 minute commute	4	9,12,14			MultiModal
63	Proximity	Acres of impervious surface within environmentally sensitive areas*	5	19			MultiModal
64	Proximity	Miles of right-of-way within environmentally sensitive areas*	5	19			MultiModal

KEY:							
	Condition	Measure of the physical condition of infrastructure including a facility or equipment					
	Capacity	Measure of the capacity of the transportation system including roadways and transit service					
	Utilization	Measure of the demand or usage of the transportation system					
	Outcome	Measure related to the resulting effects of the use of the transportation system					
	Proximity	Measure of value within a distance of the transportation facility or related feature					

5.0 Transportation Needs and Priorities

5.1 Transportation Needs

Call for Projects

The official launch of the plan began with a formal call-for-projects in October 2019 to solicit proposals from MPO member jurisdictions including TDOT, local city and county governments, and public transit agencies. The Call remained open through the end of February 2020. During the Call, member governments of the Transportation Policy Board were asked to complete an application and submit a detailed narrative and budget for each project through an online project database at Apply.NashvilleMPO.org. In all, more than 350 projects were submitted by 30 different agencies totaling more than $7 billion worth of work.

Following the formal call-for-projects period, GNRC held workshops with its planning partners to review the project evaluation process, discuss project proposals, and determine local priorities. In July 2020, one virtual workshop was held in each of the metropolitan area counties to review and confirm project details, including scope, alignment, logical termini, estimated cost, and local priorities.

Priority Capital Improvements

The following list highlights the major transportation corridor priorities of the region. These projects are consensus priorities per regional policies and tend to be the most important and visionary projects that the region has agreed upon accomplishing over the next 25 years. Some of these projects have been funded through the RTP's financial plan, however additional local and state funding will likely be necessary to complete these projects by 2045. As a result, these regional priorities provide an illustration of the tremendous need for additional transportation revenue.

Priority Description and Location	Cost Estimate*	Potential Funding**
Reconstruction and Modernization of U.S. Interstate Loop in Downtown Nashville	**$375M to $2B**	**NHPP, STBG**
Planned in the 1950s, the construction of the Interstate highway loop in downtown Nashville began in the mid-1960s. Since then, only modest improvements have been made while the city and region has continued to grow and evolve. The design of the aging structures make for dangerous weaving movements as motorists navigate the maze of interchanges, and the major junctions of I-24, I-40, and I-65 cause major bottlenecks during rush hour periods. The inner-loop should be reconstructed to minimize travel delays due to poor traffic patterns and modernized to include provisions for managed lanes and technology to improve traffic operations. Downtown interchanges, particularly on the East Bank should be redesigned from the current clover-leaf design to a more appropriate, and less land hungry, urban form. Consideration also should be given to the conversion of the East Bank section of the loop to an urban boulevard and to the potential for interstate capping on the below grade section that divides Music Row and Midtown areas from the Gulch and Central Business District. Capping would allow for much needed open space and additional economic and community development.		
Northeast Transportation (NET) Corridor Multi-Modal Capacity Upgrades, Modernization, and Extension in Davidson and Sumner Counties	**$300M to $750M**	**NHPP, STBG, FTA New Starts**
Dubbed the "NET" corridor by economic development officials, this high priority project will help implement the regional transit vision's call for rapid transit connecting Davidson and Sumner counties. Based on the 2010 Northeast Corridor Mobility Study, the RTP recommends BRT/managed lanes along Ellington Parkway (SR-6) and Vietnam Veterans Parkway (SR-386) to include direct ramp access to potential transit oriented development (TOD) sites at Cleveland Park, Trinity Lane, Indian Lake Village, and Greensboro North. Other improvements include an interchange modification along SR-386 at I-65 and Conference Drive and a new interchange at Forest Retreat and the SR-109 Bypass in Gallatin. The entire corridor would be upgraded with technologies to improve traffic operations and real-time traveler information.		

East Corridor Upgrades for Transit Oriented Development in Davidson and Wilson Counties	$40M to $80M	STBG, FTA programs
Local government and economic development officials are optimistic about the future of the east corridor commuter rail service between Nashville and Lebanon. The RTP recommends the completion of the Hamilton Springs station, additional passenger train siding along the route, equipment upgrades to diesel multiple unit (DMU) vehicles, and increased frequencies along the route to support more intense transit-oriented development.		

Southeast Corridor/ I-24 Multi-Modal Capacity Upgrades and Modernization in Davidson and Rutherford Counties	$650M to $1B	NHPP, STBG, FTA New Starts
The southeast corridor between Murfreesboro and Nashville contains some of the most congested stretches of highway in the entire state. A transit alternatives analysis completed in 2007 recommended the enhancement of regional bus service along the corridor. However, given the rapid growth in Rutherford County and in the Antioch area of Davidson County, the corridor should be re-evaluated for possible fixed-guideway investments within the next five to ten years. In the short-term, WeGo Public Transit and TDOT should explore bus-on-shoulder transit service. In the mid- to long-term, the WeGo Public Transit and TDOT should look to possible fixed-guideway lane BRT or light rail transit service that uses the interstate right-of-way with deviations as necessary to serve existing communities and new TOD. A less likely solution could involve the use of the CSX corridor for passenger rail services.		

South Corridor/ I-65 Multi-Modal Capacity Upgrades and Modernization in Davidson and Williamson Counties	$350M to $1.8B	NHPP, STBG, FTA New Starts
The south corridor stretches 15 plus miles between Nashville and Franklin, TN and another 20 miles to Columbia. Currently served by express bus service during peak commuting periods, the corridor is a top candidate for more significant transit investment over the next decade. Williamson County is expected to more than double its population by the year 2040 and high-capacity rapid transit may be one of the most effective ways to keep this part of the region moving efficiently as Cool Springs and the Carothers Parkway corridor build out. Shortly following the RTP's adoption, GNRC should work with the WeGo Public Transit and local governments in Davidson and Williamson Counties to complete the corridor study underway to evaluate the feasibility of light rail and bus rapid transit investments. The service should be integrated with local transit services in Franklin and Nashville and provide a catalyst for new local circulation in the Brentwood area.		

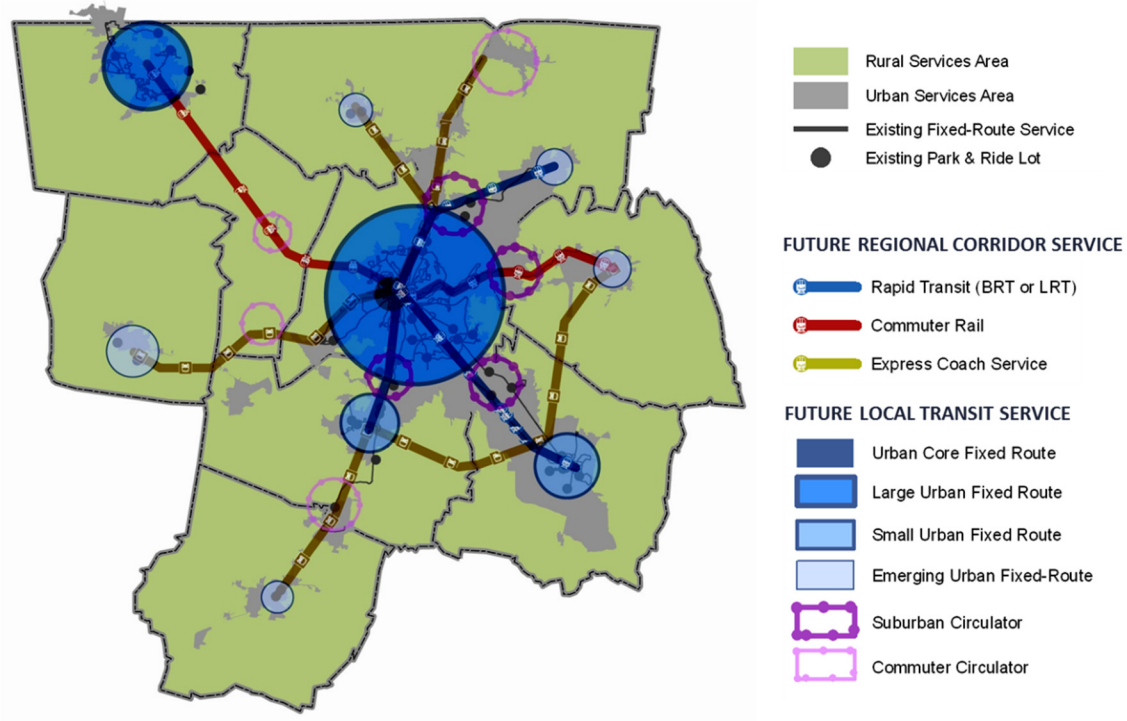
Northwest Corridor Transit Upgrades in Davidson, Cheatham, and Montgomery Counties	$150M to $300M	NHPP, STBG, FTA New Starts
The regional transit vision calls for commuter rails services between Clarksville and Nashville over the long-term. The Northwest Corridor Transit Study is currently evaluating various transit and highway improvements along the corridor to identify which options are the most viable to move forward in the short-term, and to establish a plan of action to implement the preferred vision as opportunities emerge. The RTP recommends that the corridor be developed to include rail service using DMU vehicles which could use the existing freight alignment or operate in new track built along dedicated right-of-way (ROW) or down the center of an existing street. While the service would be oriented to commuters along the corridor, it could also provide a rapid transit option to residents within Davidson County with destinations in North Nashville, and could be used to connect Tennessee State University (TSU), Meharry, Fisk, with the North Gulch and downtown.		

**2019 dollars. A range is provided to account for the various design/alignment options **Potential Federal grant programs described in Section 5.2. Additional local and state funding will likely be necessary.*

Long-Term Expansion of Transit Service

The long range vision for transit, first adopted by local elected officials in 2010, is a necessary part of the region's preparation for the increasing competitive global economy, and proactively addresses the growing concerns about increased traffic congestion. The vision includes a variety of new and expanded services for regional corridors, urban centers, suburban communities, and even the rural countryside.

Figure 5-1. Regional Transit Vision for Expanded Service



Specifically, the RTP calls for a strategic mix of transit options for future generations of Middle Tennesseans, ranging from high-frequency rapid transit service to the continued provision of rural transit services for those who do not live nearby to fixed-route options. The following describes the various types of services proposed for Middle Tennessee.

Rapid Transit	Three corridors are identified for future regional rapid transit service including the region's northeast, southeast, and south corridors. These areas are the most densely populated and fastest growing within the region and have a well-established pattern of cross-county travel. The long-range vision for rapid transit in these corridors includes the development of either light rail transit or dedicated-lane bus rapid transit that would operate at high levels of service throughout the day. The specific mode or technology used will be determined by future study and depend heavily on development patterns, anticipated ridership, cost of construction, and public support for funding.
Commuter Rail	The long-range vision calls for continued support for the Music City Star's east corridor commuter rail service and the development of a new commuter rail line in the region's northwest corridor to connect Clarksville and Nashville, two of Tennessee's five most populous cities.

Express Coach Services	In corridors with strong commuting patterns but without the land development patterns or traffic congestion to warrant dedicated-lane transit service, the vision calls for the implementation of premium express coach service. Such service will offer a comfortable and stress-free ride to and from work for commuters, providing enhanced amenities along the way including high-back seats, wireless internet access, on-board televisions, and restrooms.
Urban Fixed-Route Services	By far the most critical piece of the long-range vision, the region must continue to expand the existing urban fixed-route services in Nashville-Davidson County, Clarksville, Franklin, and Murfreesboro. Urban services are the backbone of any regional transit system and must be optimized in order to ensure the success of investments in regional rapid transit or commuter rail. The vision calls for continued investment in existing local bus systems, the eventual introduction of fixed-route service in Springfield, Gallatin, Lebanon, Columbia, and Dickson, and the return of the urban rail or bus rapid transit in downtown Nashville which serves as the central hub for the region.
Suburban and Community Circulators	As the region begins to implement rapid transit, commuter rail, or express coach services in each of the regional corridors, the vision calls for the development of local circulators in markets where a full-fledged urban fixed-route system would not make sense. Such local circulation will be important to customers to access regional services from primary destinations within their community. Suburban circulators, which would operate throughout the day, are envisioned for places like Goodlettsville, Hendersonville, Smyrna, La Vergne, and Brentwood, while commuter circulators, which would operate during peak commuting times, are envisioned for places like Portland, Spring Hill, Kingston Springs, and Ashland City.
Vanpools and Flexible Services	In addition to the geographically defined train, bus, and circulator services described above, the vision also calls for the expansion of the regional vanpool program and rural paratransit services. The regional vanpool program has been proven to be a popular and cost-effective way to provide ride-sharing opportunities to commuters who live too far away from fixed-route lines, and as the region's population continues to grow older, flexible or demand responsive rural services will be needed to ensure older Middle Tennesseans have transportation to and from life-sustaining services. Transit services also should be coordinated, to the extent possible, with the emergence of private-sector peer-to-peer transportation services like Lyft and Uber.

The transit vision seeks to communicate the region's intent for developing mass transit, but more difficult work is needed in order to make the vision a reality including the completion of detailed studies to identify projects and costs, identification of local dedicated revenue to leverage state and federal grants to build and operate new services. All projects must be fully engineered and evaluated for environmental and community impacts prior to construction. The total estimated capital cost for building out the regional transit vision is between $3 billion and $8 billion depending on the selected mode, technology, and alignment for each corridor. The process used to decide the mode, technology, and alignment for each corridor involves significant public input through detailed corridor studies which provide an estimate of cost and benefit for each possible option.

Ongoing Maintenance

Local and state governments have a shared responsibility to ensure the necessary maintenance of the nearly 28,000 roadway lane miles, more than 1,600 bridges, nearly 700 roadway miles of sidewalks, and hundreds of transit vehicles that deliver more than 11 million trips per year. The direct cost of maintaining area roadways and bridges is significant.

As part of performance-based planning requirements, the Fixing America's Surface Transportation (FAST) Act requires state Department of Transportation (DOTs) to establish targets for the following measures to use in managing bridge performance on the National Highway System (NHS).

- Percent of NHS bridges by deck area classified as in Good condition
- Percent of NHS bridges by deck area classified as in Poor condition

Regions may adopt Statewide targets or establish their own. The current state targets of NHS bridges by deck area are 36% in good condition and 6% in poor condition.

The seven-county metropolitan planning area has a total of 455 bridges on the NHS and currently exceeds these targets as 48% are in good condition and only 4% are in poor condition. In order to continue to maintain these standards over the horizon of the RTP, it will take an average investment level of $28 million per year, or approximately $750 million over the life of the plan in terms of today's dollars.

The issue of bridge maintenance is even bigger than that, as less than 30 percent of all bridges in the region are located on the NHS. The seven-county area has a total of 1,607 bridges. TDOT owns and maintains 60 percent of those or 967 bridges, local agencies own 38 percent or 602 bridges, and the remaining 38 bridges are owned by other agencies. As of 2018, the average age of bridges in the area is 44 years.

In estimating the full cost of maintenance for area bridges, GNRC used the FHWA's National Bridge Investment Allocation System (NBIAS) tool. NBIAS is designed to minimize maintenance costs by generating an optimal set of preservation actions for bridge elements based on life-cycle user and agency costs, and engineering standards of bridge maintenance needs. The results of that analysis yields an estimated need for $38 million in annual funding which adds up to about $900 million over the life of this plan. Those costs are in 2018 dollars and represent needs for current bridges only.

Figure 5-2. Funding Needs for Bridge Repair and Replacement

Highway System**	Number of Bridges	Square Feet of Deck Area	Percent in Fair of Good Condition	Annual Funding Need for Maintenance	25-Year Cumulative Funding Needed for Maintenance
National Highway System	455	829,000	96%	$28 Million	$750 Million
State Route System	967	1,451,990	95%	N/A	N/A
All bridges on Federal-Aid Network	1,607	1,756,518	94%	$38 Million	$900 Million

*Source: FHWA NBIAS analysis by Cambridge Systematics for GNRC. **Bridge systems are not mutually exclusive, several state route bridges are also on the NHS. Funding needs shown in 2018 dollars.*

Maintaining bridges is a heavy burden on the state and local governments, but that cost only represents a small share of the total maintenance cost of the existing roadway system. Those costs grow substantially when general roadway maintenance and repair is added. Roadway pavement condition across the metropolitan planning area were determined using the latest available Highway Performance Monitoring System (HPMS) data submitted by Tennessee DOT to the Federal Highway Administration (FHWA). 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. HPMS data is sample data, collected across the entire Federal-aid eligible system, for interstate, arterial and collector networks.

Pavement condition is reported as percent of lane miles in good/fair/poor condition based on the International Roughness Index (IRI). Pavement condition, based on IRI, is classified to be in Good condition if the segment IRI is less than 95, Fair condition if IRI is between 95 and 170, and Poor condition if IRI is greater than 170. Of the 7,505 lane-miles in the Federal-aid network, 52 percent are in good condition, 30 percent are in fair condition, and 18 percent are in poor condition, for a total of 82 percent of the system in good/fair condition.

Future pavement condition was forecast using FHWA's state version of the Highway Economic Requirements System (HERS) software. HERS is a computer model used to estimate investment requirements for pavement

preservation and system expansion, and to evaluate alternative highway investment levels based on performance objectives. HERS is designed to minimize maintenance costs by generating an optimal set of preservation actions based on life-cycle user and agency costs, and engineering standards of maintenance needs.

Similar to bridge performance targets, the FAST Act requires all State DOTs to establish the following performance targets for pavement condition.

- Percent of Interstate pavements in good condition
- Percent of Interstate pavements in poor condition
- Percent of Non-Interstate NHS pavements in good condition
- Percent of Non-Interstate NHS pavements in poor condition

The current state targets of Interstate pavement are 60% in good condition and 1% in poor condition. For Non-Interstate NHS pavements, the targets are 40% in good condition and 4% in poor condition. The seven-county MPO region currently exceeds these targets as 97% of Interstates are in good condition and 0% of them are in poor condition. Similarly, 69% of Non-Interstates are in good condition and only 3% of them are in poor condition. In order to maintain the existing condition of Interstates over the horizon of the RTP, it will take an average investment level of $41 million per year, or approximately $1.1 Billion over the life of the plan in terms of today's dollars. In order to maintain the existing condition of Non-Interstate NHS through 2045, an average investment level of $180 million per year, or approximately $5.4 Billion over the life of the plan in terms of today's dollars is needed.

Figure 5-3. Funding Needs for Maintenance of Roadways

Highway System**	Approximate Lane Miles	Percent in Good Condition	Annual Funding Need for Maintenance	25-Year Cumulative Funding Needed for Maintenance
U.S. Interstate System	1,200	97%	$41 Million	$1.1 Billion
National Highway System	1,600	69%	$180 Million	$5.4 Billion
State Route System	5,700	61%	N/A	N/A
Entire Federal-Aid Network	7,500	52%	$420 Million	$12 Billion

*Source: FHWA HERS-ST analysis by Cambridge Systematics for MPO. **Highway systems are not mutually exclusive, Interstates and several state routes are also on the NHS. Funding needs shown in 2018 dollars.*

In addition to the growth and improvements of the transportation network, the MPO and its members must also ensure the maintenance and efficient operation of the existing roadway and public transit infrastructure. Maintenance activities are those that occur primarily in reaction to situations that have an immediate or imminent adverse impact on the safety or availability of transportation facilities such as pavement resurfacing and markings, bridge repair, guardrail and sign replacement and traffic signal maintenance. Operations may include more routine items such as painting and right of way maintenance. The following figure presents the estimated costs incurred by each MPO jurisdictions involved in the operations and maintenance of transportation infrastructure over the life of the TIP and plan.

Figure 5-4. Operations and Maintenance Cost (in millions)

Jurisdiction/ Agency	Annual Funding	Short-Term 2021-2025	Mid-Term 2026-2035	Long-Term 2036-2045	Cumulative 2021-2045
Roadways and Bridges	**$ 90.8**	**$ 453.9**	**$ 908.0**	**$ 908.0**	**$ 1,805.6**
Brentwood	$ 2.1	$ 10.8	$ 21.6	$ 21.6	$ 54.0
Columbia	$ 0.9	$ 4.5	$ 8.9	$ 8.9	$ 22.3
Fairview	$ 0.2	$ 1.1	$ 2.2	$ 2.2	$ 5.6
Franklin	$ 2.6	$ 12.9	$ 25.8	$ 25.8	$ 64.5
Gallatin	$ 0.9	$ 4.6	$ 9.2	$ 9.2	$ 23.0
Goodlettsville	$ 0.5	$ 2.7	$ 5.3	$ 5.3	$ 13.2
Greenbrier	$ 0.3	$ 1.6	$ 3.3	$ 3.3	$ 8.2
Hendersonville	$ 1.5	$ 7.3	$ 14.7	$ 14.7	$ 36.6
La Vergne	$ 1.0	$ 4.9	$ 9.8	$ 9.8	$ 24.5
Lebanon	$ 0.7	$ 3.7	$ 7.4	$ 7.4	$ 18.5
Maury County	$ 5.7	$ 28.6	$ 57.1	$ 57.1	$ 142.8
Metro Nashville-Davidson County	$ 28.5	$ 142.5	$ 285.0	$ 285.0	$ 712.5
Millersville	$ 0.3	$ 1.5	$ 3.0	$ 3.0	$ 7.4
Mt. Juliet	$ 1.2	$ 5.9	$ 11.8	$ 11.8	$ 29.5
Murfreesboro	$ 2.7	$ 13.3	$ 26.7	$ 26.7	$ 66.7
Nolensville	$ 0.2	$ 1.2	$ 2.3	$ 2.3	$ 5.8
Portland	$ 0.3	$ 1.5	$ 3.0	$ 3.0	$ 7.5
Robertson County	$ 3.7	$ 18.6	$ 37.2	$ 37.2	$ 93.0
Rutherford County	$ 9.0	$ 45.0	$ 90.0	$ 90.0	$ 225.0
Smyrna	$ 1.0	$ 4.9	$ 9.9	$ 9.9	$ 24.6
Spring Hill	$ 1.3	$ 6.4	$ 12.7	$ 12.7	$ 31.8
Springfield	$ 0.4	$ 1.8	$ 3.6	$ 3.6	$ 9.0
Sumner County	$ 7.2	$ 35.9	$ 71.9	$ 71.9	$ 179.6
White House	$ 0.2	$ 1.2	$ 2.4	$ 2.4	$ 5.9
Williamson County	$ 11.3	$ 56.7	$ 113.4	$ 113.4	$ 283.5
Wilson County	$ 7.0	$ 35.0	$ 70.0	$ 70.0	$ 175.0
Public Transit System	**$ 46.2**	**$ 244.4**	**$ 526.3**	**$ 526.3**	**$ 1,297.0**
Franklin Transit Authority	$ 2.0	$ 9.8	$ 19.6	$ 19.6	$ 49.0
Murfreesboro Rover	$ 1.1	$ 5.8	$ 12.6	$ 12.6	$ 31.0
Nashville MTA	$ 40.1	$ 212.9	$ 459.7	$ 459.7	$ 1,132.3
Regional Transportation Authority	$ 3.0	$ 15.9	$ 34.4	$ 34.4	$ 84.7

5.2 Funding Availability

Federal Sources of Funding

The federal government is the largest source of funding for improvements to the region's major roadway network identified in this RTP. The Federal-Aid Highway Act and the Highway Revenue Act in 1956 established the Highway Trust Fund in order to create a financing mechanism for the Interstate Highway System.

User Taxes

Generally speaking, transportation revenue comes from a motor fuels tax levied by the federal government and administered by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA). The following programs are included in the Highway Trust Fund, some as part of the Trust Fund's embedded Mass Transit Account.

Federal gas taxes are put into the Highway Trust Fund, which experts estimate will have $41 billion in revenue last fiscal year. These gasoline excise taxes are then used to pay for transportation-related infrastructure projects, as well as mass transportation costs across the U.S. Another interesting fact? The federal gas tax has not been raised since 1993 and has not been adjusted for inflation.

Type of Tax	Tax Rate	Highway Trust Fund		Leaking Underground Storage Tank Trust Fund
Taxes on Motor Fuels (1)	**Per Gallon (2)**	**Highway Account**	**Mass Transit Account**	
Gasoline	18.4 cents	15.44 cents	2.86 cents	0.1 cents
Diesel	24.4 cents	21.44 cents	2.86 cents	0.1 cents
Gasohol	18.4 cents	15.44 cents	2.86 cents	0.1 cents
Liquefied Petroleum Gas	18.3 cents	15.42 cents	2.88 cents	-
Liquefied Natural Gas	24.3 cents	21.08 cents	3.22 cents	-
M85 from Natural Gas	9.25 cents	7.72 cents	1.43 cents	0.1 cents
Compressed Natural Gas	18.3 cents	17.10 cents	1.20 cents	-
Taxes on Truck-Related Sales				
Tire Tax (1)	9.45 cents for each 10 pounds so much of the maximum rate load capacity thereof as exceeds 3,500 pounds			
Truck and Trailer Sales	12 percent of retail sale price for tractors and trucks over 33,000 pounds gross vehicle weight (GVW) and trailers over 26,000 pounds GVW			
Heavy Vehicle Use Tax	Annual tax on trucks of 55,000 or more pounds GVW equal to $100 plus $22 for each 1,000 pounds in excess of 55,000 pounds up to a maximum tax of $550.			

Sources: FHWA FAST Act Fact Sheet "Highway Trust Fund and Taxes" (FHWA, 2017). Notes: (1) Motor Fuels rate will reduce to 4.3 cents per gallon and the tire tax eliminated at the end of FY 2022 without further action from Congress; (2) Or per gallon equivalent as of February 2017

General Fund Transfers

Over recent years the call for Congress to address the nation's transportation funding crisis has continued to grow. As Congress continues to draw from the general fund to fill holes in the Federal Highway Trust Fund, cities and states are now looking inward to find funding solutions for their growing transportation needs. The current funding issues are due in part to the declining purchasing power of the federal gas tax, which has not been increased since 1993. The value of revenue from this source has fallen by more than 40 percent due to inflation and is compounded by drivers buying less gas as fuel efficiency standards for cars and trucks has significantly improved. By 2025, the

average car will achieve 54.5 miles per gallon, nearly double that of today's cars – saving consumers over $1.7 trillion in gas over the lifetime of a 2025 vehicle, and slashing U.S. oil consumption by 12 billion barrels. These realities are met with similar struggles at the local level, as Tennessee's state gas tax has not been increased since 1989.

Declining gas tax revenues and buying power means fewer projects, slower progress, and less benefit to communities and economies—thus forcing local governments to find other means to meet funding needs. In the State of Tennessee, TDOT has long operated under a pay-as-you-go policy which has kept the state from going into debt to build or maintain roads. However, as funding dwindles, the policy has pushed the state into a position where funds are used mainly for maintenance of existing facilities with no resources to invest in improvements or expansions to the network.

Beginning in 2008, the user taxes generated specifically for the Highway Trust Fund became insufficient to pay for the cost of the federal surface transportation program. From 2008 and 2016, Congress has transferred approximately $140 billion of general revenues from the U.S. Treasury in order to prevent a reduction in the federal contribution to growing transportation infrastructure costs. As a result of those transfers, the Highway Trust Fund is expected to meet its obligations through 2020. The Congressional Budget Office projects that the Highway Trust Fund will need an additional $161 billion to remain solvent through 2028.

In addition to making the Highway Trust Fund whole, the General Fund also contributes revenue to pay for the operations of the U.S. Dept of Transportation agency, emergency highway relief projects not accounted for in federal transportation authorizations, certain discretionary grant programs like the BUILD Grant, public transit capital investments through the FTA 5309 program, and intercity passenger rail service administered through the Federal Rail Administration.

Federal Grant Programs

The following tables presents an overview of the various funding sources available to pay for transportation projects and programs in the FAST Act. In general, the federal share of the cost of a project or program is 80 percent, requiring a 20 percent cost share, or match, from non-federal sources. Matching funds are typically provided by the agency implementing the project.

- Formula Grants: Funding for these programs are distributed to states according to mathematical formulas at the direction of U.S. Congress via the FHWA and FTA of the U.S. DOT. The specific formula varies by individual grant program, but generally include factors related to the population and transportation system. Once distributed, states have considerable discretion on how to use the funding so long as they coordinate the project selection process with local communities.
- Discretionary Grants: Funding for discretionary grant programs is usually retained by the U.S. DOT Office of the Secretary or by FHWA or FTA to be awarded to projects through a nationwide competitive process. These programs are typically aimed at large capital projects of national significance.

For certain programs, Congress requires a minimum share of each state's apportionment to be used in specific areas within the state. Federal authorizations generally use the term "suballocation" to refer to this reservation of funds. Under the FAST Act, suballocation is required for a portion of each State's apportionment to be distributed to urbanized areas to ensure that a minimum level of investment is made in these areas. The most commonly suballocated grant programs are the FHWA Surface Transportation Block Grant Program, the FHWA Transportation Alternatives Program, and the FTA 5307 Urbanized Area Transit Program.

Regardless of whether grants funds are suballocated to a specific area or made available statewide, the metropolitan planning requirements of 23 USC 134-135 related to project selection must be followed for all programs under 23 USC. For areas designated as a Transportation Management Area (TMA), such as the multi-county Nashville-Davidson Urbanized Area, all federal-aid projects must be selected from the approved

metropolitan Transportation Improvement Program (TIP) by the designated Transportation Policy Board in consultation with the State and an affected public transportation operators.

Formula-Based Grant Programs

The following tables presents an overview of the various funding sources available to pay for transportation projects and programs in the FAST Act. In general, the federal share of the cost of a project or program is 80 percent, requiring a 20 percent cost share, or match, from non-federal sources. Matching funds are typically provided by the agency implementing the project.

National Highway Performance Program (NHPP)	The NHPP provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and to ensure that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a State's asset management plan for the NHS. (23 USC 119)
Surface Transportation Block Grant Program (STBG)	The STBG program provides flexible funding that may be used by States and local agencies for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals. (23 USC 133)
Highway Safety Improvement Program (HSIP)	The HSIP is intended to help achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. (23 USC 130 and 148)
Congestion Mitigation Air Quality Program (CMAQ)	The CMAQ program provides a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas). (23 USC 149)
Transportation Alternatives Program (TAP)	The TAP provides for a variety of alternative transportation projects, including many that were previously eligible activities under separately funded programs. The TAP replaces the funding from pre-MAP-21 programs including Transportation Enhancements, Recreational Trails, and Safe Routes to School, wrapping them into a single funding source. (23 USC 101, 206, 213)
Urbanized Area Transit Program (FTA 5307)	The FTA 5307 program provides grants to urbanized areas (UZAs) for public transportation capital, planning, and limited operating assistance. The program serves as the core investment in the enhancement and revitalization of transit systems in the nation's urbanized areas which depend on public transportation to improve mobility and manage congestion.
Enhanced Mobility of Seniors and the Disabled Program (FTA 5310)	The FTA 5310 program provides funding for the purpose of assisting transit agencies and private nonprofit groups in meeting the transportation needs of older adults and people with disabilities when the transportation service provided is unavailable, insufficient, or inappropriate to meeting these needs. The program aims to improve mobility for seniors and individuals with disabilities by removing barriers to transportation service and expanding transportation mobility options. Eligible projects include both "traditional" capital investment and "nontraditional" investment beyond the Americans with Disabilities Act (ADA) complementary paratransit services.

Rural Area Transit Program (FTA 5311)	The FTA 5311 program provides capital, planning, and operating assistance to states to support public transportation in rural or small urban with populations of less than 50,000, where many residents often rely on public transit to reach their destinations.
State of Good Repair Program (FTA 5337)	The FTA 5337 program provides capital assistance for maintenance, replacement, and rehabilitation projects of high-intensity fixed guideway and bus systems to help transit agencies maintain assets in a state of good repair. Additionally, SGR grants are eligible for developing and implementing Transit Asset Management plans.
Transportation Alternatives Program (TAP) Buses and Bus Facilities (FTA 5339)	The FTA 5339 program provides capital funding to replace, rehabilitate and purchase buses and related equipment and to construct bus-related facilities including technological changes or innovations to modify low or no emission vehicles or facilities. A sub-program, the Low- or No-Emission Vehicle Program, provides competitive grants for bus and bus facility projects that support low and zero-emission vehicles.

Competitive or Discretionary Grants

Funding for discretionary grant programs is usually retained by the U.S. DOT Office of the Secretary or by FHWA or FTA to be awarded to projects through a nationwide competitive process. These programs are typically aimed at large capital projects of national significance.

Better Utilizing Investments to Leverage Development (BUILD)	The BUILD discretionary grant program provides a unique opportunity for the DOT to invest in road, rail, transit and port projects that promise to achieve national objectives. The program was previously known as Transportation Investment Generating Economic Recovery, or the TIGER Discretionary Grant.
Infrastructure for Rebuilding America (INFRA)	The INFRA discretionary grant program advances a grant program established in the FAST Act of 2015 to help rebuild America's aging infrastructure. INFRA utilizes selection criteria that promote projects with national and regional economic vitality goals while leveraging non-federal funding to increase the total investment by state, local, and private partners. The program also incentivizes project sponsors to pursue innovative strategies, including public-private partnerships. INFRA promotes the incorporation of innovative technology, such as broadband deployment and intelligent transportation systems, that will improve our transportation system. INFRA will also hold recipients accountable for their performance in project delivery and operations.
Capital Investment Grants Program "New Starts" (FTA 5309)	This FTA Capital Investment discretionary grant program funds transit capital investments, including heavy rail, commuter rail, light rail, streetcars and bus rapid transit. Federal transit law requires transit agencies seeking CIG funding to complete a series of steps over several years. For New Starts and Core Capacity projects, the law requires completion of two phases in advance of receipt of a construction grant agreement – Project Development and Engineering. For Small Starts projects, the law requires completion of one phase in advance of receipt of a construction grant agreement – Project Development. The law also requires projects to be rated by FTA at various points in the process according to statutory criteria evaluating project justification and local financial commitment.

State Funding

The State of Tennessee levies a motor fuels tax on top of the federal fuel tax to generate state revenues for the administration and construction of transportation projects. State transportation funds are used for matching funds for federal grant programs, ongoing maintenance and operations of the statewide transportation system, and for state-aid grant programs. In 2017, Tennessee passed the Improving Manufacturing, Public Roads, and

Opportunities for a Vibrant Economy (IMPROVE) Act that increased the gasoline, diesel, and alternative fuel tax rates over a three-year period. As a result, the state's gasoline tax rate increased from 21 cents per gallon in 2016 to 26 cents per gallon in 2019. According to the Tennessee Department of Revenue, the gas tax yielded approximately $800 million in state fiscal year 2018.

Type of Tax	Tax Rate per Gallon			
Taxes on Motor Fuels	**Prior Rate**	**FY 2018**	**FY 2019**	**FY 2020**
Gasoline	20 cents	24 cents	25 cents	26 cents
Diesel (1)	17 cents	21 cents	24 cents	27 cents
Liquefied Gas	14 cents	17 cents	19 cents	22 cents
Compressed Natural Gas	13 cents	16 cents	18 cents	21 cents
Other Taxes as of July 1, 2017				
Vehicle Registration Tax	Personal vehicles are charged a $26.50 annual registration fee; Commercial and freight vehicles are charged based on size			
Electric Vehicle Registration Tax	Electric car drivers are charged $100 registration fee in addition to the standard registration fee of $26.50			

Source: TN IMPROVE Act (Dept of Revenue, 2017). Notes: (1) The tax on dyed diesel used by commercial carriers to for transportation purposes is 17 cents per gallon

Local Funding

The State Aid program provides funds to county governments for the improvement or rehabilitation of roads on the State Aid system. The State Aid system is a network of local selected county roads that require construction, planning, or paving projects. The Roadway Data office is responsible for processing county requests for additions/deletions of qualifying roads to the State Aid System.

The process involves the submission of documents to the Roadway Data Office through a designated TDOT Region State Aid office. There is also collaboration between the State Aid Engineer and personnel from the Region Office.

The Tennessee General Assembly authorized the state to distribute a portion of the proceeds from the state gasoline fuel taxes to incorporated cities and towns for use on municipal streets. Distribution is based on a population proportionate formula. Each year MTAS estimates the per capita amount of state street funds cities will receive. The per capita amount estimated for fiscal year 2019 is $38.50.

The proceeds from these taxes are paid monthly to local governments on a per capita basis. The law permits motor vehicle fuel tax monies to be used for street-related purposes. The law further requires that these funds be accounted for separately in a special revenue fund, commonly titled the state street aid fund or gas tax fund. Cities may request permission from the state comptroller's office to account for these funds in the general fund. T.C.A. § 54-4-204. See T.C.A. § 54-4-203 for distribution of funds for premier tourist resort cities.

In addition to their share of the state gasoline and motor fuels tax revenue, municipal and county governments rely on General Fund revenue as a source of funding for operations and maintenance. Some counties have instituted a local wheel tax in addition to the State motor vehicle registration fee to build the general fund. Local jurisdictions also provide funding in full or to match federal or state funds for local transportation projects. Money for capital investments in streets and highways may also come from the sale of bonds.

Locally, the jurisdictions in the Nashville metropolitan area have alternative sources of funding authorized by the state enabling legislation to finance transportation projects. These sources of funding can include toll facilities, rail authorities, local gasoline tax, local motor vehicle taxes and road improvement districts. These sources help to generate a steady flow of funding for transportation improvements.

State Street-Aid Fund	Sections 54-4-103 and 203 of the Tennessee Code Annotated established monthly distributions of a portion of the State's fuel tax revenues to counties and incorporated cities and towns to help improve local streets. For counties, the distribution is based on area size and population. For municipalities, distribution is based on a population proportionate formula.
Property Tax	This is the chief source of local revenue. The funds are distributed to a General Fund and then appropriated for transportation purposes. These taxes are dependent on local economic conditions, although, they remain a steady and reliable source of revenue. A separate tax for transit operations and capital can be administered by voter approval.
Sales Tax	This is one of the most commonly used and the second largest source of local revenue for local jurisdictions in the state. This tax is placed on the sale of consumer goods and services, and purchases by business firms of items for business use. The tax is a function of the tax rate, use of funds and of redistribution formulas. A sales tax is generally more acceptable to citizens than other taxes since the tax is collected in small amounts that are not highly visible to consumers. Sales tax within the metropolitan planning area counties range from a low of 1.00 percent to the state maximum of 2.75 percent.
Wheel Tax	Counties are authorized under Section 5-8-102 of the Tennessee Code Annotated to impose a local motor vehicle tax to provide revenue for county purposes. Imposition of the tax requires a majority vote in public referendum of a two-thirds vote from the county legislators at two consecutive meetings. Revenue potential of the local motor vehicle tax depends on the tax rate, driver sensitivity to price, administrative costs and the number of registered vehicles. The high tax rate may encourage some motorists to register their vehicle in a county that does not have local motor vehicle tax. Administrative costs are likely to be low because local motor vehicle departments are already organized to collect state taxes and fees. A disadvantage of this tax is that the tax revenues do not have to be earmarked for transportation.
Development Impact Fees	In some cases, state law allows local governments the ability to impose fees on private developers according to a locally adopted schedule that is devised to recoup a reasonable share of the costs of necessary transportation improvements along the corridor or general area of proposed development.

Revenue Levels and Projections

Base Year Grant Revenue

The FY 2019 Federal Apportionments serve as the base year revenue levels for Regional Transportation Plan. According to the Congressional Budget Office projections (CBO, 2019), user taxes and interest income will generate approximately $44 billion for the Highway Trust Fund in 2019. Of that amount, $38 billion in deposits are expected into the Trust Fund's Highway Account, and $6 billion into the Mass Transit Account.

The following table depicts the resulting revenue levels by grant program at the national, state, and regional scale. The regional share of federal funding is based on the federally-mandated suballocation amounts for designated grants plus an assumed percentage of the state share for all other grants. The assumed regional share of statewide FHWA grants (e.g., NHPP, STBG, HSIP, RHCP, CMAQ, TAP, etc.) is 25%. The assumed regional share FTA 5310 and FTA 5339 grants is 15%. The assumed share of FTA 5311 is 10%.

Figure 5-5. Federal Apportionments, FY 2019

FY 2019 Federal Apportionments	United States	Tennessee	Region (2)
Total FHWA and FTA Programs	**57.6 B**	**$988 M**	**$260.5 M**
FHWA Formula Grant Program Totals	**$42.9 B**	**$893.0 M**	**$225.3 M**
National Highway Performance Program (NHPP)	$23.7 B	$491.8 M	$122.9 M
Surface Transportation Block Grant Program (STBG) (1)	$10.8 B	$236.38 M	$64.9 M
Highway Safety Improvement Program (HSIP)	$2.4 B	$50.9 M	$12.7 M
Railway-Highway Crossing Program (RHCP)	$240 M	$5.2 M	$1.3 M
Congestion Mitigation Air Quality Program (CMAQ)	$2.4 B	$38.3 M	$9.6 M
Transportation Alternatives Program (TAP) (1)	$850.0 M	$19.0 M	$5.2 M
Metropolitan and State Planning and Research Programs	$1.2 B	$23.1 M	$1.7 M
FTA Formula Grant Program Totals	**$10.0 B**	**$95.0 M**	**$35.2 M**
FTA 5307 Urbanized Area Transit Program (1)	$5.3 B	$52.8 M	$25.7 M
FTA 5310 Enhanced Mobility Program (1)	$278.2 M	$6.0 M	$1.1 M
FTA 5311 Rural Area Transit Program	$716.4 M	$21.2 M	$2.1 M
FTA 5337 State of Good Repair Program (1)	$2.9 B	$4.5 M	$3.0 M
FTA 5339 Buses and Bus Facilities (1)	$695.4 M	$8.7 M	$2.8 M
Metropolitan and State Planning and Research Programs	$138.4 M	$1.9 M	$0.5 M
Competitive Grant Program Totals	**$4.7 B**		
BUILD Grant Program	$900 M		
INFRA Grant Program	$900 M		
FTA 5309 Capital Investments "New Starts" Program	$2.5 B		
FTA 5339 Bus and Bus Facilities Competitive Program	$423.2 M		

Sources: U.S. Dept of Transportation FHWA, FTA. Notes: (1) Requires a mandatory minimum suballocation of funding to urbanized areas; (2) Estimated regional share based on suballocation and TDOT project distribution

Grant Revenue Projections

GNRC prepared three funding scenarios for review and comment by TDOT, transit agencies, and local governments who are represented by the Transportation Policy Board. Given the recent insolvency of the Highway Trust Fund, GNRC elected to use a 2 percent rate of growth per year over the life of the plan – a more conservative outlook than assumed in the 2040 Regional Transportation Plan adopted in February 2016. The following table presents the anticipated federal revenue by each of the formula-based grant programs based on the three revenue scenarios.

Figure 5-6. Federal Revenue Projections by Grant Program and Horizon, 2016-2040

25-Year Cumulative Forecast of Federal Grants and Matching Funds (Millions)	No Annual Growth	2 Pct Annual Growth	4.4 Pct Annual Growth
Total FHWA and FTA Programs	$8,140.50	$10,429.71	$14,315.10
FHWA Formula Grant Program Totals	$7,042.01	$ 9,022.30	$12,383.39
National Highway Performance Program (NHPP)	$3,842.04	$ 4,922.47	$ 6,756.24
Surface Transportation Block Grant Program (STBG)	$2,028.04	$ 2,598.35	$ 3,566.31
Highway Safety Improvement Program (HSIP)	$ 397.83	$ 509.71	$ 699.59
Railway-Highway Crossing Program (RHCP)	$ 40.41	$ 51.77	$ 71.06
Congestion Mitigation Air Quality Program (CMAQ)	$ 299.21	$ 383.35	$ 526.16
National Highway Freight Program	$ 221.43	$ 283.70	$ 389.38
Transportation Alternatives Program (TAP)	$ 161.16	$ 206.48	$ 283.40
Metropolitan and State Planning and Research Programs	$ 51.89	$ 66.48	$ 91.25
FTA Formula Grant Program Totals	$1,098.50	$ 1,407.41	$ 1,931.71
FTA 5307 Urbanized Area Transit Program	$ 803.13	$ 1,028.98	$ 1,412.30
FTA 5310 Enhanced Mobility Program	$ 35.21	$ 45.11	$ 61.91
FTA 5311 Rural Area Transit Program	$ 66.38	$ 85.05	$ 116.73
FTA 5337 State of Good Repair Program	$ 92.65	$ 118.71	$ 162.93
FTA 5339 Buses and Bus Facilities	$ 86.41	$ 110.70	$ 151.94
Metropolitan and State Planning and Research Programs	$ 14.72	$ 18.86	$ 25.89

Non-Federal Matching Funds

Unless otherwise note, the Federal grant programs accounted for in the plan require a 20 percent non-federal match requirement. The plan assumes that the State or TDOT will provide the required match for NHPP, statewide STBG funds, CMAQ, HSIP, statewide TA, and half of the non-federal match requirement for FTA programs. The plan assumes that local agencies will provide the required match for suballocated STBG, suballocated TA, and the other half of the non-federal match requirement for FTA programs.

5.3 Scheduled Expenditures

Federal regulations require that the Regional Transportation Plan include a fiscally constrained list of projects that can be constructed or implemented over the next 25 years with anticipated federal funding, based on current annual appropriations. There are approximately 200 individual projects scheduled for implementation throughout the life of the RTP. These improvements are scheduled in either a short-term horizon (2021-2025), a mid-term horizon (2026-2035), or a long-term horizon (2036-2045) based on funding availability. While many of these projects are needed today to address safety, traffic congestion, or economic development needs, many will have to wait years due to funding shortfalls, adding to their overall cost as inflation takes its toll.

Since the available revenue identified in Section 5.2 is insufficient to cover the full costs of identified transportation needs, GNRC developed a formal evaluation and scoring system to help determine which projects should be prioritized for the limited funding available from the federal government. The scoring system is based on both federally-defined planning guidance and local input and includes a comprehensive set of factors that were determined to provide the best approach, given the available data, to evaluate projects for their consistency with the guiding principles, regional goals, and major objectives described in Chapter 4. Appendix C includes a comprehensive list of evaluation criteria, project scoring weights, and an example of a project information sheet which was compiled to show relevant data and information for each project being considered for funding.

Programmatic Investments

The following figure provides a summary of the programmatic investments contained within the RTP, meaning that funding has been identified for a specific objective, but that individual projects will be selected at a later time – usually as part of the development of the region's short-range Transportation Improvement Program (TIP), or as scheduled by TDOT. The use of programmatic funding in the Plan is consistent with Title 23, Part 450.324(f) of the Code of Federal Regulations which allow the grouping of projects by function, work type, or geography in cases where projects are not an appropriate scale for individual identification.

Figure 5-7. Summary of Programmatic Investments

Program	Description	2021-2045 Federal Funding
Highway Repair and Maintenance	Highway Repair and Maintenance is carried out annually across the state through portions of the National Highway Performance Program (NHPP) Grouping and the Surface Transportation Block Grant Program (STBG) Grouping. The NHPP Grouping is primarily dedicated to the replacement or rehabilitation of bridges and resurfacing, restoring, and rehabilitating of U.S. Interstates. The STBG Grouping is generally allocated to rehabilitation, resurfacing, restoration, preservation, and operational improvements on Federal-aid highways, bridge and tunnel improvements on public roads, and traffic operations and, safety improvements on public roads.	***$254 Million***
Regional Transit and Technology Program	The Transit and Technology Program was first established by the Transportation Policy Board in 2010 to provide additional funding to help accelerate the deployment of emerging smart mobility solutions including those aimed at improving traffic conditions and modernizing local and regional transit options. The program is funded through a minimum set-aside of the region's suballocation of the federal Surface Transportation Block Grant (STBG) program.	***$125 Million***

Regional Active Transportation Program	The Active Transportation Program was first established by the Transportation Policy Board in 2010 to provide additional funding to local governments and transit agencies seeking to improve walking and bicycling conditions across the region. The program is funded through the region's share of the federal Transportation Alternatives (TA) grant program and a minimum set-aside of the region's suballocation of the federal Surface Transportation Block Grant (STBG) program. The program is coordinated with the GNRC's Bicycle and Pedestrian Advisory Committee whose members help evaluate projects for funding.	***$105 Million***
Congestion Mitigation Air Quality (CMAQ)	The CMAQ program was designed to assist non-attainment and maintenance areas in attaining the National Ambient Air Quality Standards for ozone, carbon monoxide (CO), and particulate matter by funding transportation projects and programs that will improve air quality by reducing transportation related emissions. Unless otherwise noted, the CMAQ program will be administered by TDOT.	***$307 Million***
Statewide Transportation Alternatives (TA)	In addition to the Transportation Alternatives funding provided through the GNRC Active Transportation program, TDOT will administer a statewide program aimed at improving walking and bicycling conditions in urban and rural parts of the state.	***$123 Million***
Highway Safety Improvement Program (HSIP)	This program is targeted at safety projects and programs across the State of Tennessee. TDOT administers the program through a data-driven process that maximizes opportunities to reduce traffic fatalities and serious injuries on public roadways	***$408 Million***
Urban Area Transit Program	The Federal Transit Administration (FTA) Urban Area Transit Program is intended to provide planning, capital, and operating assistance to public transportation providers in urbanized areas. Funds are administered by area transit agencies in coordination with GNRC.	***$823 Million***
Rural Area Transit Program	This FTA program is administered by TDOT and is intended to provide planning, capital, and operating assistance to public transportation providers in rural areas.	***$68 Million***
Bus and Bus Facilities Program	This FTA program is intended to provide funding for the acquisition and rehabilitation of vehicles and the construction of transit-related facilities for customer service, administration, or fleet maintenance. Funds are administered by area transit agencies in coordination with GNRC.	***$89 Million***
Transit State of Good Repair Program	This FTA program is administered by area transit agencies to help maintain dedicated/fixed-guideways used for rail and bus rapid transit service.	***$95 Million***
Enhanced Mobility for Seniors/ADA	This FTA program is intended to help expand transportation options for the elderly and individuals with disabilities. Funds are administered by area transit agencies in coordination with GNRC.	***$36 Million***

Itemized Projects Identified for Funding

The 2045 RTP invests approximately $8 Billion federal transportation funds over the next 25 years into specific projects that have been identified in Appendix B. The Plan invests approximately $8.2 Billion to address maintenance needs and maintain a state of good repair. These projects represent about 63% of total projects in the plan and consist of roadway reconstruction, roadway maintenance, bridge repair and replacement, sidewalk repair, roadway realignment, and interchange modification.

Investments in safety improvements total $7.2 Billion and represent nearly three quarters (72%) of all projects. Out of these projects, more than three fourths (76%) of them implement safety improvements at high crash areas within the region. These improvements include sidewalk repair, pedestrian signage/signalization, non-motorized facilities, roadway realignment, greenways, and intersection improvements. Investments in congestion improvements total $8.9 Billion and represent about 82% of all projects. Out of these projects, nearly 60 percent (59%) of them attempt to address moderately to severely congested areas by implementing at least one of the CMP strategies (operational improvements, shift to alternative modes, and increased roadway capacity).

Figure 5-8. Summary of Itemized Projects by Improvement Type

Improvement Type	Amount Scheduled	Number of Projects	Percent of Projects
State of Good Repair	$8.2 Billion	78	63%
Roadway Safety	$7.2 Billion	89	72%
Congestion Management	$8.9 Billion	102	82%
Economic Opportunity	$6.6 Billion	43	34%

Categories are not mutually exclusive and cannot be summed to a total.

Cost Estimates and Accounting for Inflation

Project cost estimates were provided by the project applicant and/or implementing agency. For cost estimates that were identified as "rough planning estimates," GNRC verified and/or adjusted costs using best available information and/or with a cost estimation tool derived from TDOT project cost methodology.

Unless otherwise noted, all project costs reported in the plan are estimated for the expected year of expenditure, meaning that cost estimates include an adjustment to account the annual inflation of prices. For the short-term (2021-2025) planning horizon, project cost estimates submitted by sponsoring agencies were adjusted to the expected program year based on best available information. For the mid-term (2026-2035), and long-term (2036-2045) planning horizons, project cost estimates are inflated by 4 percent per year up to the mid-point of that horizon, or to the year 2030 and 2040, respectively for the mid- and long-term horizons. All inflationary adjustments were developed in cooperation with TDOT and local transit agencies.

Revenue and Expenditures by Planning Horizon

In all, more than $10.5 billion in projects have been identified as part of the cost-feasible plan. The financial tables included in this section compare the estimated federal share of revenues and identified project expenditures for each of the plan's horizon years. Though the financial tables may indicate a surplus of funding for some grant programs, the reality is that region's needs for transportation dollars far outpace the available revenues. Any appearance of a surplus exists as a result of the nature of grant programs that seek to identify projects as the funding is appropriated. Such projects must be consistent with the goals and objectives of the regional plan and are typically exempt from air quality conformity analysis.

Figure 5-9. Cumulative Balance of Federal Grant Programs through 2045

25-Year Cumulative Forecast of Federal Grants (Federal Share in Millions)	Cumulative Revenue*	Scheduled Expenditures	Remaining Balance
Total FHWA and FTA Programs	$8,479.58	$8,461.60	$17.98
FHWA Formula Grant Program Totals	**$7,353.66**	**$7,335.68**	**$17.98**
National Highway Performance Program (NHPP)	$3,937.97	$3,930.33	$7.64
Surface Transportation Block Grant Program (STBG)**	$2,214.49	$2,204.15	$10.34
Highway Safety Improvement Program (HSIP)	$407.77	$407.77	$0.00
Railway-Highway Crossing Program (RHCP)	$41.42	$41.42	$0.00
Congestion Mitigation Air Quality Program (CMAQ)	$306.68	$306.68	$0.00
National Highway Freight Program	$226.96	$226.96	$0.00
Transportation Alternatives Program (TAP)	$165.18	$165.18	$0.00
Metropolitan and State Planning and Research Programs	$53.19	$53.19	$0.00
FTA Formula Grant Program Totals	**$1,125.92**	**$1,125.92**	**$0.00**
FTA 5307 Urbanized Area Transit Program	$823.18	$823.18	$0.00
FTA 5310 Enhanced Mobility Program	$36.08	$36.08	$0.00
FTA 5311 Rural Area Transit Program	$68.04	$68.04	$0.00
FTA 5337 State of Good Repair Program	$94.97	$94.97	$0.00
FTA 5339 Buses and Bus Facilities	$88.56	$88.56	$0.00
Metropolitan and State Planning and Research Programs	$15.09	$15.09	$0.00

**The total cumulative revenue included in the plan is $10.56 Billion when matching funds are combined with the federal share. **Includes 135.81 million in unobligated funds apportioned before 2021.*

Unfunded Needs

There are another 100 projects submitted by local jurisdictions that cannot be implemented at current levels of funding during the 25-year span. In order to speed up project delivery and to address more of our transportation challenges, legislators at all levels of government should consider the following options for plugging the gap between revenue and costs. The existing federal and state gasoline tax rates have not been adjusted in more than 20 years.

Indexing Gasoline Tax to Inflation or Conversion to Sales Tax	One of the fundamental flaws of the gasoline tax is that it is currently levied at a static per gallon rate. Since the amount of revenue generated does not increase with the price of gasoline, the tax is not able to sustain its value over the long-term due to inflation. One solution could be to index the per gallon rate to inflation so that it automatically increases over time, or to convert all or portions of the tax to a sales tax. This option would likely require a "floor" and a "ceiling" to protect transportation revenue should gasoline prices drop below current levels, and the consumer should prices grow too rapidly.
Distance-Based or Vehicle Miles Travelled Tax	Taxing gasoline will not be a viable option as hybrid and electric vehicles grow in market share. Instead of relying on fuel consumption to generate revenue, a distance-based tax would make it possible for users to pay for their amount of travel. This type of fee could be calculated using existing technology including odometers. With Global Positioning System (GPS) technology, the rate could vary by route, time-of-day, or congestion levels. This type of "congestion" pricing has been shown in other metro areas to help manage traffic levels on roadways.

Tolling & Congestion Pricing	Some states and regional authorities charge tolls on roadways that help generate revenue for maintenance, and in some cases to pay for construction. Tolling typically is used on new roadways, but can also be implemented along existing routes with the most common application being the conversion of HOV lanes to toll lanes.
Special Assessment Districts	Special Assessment Districts are designated areas within which commercial and residential property is assessed a charge sufficient to defray the costs of capital improvements that benefit the property within the district. Transportation Development Districts (TDDs) are one example of these districts used to finance transportation improvements. The TDD has the power to issue bonds to pay for construction that can benefit the area instead of waiting for the local jurisdiction to fund the project. These districts work best in small, fast growing suburban areas where the tax base is low and the tax rate is high.
Local Option Gasoline Taxes	Counties, municipalities and metropolitan governments are authorized under Section 67-3-101 to 67-3-1013 of the Tennessee Code Annotated to impose a local gasoline tax to support local public transportation services. Imposition of the tax requires a majority vote in public referendum. The tax revenue depends on tax rate, driver sensitivity to price, administrative costs, population, and real travel patterns. The Tennessee Gasoline Tax is 21.4 cents per gallon. That yields approximately $642.3 million per year of which TDOT collects about $380.1 million (or 12.7 cents per gallon).
Sales Tax	This is one of the most commonly used and the second largest source of local revenue for local jurisdictions in the state. This tax is placed on the sale of consumer goods and services, and purchases by business firms of items for business use. The tax is a function of the tax rate, use of funds and of redistribution formulas. Sales tax within the metropolitan area counties ranges from a low of 1.00 percent to the state maximum of 2.75 percent.
Wheel Tax	Counties are authorized under Section 5-8-102 of the Tennessee Code Annotated to impose a local motor vehicle tax to provide revenue for county purposes. Imposition of the tax requires a majority vote in public referendum of a two-thirds vote from the county legislators at two consecutive meetings. Revenue potential of the local motor vehicle tax depends on the tax rate, driver sensitivity to price, administrative costs and the number of registered vehicles. A disadvantage of this tax is that the tax revenues do not have to be earmarked for transportation.
Impact and Utility Fees	This one-time fee is imposed by local governments on new developments to help pay for the capital facilities, mainly extending utilities and putting in traffic enhancements and transit facilities that serve it. A fee is typically assessed on a square footage of the planned development and in some cases the granting of a building permit is made contingent on payment of the fee. To implement this impact fee, it must be demonstrated that 1) improvements are necessary and are caused by the new development, 2) each developer is being charged a fair share of the cost of the improvements, and 3) funds to be collected are being used in close proximity to the new development and for the intended purposes only. These fees are enacted by the local ordinance and are usually favorable because the new development is creating these development needs. The upper limit on impact fees is around 3 percent of project value, however, enforcing and administrating this fee is burdensome to the local government.
Bond Financing	Bond financing helps local government pay for projects by establishing a type of payment plan that allows capital costs to be spread out over a number of years.
Public Private Partnerships	Public-private partnerships are cooperative agreements between the public and private sectors in which the private sector has the option to share in the design, delivery, operation, or maintenance of certain transportation projects. These partnerships allow the public sector to transfer some risk to the private sector and also allows the private sector to share in the proposed revenue or other incentive. There are many forms of public-private partnerships ranging from simple design-build contracts, where the public sector hires a single contractor to design and build a facility, to the most complex partnership, like a

	Design/Build/Finance/Operate, where the public sector privatizes nearly every aspect associated with a transportation facility to the highest bidding and/or most qualified private company.
Other Taxes	Other taxes that can be used to generate revenue include payroll tax, income tax, severance tax, driver's license fees, and a parking tax. The payroll, income, and parking tax are used in relatively few states but can offer a small additional revenue source. The severance tax can be imposed on resources extracting industries such as oil, gas, coal, or other natural products. This tax is used to help pay for the cost of providing roads to these industries. The driver's license fee has limited revenue potential, but it does offer a stable source of money.

6.0 Implementation & Monitoring

6.1 Ongoing Engagement and Planning

The Regional Transportation Plan represents one of the earliest stages of any major transportation project. In most cases, the RTP offers only a conceptual proposal and best estimate of costs for transportation projects, especially those identified for the mid- and long-term horizons of the plan. To assist members of the public who are interested in following a project's progress towards implementation, GNRC has identified a sponsor or lead agency for each. The implementation of transportation projects can take several years and members of the public shall be afforded the opportunity to continue to ask questions and present concerns during each stage of the process including subsequent planning efforts, preliminary engineering and design work, and environmental review.

Recommended Planning Activities

To further refine the Plan's proposed strategies for implementation, GNRC and its transportation planning partners will conduct additional studies and perform ongoing research and analysis related to congestion management, asset management, freight and goods movement, downtown mobility and parking, transportation demand management strategies, transportation revenue/ funding options, managed lanes and dynamic pricing strategies, and regional corridor management strategies. The following is a list of specific efforts being recommended for funding through the Unified Planning Work Program.

- Traffic Shed/Impact Fee Analysis – GNRC will conduct a regional traffic shed/impact fee analysis to implement recommendations from the Regional Transportation Plan by identifying transportation revenue options and growth management help local communities manage future growth and development.
- Tier 2 "Environmental Analysis" – Build off the project-level environmental analysis conducted for the 2045 RTP to identify a set of projects that would benefit from additional environmental analysis in order to support them through environmental review and permitting processes.
- Project Development Support – GNRC staff will increase its participation in the project development process and utilize its project-level staff analysis and documentation to ensure considerations for safety, congestion, environment, safety, active transportation, and equity are adequately considered through the development process.
- Ongoing Coordination with other Regional Planning Documents – Align the Regional Transportation Plan with other regional planning initiatives and products developed by GNRC including the federally required documents like the Comprehensive Economic Development Strategy and Area Plan for Aging and Disability Services, as well as products of regional interest related to environmental quality and resource conservation, solid waste management, social equity, housing affordability, and workforce development.
- Congestion Monitoring and Reporting – Continue to explore and analysis observed travel speed data to monitor congestion trends in the region. Participate in future data collection pilot for active transportation users to expand reporting capabilities of bicycle and pedestrian usage. Maintain and enhance public-facing data dashboards and online mapping tools to share congestion analysis with transportation stakeholders and members of the public.
- CMP Coordination – Continue monthly meeting among GNRC, TDOT, WeGo Public Transit, and FHWA to maintain coordination on data, needs and issues, and strategies to address congestion. Consider broadening participation to include other relevant entities critical to solving Middle Tennessee's congestion challenges.
- Ongoing Safety Planning – GNRC staff will increase its participation in Road Safety Audits (RSA) led by TDOT to identify locations with high crash frequencies, review those areas, and priority safety improvement projects to address safety needs.

6.2 Project Development and Delivery

Short-Term Scheduling and Programming

Any federally-funded transportation improvement listed in the Regional Transportation Plan is required to be programmed into the region's Transportation Improvement Program (TIP) and obligated by the federal government prior to implementation. This short-term programming requirement ensures that the metropolitan area has accounted for recently authorized federal funding levels appropriated by Congress and provides additional opportunities for the public and interested stakeholders to have input on the projects that are to be implemented over the next few years.

Programming Policies

The Transportation Policy Board has adopted the following policies to provide guidance for the development and maintenance of the regional work program, and to assist in the effective administration of federal grant funds suballocated to the metropolitan planning area.

Policy 1. Compliance with Regional Plan	For a project to be eligible for the TIP, it first must be included in the adopted regional transportation plan. Large capital projects, roadway capacity, and/or general purpose roadway projects must be individually listed or clearly part of a larger project included in the fiscally-constrained component of the plan. Certain projects seeking to improve safety, increase multi-modal opportunities, or enhance the existing transportation system may be programmed in the TIP without individual identification in the regional plan, so long as they are consistent with the established goals and objectives of the plan, are funded with revenue identified by the plan, and are included in the assumptions of the air quality conformity determination (if required).
Policy 2. Compliance with Air Quality Standards	Prior to the adoption of a TIP or the approval of any subsequent amendment or modification to the TIP, the MPO shall ensure that the collection of projects comprising the work program conform to applicable air quality standards and/ or meet state and federal air quality regulations or requirements. Such regulations or requirements may necessitate that members of the MPO submit to the MPO detailed information about any project that adds vehicular capacity to the major roadway system -- whether funded with federal grants or not.
Policy 3. Compliance with State Transportation Work Program	No TIP project may assume the receipt of state revenues or state-managed federal grant funds unless those funds are included in the state's three-year work program presented annually to the Tennessee General Assembly, or unless otherwise authorized in writing by the Tennessee Commissioner of Transportation. Valid contractual agreements between the State of Tennessee and a local grant recipient may serve as sufficient proof of the State's commitment.
Policy 4. Fiscal Constraint Limitations	The MPO shall not program in the TIP any MPO-managed federal grant funds for which funding cannot be identified, either as part of unobligated amounts appropriated by Congress in the current or previous federal fiscal years, or as part of the MPO's adopted financial forecast for the corresponding TIP year(s).
Policy 5. Illustrative Priorities	Upon adoption of the TIP and in each year thereafter, the MPO shall endorse or reaffirm its commitment to seeking resources for regional priority projects not funded by grants provided by the TIP. The endorsed list of priorities shall be used to identify next-in-line projects to receive additional funding available to the MPO, either through higher-than-expected appropriations or new federal grant programs, or from funding that is returned to the MPO general fund from any project not able to use its award. The list also shall be used to communicate the region's top priorities for other funding opportunities to TDOT, state legislators, the U.S. Congressional delegation, and other interested parties.
Policy 6. Eligibility for MPO-Managed Federal Grant Funds	At minimum, any proposed project to improve the safety, capacity, operations, or physical condition of roadways identified on the MPO's federal-aid network are eligible for MPO-managed federal grant funds. In addition, projects that improve safety or multi-modal opportunities on routes not identified on the federal-aid system (e.g., sidewalks on local roads, greenways, transit routes, etc.) also are eligible as long as they meet any applicable

	federal codes and regulations. Certain MPO-managed federal grant funds may require additional conditions be met in order to be considered eligible (e.g., CMAQ funds require an air quality benefit). In general, MPO-managed federal grant funds should be awarded to projects that serve locations contained within the geographic area of the associated grant program (e.g., urbanized area Surface Transportation Program funds), but exceptions may be granted in cases where an MPO priority project located outside of the area is shown to have benefit to the region as a whole, and where that project has no other opportunity for funding within the desired implementation schedule.
Policy 7. MPO Commitment to Projects	With the adoption of the TIP, or its subsequent amendment, the MPO formally commits to ensuring that MPO-managed federal grant funds identified for a project are provided as programmed unless such funding is not available due to changes in law or federal regulations, or if funding is not appropriated at anticipated levels, or is lost to the periodic rescission of unobligated balances. Should MPO-managed federal grant funding be removed from a project as a result of a decrease in funding levels, that project shall remain a top priority for funding once revenues are identified or restored. Any project programmed in the TIP with MPO-managed federal grant funds, which continues to meet all eligibility requirements while maintaining the proper support of the project sponsor, shall continue to be a priority for the MPO as the region develops a new TIP. Projects with federal funding already obligated shall automatically have unobligated programmed funds carried forward to the new TIP, along with the appropriate increase in funding to cover inflation (see Policy 11) unless that project is proven to have a fatal flaw, loses support from the project sponsor, or is estimated to cost more than 10% beyond previous cost estimates provided to the MPO (see Policy 12).
Policy 8. Project Sponsor Commitment to Projects	Project sponsors hold ultimate responsibility for ensuring that project information contained in the TIP is correct, that it accurately represents the scope of work being performed, and the amount of funding being requested. The sponsor is responsible for providing to the MPO an honest accounting of project details including: costs, implementation schedules, and local matching fund sources, at the time of the application for federal funds and anytime such details change, or at the request of the MPO. For a project funded with MPO-managed federal funds to remain eligible for those funds, the project's sponsor must provide proof of stated local matching funds at least 3-months prior to the beginning of the federal fiscal year for which the funds are programmed for use. Should a sponsor fail to satisfy the requirement, the project may be allowed a one-year grace period (see Policy 10).
Policy 9. Construction Funding	To facilitate the timely delivery of projects and to prevent the lapse of obligation authority provided by Congress to the state and MPO, the construction phase of projects shall not be formally programmed with MPO-managed federal grant funds until all preliminary engineering (PE) work is completed. This approach assists in the management of federal funds by providing a realistic construction cost estimate and implementation schedule, thus preventing large amounts of funding from being held up on delayed projects. In order to ensure the availability of MPO-managed federal grant funds for projects ready for construction, the MPO will reserve at least 80% of the amount of funding needed for construction on projects programmed in the TIP (which have not completed PE) as unprogrammed funds. Funding will be programmed on projects in the TIP after the completion of the PE phase on a first-come, first-serve basis as funding is made available. In order to be eligible for MPO-managed federal grant funds for a construction phase, the project sponsor must submit a construction cost estimate at the time of the MPO's call-for-projects associated with the development of a new TIP. If the project is selected for funding, the MPO's federal share of construction costs will be shown as "illustrative," until the PE phase has been completed. Should the construction cost estimate identified after the completion of PE exceed the original estimate by 10% or more, the project sponsor must find an alternative source of revenue, make a special request to the MPO Executive Board for additional funding, or compete for the additional funding as part of the MPO's next call-for-projects. In such

	competition, priority will be given to viable projects previously programmed in the TIP (see Policy 7).
Policy 10. Dormant or Inactive Projects	Project sponsors are given a one-year grace period to obligate funding on projects beyond the originally programmed year of work. Failure to do so may cause federal funds to be returned to the MPO general fund and re-programmed to the next highest eligible MPO priority as identified by the MPO's annual list of priorities (see Policy 5). Project phases which have been obligated, but have not realized any activity within a 12-month timeframe, may be subject to de-obligation and grant funds returned to the MPO general fund. Returned funds will be re-programmed to the next-highest eligible MPO priority, as identified by the MPO's annual list of priorities.
Policy 11. Inflation Adjustments	Whenever a project is deferred or carried over from one TIP to another, the MPO shall automatically increase the project award by 5% and up to 10%, unless evidence suggests that such adjustment is not necessary. Should evidence show that project cost estimates have increased by more than 10% on a project in a previous TIP, the project sponsor must compete for the additional funding. In such competition, priority will be given to viable projects previously programmed in the TIP (see Policy 7).
Policy 12. Cost Increases/ Cost Over-Runs	In cases where a project that is awarded MPO-managed federal grant funds does not have sufficient funding to fulfill the scope of the project as originally programmed, the project sponsor may be granted the flexibility to shift funding across phases and/or years (pending the availability of funding) to cover increased cost estimates for the affected phase. Should additional funding be required to implement the phase, the project sponsor will be responsible for securing that additional funding from an alternative source of revenue or compete for additional funds at the next available MPO call-for-projects. In such competition, priority will be given to viable projects previously programmed in the TIP (see Policy 7). The responsibility for any cost over-run on a project already under contract shall be determined by the prevailing contractual agreement between TDOT and the project sponsor. Such contractual agreement shall not bind the MPO to pay for cost-overruns with MPO-managed federal grant funds. The project sponsor may shift funding across phases and/or years (pending the availability of funding) to cover increased costs, however, should additional funding be required to conduct the programmed phase, the project sponsor will be responsible for securing that additional funding from an alternative source of revenue or compete for additional funds at the next available MPO call-for-projects. In such competition, priority will be given to viable projects previously programmed in the TIP (see Policy 7).
Policy 13. Changes in the Scope of Work	All changes to the scope of work for projects programmed in the TIP with MPO-managed federal grant funds must first be approved by the MPO. Projects are evaluated, scored, ranked, and prioritized, and selected based on the benefits and costs of the project as proposed at the time the TIP is developed. Any changes that significantly depart from the original scope may require that project to compete for federal funds during the next MPO call-for-projects.
Policy 14. Project Tracking	In order to facilitate the implementation of the TIP policies, the MPO will work with TDOT and project sponsors to present to MPO members, at least quarterly, a full accounting of the funds obligated for each project and any changes in the status of those projects.
Policy 15. TIP Amendment Cycles	MPO will consider amendments to the TIP on a quarterly basis. The annual schedule of amendment cycles shall be adopted by the MPO prior to the beginning of each federal fiscal year (October 1). Any project sponsor requesting an amendment not deemed to be an emergency must wait for the next amendment cycle or reimburse the MPO for the direct costs incurred to pay for the required public noticing.

Project Design and Delivery

One a project is programmed in the Transportation Improvement Program, the implementing agency will begin work on designing and delivering the proposed improvement. The project development process can take several years, and the average federally-funded roadway project in the U.S. takes about 12 years to implement once the engineering phase begins. The following steps are common to most transportation projects.

Continued Planning and Detailed Studies	The first step of any project is the planning phase. This phase is only ever completed once a project begins the engineering process. Until then, the project's need is continuously evaluated as the landscape changes. A project is first identified through a long-range planning or visioning process which identifies the general need, conceptual design, and rough cost estimate. Major investments typically also go through detailed planning studies which evaluate alternative design options and produce higher grade cost and benefit analysis.
Programming and Funding Obligation	Once a project has been identified in the Regional Transportation Plan, it must then be programmed in the Transportation Improvement Program as a way of establishing the project as a short-term funding priority. The programming of a project also authorizes it for funding from federal grants once they are appropriated by Congress. When a project is ready to move forward towards implementation, those federal funds are obligated in the federal system, which constitutes the federal government's commitment to reimburse the state or project sponsors for eligible expenses.
Preliminary Engineering	After programmed funds are obligated, most projects then proceed through an engineering process. This early work includes an environmental assessment of the various build options, and results in an initial design that is used to inform project sponsors of the right-of-way needs and construction cost estimates.
Right-of-Way Acquisition	Depending on the project, additional land, or ROW, is acquired to accommodate the project's design. ROW can be acquired through donation, market purchase, or through eminent domain. Eminent domain is an option of last resort and still requires land holders to be compensated according to prevailing market prices. If necessary, other public or private utilities are relocated during this phase.
Final Design and Construction Plans	Once ROW, utility, and environmental needs have been addressed and a final construction budget is determined, the design is finalized and construction plans are developed.
Construction or Implementation	The construction of major projects may take multiple years depending on their size and complexity. "Implementation" typically refers to the administration of projects not requiring physical changes to the landscape, including education and outreach programs, public transit services, etc.
Purchase or Acquisition	Some projects are intended to fund the procurement of transportation equipment such as public transit vehicles, or important assets like software or vendor services.
Operations & Maintenance	All transportation infrastructure will need to be operated and maintained for its useful life. This cost is typically borne by the owner or administrator of the asset, product, or service.

Figure 6-1. Typical Project Development Process and Timelines

6.3 Minimizing Disruption of Proposed Projects

Understanding the distribution of the region's natural and sociocultural resources is critical to assessing the potential threats to those resources caused by the transportation planning and project development process over an extended timeframe. The following section documents GNRC's inventory of the region's key resources and their current conditions and trends. This characterization is utilized by staff to assess how proposed transportation investments overlap with environmental assets in order to identify alternatives and potential mitigation strategies for consideration.

Environmentally Sensitive Areas

In cooperation with environmental resource agencies, GNRC has identified locations across the metropolitan planning area that are considered to be environmentally sensitive. These Environmentally Sensitive Areas, or ESAs, are intended to represent natural or sociocultural assets or resources that could be negatively impacted by a transportation project. In total, the environmental factors that comprise the ESA cover approximately 2,430 square miles, or 62%, of the 7-county metropolitan area.

The components of the ESA are categorized into of two groups depending on the anticipated impact. The first group, called "Environmental Challenges," are those features that may increase the cost or complexity to implement a transportation project. For example, a highway segment may need to cross a stream even after other alignment alternatives are considered. This stream crossing will require that the implementing agency spend additional attention to the design and engineering to avoid impacts to regulatory floodplains and existing habitat. Environmental regulators will need additional project documentation to approve the project, and construction crews will need to take additional steps to protect the environmental quality of the stream during construction.

The second group, called "Environmental Conflicts," are those features that may be directly or indirectly threatened by a proposed transportation project. For example, the same highway segment described above that crosses a stream may result in increased stormwater runoff that is discharged to the stream. That runoff could carry suspended solids that cause a negative impact on water quality within the stream. The quantity of water could also affect aquatic habitat or flood risk downstream of the project site.

In addition to Environmental Challenges and Conflicts, GNRC worked with stakeholders to identify additional environmental factors that experts view as important secondary considerations that should be taken into account as specific transportation projects move through the project development process.

Figure 6-2. List of Environmentally Sensitive Features

Environmental Asset/Resource	Environmental Challenge	Environmental Conflict	Additional Environmental Factor
Prime Agricultural Farmlands		●	
Historic Sites & Districts	●	●	●
100-Year Floodplain	●	●	
500-Year Floodplain		●	
Steep Slopes (Hillsides with a slope >15%)	●		
High Priority Habitat Areas		●	
Protected Lands & Conservation Areas	●	●	
Surface Waters & Wetlands	●	●	
Climate Resilient Lands			●
Critical Habitat			●
Rare & Endangered Species			●
Impaired & Threatened Waters			●
Scenic Rivers			●
Century Farms			●
Likely Agricultural Operations			●

Figure 6-3. Map of Environmental Sensitive Areas

The transportation project delivery process can take advantage of a number strategies to help minimize the impacts a specific project or parts of the transportation system have on natural and sociocultural resources. Avoidance strategies prevent negative environmental impacts before they happen by implementing projects in places or with features that minimize environmental conflicts or challenges. Mitigation strategies recognize that an environmental conflict may be unavoidable and therefore attempt to compensate for that impact by investing in resource conservation or restoration within the project vicinity or elsewhere in the region.

While some sort of avoidance or mitigation effort should be included in every project that has an impact on an environmentally sensitive area, it is recognized that not every project will have the same level of impact and thus different strategies should be utilized. Some projects involve major construction with considerable earth disturbance, such as new roadways and roadway widening projects. Other projects involve minor construction and minimal, if any earth disturbance, such as traffic signal, street lighting, and resurfacing projects.

In evaluating projects for potential environmental impacts, GNRC calculated the geographic overlap between a proposed project and the ESA and also identified the specific environmental factors that were implicated in the overlap. For example, a project may overlap the ESA because it crosses a river, floodplain and wetland feature. A different project may only overlap one environmental factor- for example just a floodplain or just a historic district listed on the National Register of Historic Places. For projects that overlap the ESA, GNRC identified potential opportunities the project applicant can consider that may help avoid or minimize environmental conflicts or minimize environmental challenges. In some cases, where a project scope was large or a project was expected to trigger or accelerate land use changes on nearby properties, GNRC's evaluation included a recommendation for a more thorough analysis of direct and indirect environmental impacts that may be caused by the project. Documentation of this staff analysis is provided in Appendix E.

Vulnerable Populations

GNRC is required to consider equity in transportation planning decisions. Executive Orders 12898 and 13166, the Americans with Disabilities Act (ADA), and the Civil Rights Act of 1964 prohibit discrimination based on race, color, gender, national origin, or disability and require agencies to examine and provide access to the services they offer. GNRC considered these federal regulations and guidelines as well as other populations that face physical, economic, educational, and other challenges that disproportionately affect their quality of life to identify nine traditionally under-served or vulnerable populations. The nine population groups considered in the development of the Regional Transportation Plan, include: seniors (those aged 65 years or older), racial and ethnic minorities, people with disabilities, single mother households, carless households, limited English-speaking households, families below the poverty level, and the unemployed labor force.

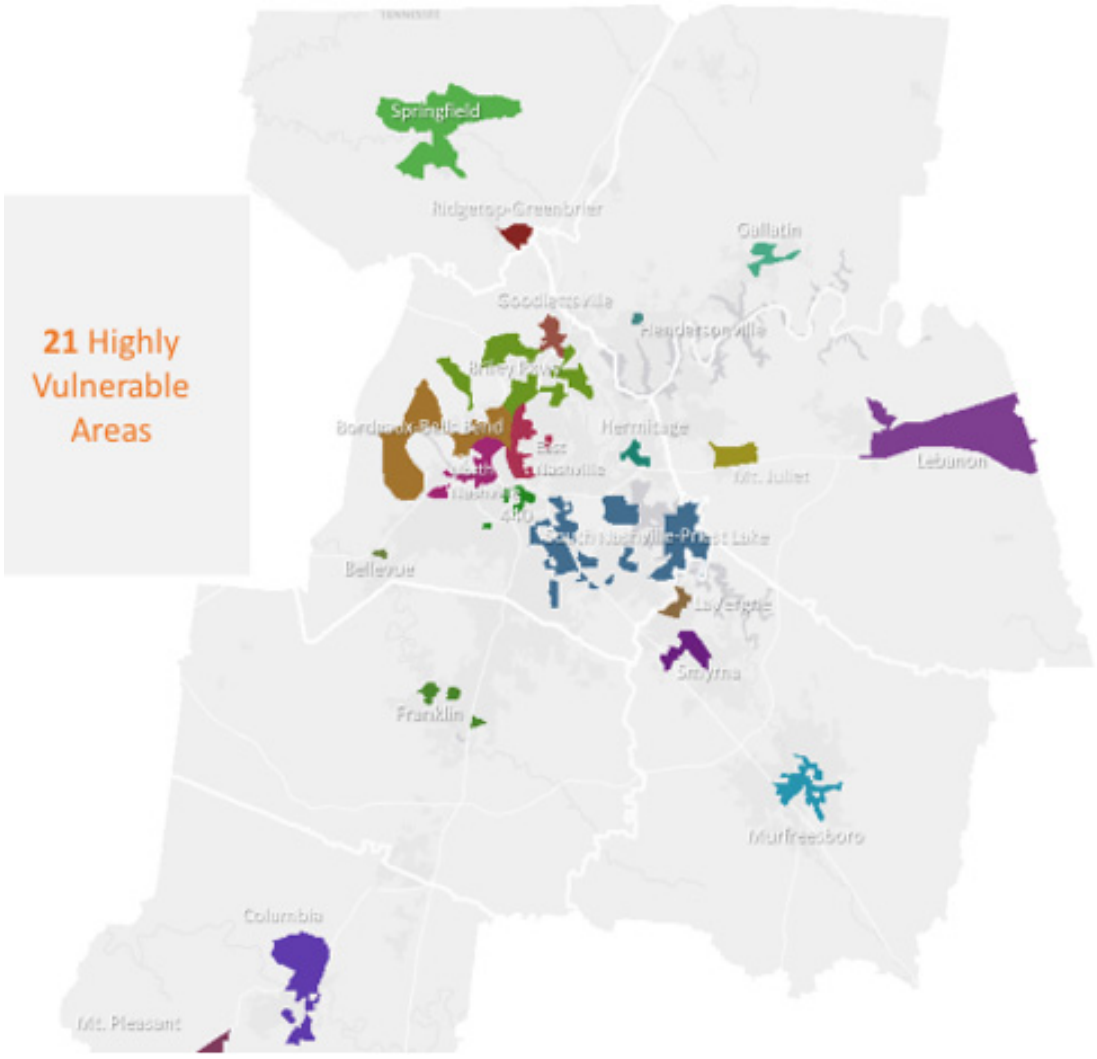
Identifying Vulnerable Populations

This following section summarizes the methods used by GNRC to identify vulnerable populations across the region. While not perfect, it does provide an indication of where transportation projects impacts could be magnified. Specifically, EJ analysis is concerned with the impacts of disparate funding and disparate services on defined minority and low-income groups. Each population group has specific planning-related challenges. Using U.S. Census Bureau's American Community Survey (ACS) 5-year estimates for 2014-2018 at the block group level, which is currently the most up to date and finest scale of demographic data available, GNRC gathered population group data across the seven counties within the metropolitan planning area. From there, the total number of persons in each demographic group is divided by the appropriate universe (either population or households) for the seven-county region, providing a regional average for that population group. Based on the analysis, GNRC further examined the vulnerable populations by degrees of vulnerability and highly vulnerable areas.

- Vulnerable Area: To determine areas where vulnerable areas are located in the region, GNRC staff identified block groups that exceed the regional average for each of the nine population groups. For example, seniors account for 12.4% of the region's population, so vulnerable areas for seniors are block groups where more than 12.4% of the block group's population are seniors.
- Degrees of Vulnerability: To determine areas where there is greater overlap of the nine vulnerable population groups, GNRC employs the Degrees of Vulnerability (DOV) index. A Degree of Vulnerability is identified for a population group if the census block group exceeds the regional average for that population group. Degrees of vulnerability can range from zero to nine, based on the number of nine population groups above the regional average within each census block group.

- **Highly Vulnerable Area:** To highlight the areas with higher degrees of vulnerability, GNRC classified block groups with six more degrees of vulnerability. Of the region's 916 block groups, 179, approximately 20%, were defined as highly vulnerable. The 179 highly vulnerable block groups were clustered into 21 Highly Vulnerable Areas (HVAs) based on their geography within the region and classified by city or neighborhood. Approximately 17% (291,953) of the region's total population resides in these areas. The map below shows the 21 HVAs and where they are located in the region.

Figure 6-4. Map of Vulnerable Communities



The maps to the left show the vulnerable areas, or block groups with a higher than average proportion of the population, in orange. The raw value of the population, or density of the population rather than proportion, is shown in the blue dots. The final map is a composite of all of the orange areas, or vulnerable areas, and shows how they rank from having zero to nine high concentrations of vulnerable populations.

A list of proposed projects that overlap with areas that contain higher than average rates of the nine vulnerable populations is provided in Appendix F.

6.4 Performance Monitoring

The 2045 RTP invests $10 Billion in federal transportation grants and matching funds over the next 25 years to make progress toward the goals and objectives outlines in the policy framework. Regional goals, described in Chapter 4, provide the framework for RTP evaluation criteria used in the process for selecting projects for funding. These criteria are utilized to identify which projects advance the region's goals. The nature of the plan is long-term, and therefore performance of the plan must be measured by how individual projects are expected to change the overall system's performance as it relates to the goals, objectives, and performance measures in the policy framework.

Annual List of Obligated Funding

Each December, GNRC publishes a complete list of all transportation projects that have had federal funds obligated during the preceding federal fiscal year. The obligation of funds is the federal government's promise to pay for all eligible expenses incurred by TDOT or the local implementing agency. Grant funds must be approved by the Transportation Policy Board and included in the RTP and TIP prior to their obligation by the federal government.

Performance Measure Tracking

Federal Performance Based Planning Requirements

Pursuant to the Moving Ahead for Progress in the 21st Century Act (MAP-21) Act enacted in 2012 and the FAST Act enacted in 2015, states and metropolitan areas must adhere to a performance management approach in carrying out their federally-required transportation planning and programming activities. The process requires the establishment and use of a coordinated performance-based approach to transportation decision-making to support national goals for the federal-aid highway and public transportation programs. As a result, State DOTs, Transit Providers, and regional transportation planning organizations are required to periodically set performance targets for achieving seven national transportation goals.

Transportation Policy Boards for metropolitan areas have three options for setting their annual performance targets:

- Option A - Concur with State DOT targets
- Option B - Establish targets for their respective metropolitan planning area
- Option C - Concur with State DOT targets and establish targets for the metropolitan planning area

While FHWA will determine whether a State DOT has met or made significant progress toward meeting these targets, it will not directly assess progress toward meeting targets at the regional level. GNRC will continue to review these performance measures and will update these targets on the required annual, two-year, and four-year cycles, following updates completed by the state.

Safety Performance Measures Targets

The final rule on safety performance measures target setting was the first of a series of rules related to target setting, effective April 14, 2016. Annual safety targets are required of state departments of transportation and metropolitan planning organizations for five performance measures, and are based on a five-year rolling average and apply to all public roads within the MPO region. GNRC is required to establish safety targets within 180 days of TDOT establishing its targets. Safety performance measures regulations in support of the Highway Safety Improvement Program (HSIP) require States and metropolitan areas to assess the following on all public roads covered by HSIP:

- Number of Fatalities: The total number of persons suffering fatal injuries in a motor vehicle crash during a calendar year.
- Rate of Fatalities: The ratio of total number of fatalities to the number of vehicle miles traveled (VMT, in 100 Million VMT) in a calendar year.

- Number of Serious Injuries: The total number of persons suffering at least one serious injury in a motor vehicle crash during a calendar year.
- Rate of Serious Injuries: The ratio of total number of serious injuries to the number of VMT (in 100 Million VMT) in a calendar year.
- Number of Non-motorized Fatalities and Non-motorized Serious Injuries: The combined total number of non-motorized fatalities and non-motorized serious injuries involving a motor vehicle during a calendar year.

On February 19, 2020, the Transportation Policy Board voted to support the state targets, thereby fulfilling the aforementioned requirements related to safety performance measure target setting established under MAP-21 and the FAST Act.

In the development of the Regional Transportation Plan, the Transportation Policy Board is pursuing regional safety targets of a one percent annual reduction in safety performance measures out to 2045. The Transportation Policy Board is scheduled to adopt regional safety targets on February 17, 2021.

Figure 6-5. Established Safety Performance Targets

PERFORMANCE MEASURES	BASELINE	TARGET
	2014-2018	2016-2020
Number of Fatalities	1,005.4	1043.4
Fatality Rate (per 100 Million VMT)	1.282	1.256
Number of Serious Injuries	6,988.4	6,352.4
Serious Injury Rate (per 100 Million VMT)	8.948	7.690
Number of Non-motorized Fatalities and Serious Injuries	498.0	527.2

Tracking Safety Progress

Safety performance measures are the critical link between the RTP project list and the safety goals and objectives outlined in the policy framework. They are also an essential tool GNRC uses to comprehensively evaluate projects, identify and prioritize meaningful solutions, and better implement and coordinate programs toward the targets set out in each of the five safety performance measures. The following strategies and tools will be used and explored by GNRC to meet the safety performance targets decided upon by the TPB.

- RTP Project Prioritization: Through the RTP process, the Transportation Policy Board weighted goals in order of importance, with improving safety for the traveling public as the region's top priority among the six main goals identified in the policy framework. A staff member was dedicated to evaluating each project based on how the project addressed safety, while also identifying opportunities to enhance each project in relation to safety. Staff also evaluated projects based on how they addressed safety specifically for non-motorized users, and recommended improvements for projects that did not address non-motorized users. These evaluations helped identify projects that were more likely to address safety performance by scoring those projects higher.
- Active Transportation Program (ATP): The Active Transportation Program targets at least 15 percent of available Surface Transportation Block Program (STBG) resources for walking, bicycling, or transit-supportive projects that may not have otherwise received funding through more traditional revenue streams. These projects are evaluated by staff and reviewed by the Bicycle and Pedestrian Advisory Committee (BPAC), particularly on how they address non-motorized safety. Through the implementation of these projects, the ATP funds improvements that will ultimately aid in meeting the TPB's established safety performance targets.

- Road Safety Audits (RSA): A Road Safety Audit is the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users. GNRC is committed to collaborating with TDOT and local governments during the Road Safety Audit process and intends to be more involved in this process going forward. Involvement in this process will help identify safety improvements that will help achieve the TPB's established safety performance targets.
- Regional Bicycle and Pedestrian Safety Action Plan: Through data analysis and collaboration with TDOT and local stakeholders, GNRC hopes to further prioritize safety improvements and programs through the development of a Regional Bicycle and Pedestrian Safety Action Plan. This process will not only identify high-crash locations, but will create a coordinated guide for planners, law enforcement, educators, and all other stakeholders to achieve a reduction in non-motorized crashes and improve safety for all users. This plan will be in coordination with existing and planned bike-ped planning efforts throughout the region, such as Metro Nashville's Vision Zero strategy, as well as existing and planned bike-ped infrastructure improvements.

Infrastructure Condition Performance Measures Targets

The final rule on pavement and bridge condition performance measures target setting was the second of a series of rules related to target setting, effective May 20, 2017. Pavement and bridge condition performance measures require States and metropolitan areas assess the following on the NHS to carry out the National Highway Performance Program (NHPP):

- Percent of Interstate Pavement in Good Condition: Pavement condition shall be calculated in accordance with the HPMS Field Manual and based on three condition ratings of Good, Fair, and Poor calculated for each pavement section. Good condition suggests no major investment is needed.
- Percent of Interstate Pavement in Poor Condition: Pavement condition shall be calculated in accordance with the HPMS Field Manual and based on three condition ratings of Good, Fair, and Poor calculated for each pavement section. Poor condition suggests major reconstruction investment is needed.
- Percent of Non-Interstate NHS Pavement in Good Condition: Pavement condition shall be calculated in accordance with the HPMS Field Manual and based on three condition ratings of Good, Fair, and Poor calculated for each pavement section. Good condition suggests no major investment is needed.
- Percent of Non-Interstate NHS Pavement in Poor Condition: Pavement condition shall be calculated in accordance with the HPMS Field Manual and based on three condition ratings of Good, Fair, and Poor calculated for each pavement section. Poor condition suggests major reconstruction investment is needed.
- Percent of NHS Bridge by Deck Area in Good Condition: Measures are based on deck area. Deck area is computed using National Bridge Inventory (NBI) data. Classification is based on NBI condition ratings for deck, superstructure, substructure, and culvert. Condition is determined by lowest rating of these. If the lowest rating is greater than or equal to 7, the bridge is classified as good.
- Percent of NHS Bridges by Deck Area in Poor Condition: Measures are based on deck area. Deck area is computed using National Bridge Inventory (NBI) data. Classification is based on NBI condition ratings for deck, superstructure, substructure, and culvert. Condition is determined by lowest rating of these. If the lowest rating is less than or equal to 4, the bridge is classified as poor.

On October 17, 2018, the Transportation Policy Board voted to support the Tennessee Department of Transportation's individual four-year infrastructure condition performance measure targets by planning and programming projects so they contribute to the accomplishment of the statewide targets, thereby fulfilling the aforementioned requirements related to infrastructure condition performance measure target setting established under MAP-21 and the FAST Act.

While FHWA will determine whether a State DOT has met or made significant progress toward meeting these targets, it will not directly assess progress toward meeting targets at the regional level. GNRC will continue to review these performance measures and will update these targets on a two-year cycle, following updates completed by the state.

Figure 6-6. Established Infrastructure Condition Targets

PERFORMANCE MEASURES	BASELINE	TDOT TARGETS	
	2017	2-Year (2020)	4-Year (2022)
Percent of NHS Bridges by Deck Area in Good Condition	39.5%	36.0%	36.0%
Percent of NHS Bridges by Deck Area in Poor Condition	3.5%	6.0%	6.0%
Percent Interstate Pavement in Good Condition	N/A	N/A	60.0%
Percent of Interstate Pavement in Poor Condition	N/A	N/A	1.0%
Percent of Non-Interstate NHS Pavement in Good Condition	N/A	42.0%	40.0%
Percent of Non-Interstate Pavement in Poor Condition	N/A	4.0%	4.0%

System Performance - Performance Measures Target-Setting

The final rule on system performance target setting was the third of a series of rules related to target setting, effective May 20, 2017. System Performance measures require State DOTs assess the following on the NHS to carry out the National Highway Performance Program (NHPP). The Nashville metropolitan area is only subject to the first three travel time reliability measures.

- *Interstate Travel Time Reliability*
- *Non-Interstate NHS travel Time Reliability*
- *Interstate Truck Travel Time Reliability*
- Total Emissions Reductions
- Annual Hours of Peak Hour Excessive Delay Per Capita
- Percent of Non-Single Occupancy Vehicle Travel

Interstate Travel Time Reliability: This is not level of congestion. This is a single number describing the predictability of travel times combined for all the Interstates. In cities that are congested people can plan for 'normal' delays, so 100% is the desired number. Lower numbers show higher unpredictability. Travel time reliability measures the extent of unexpected delay. A formal definition for travel time reliability is: the percentage of people (not vehicles) who have travel that has consistent travel times. It can be used to compare across days and across different times of day: Monday through Friday (morning peak (6-10 a.m.), midday (10 a.m.-4 p.m.) and afternoon peak (4-8 p.m.). This measure also looks at weekends (6 a.m.-8 p.m.). Data are collected in 15-minute periods between 6 a.m. and 8 p.m. local time. Using person-miles and not vehicle miles of travel takes into account the travelers on buses, and carpooling in automobiles, and trucks.

Non-Interstate NHS travel Time Reliability: This is the same measure as above, except for highways designated as part of the National Highway System that are not Interstates. Again, it is not level of congestion, is the predictability of travel time using person-miles and not vehicle miles of travel. Using person-miles instead of vehicle miles helps account for the number of people on buses, and carpooling in automobiles, and trucks.

Interstate Truck Travel Time Reliability (TTTR): Freight movement is assessed using the TTTR Index. Reporting is divided into the same periods described above, with the addition of an overnight time period. The five periods used for Truck Travel Time are Mondays through Fridays: morning peak (6-10 a.m.), midday (10 a.m.-4 p.m.); afternoon peak (4-8 p.m.); and overnights (8 p.m.-6 a.m.). Weekends (6 a.m.-8 p.m.) are measured as above. The TTTR ratio is determined by dividing the time it takes 95 percent of trucks to travel a given segment by the 'average' time (50 percent of trucks) for each segment. Specifically, the Level of Travel Time Reliability (LTTR) is the ratio of unexpectedly delayed travel (95% of the trucks travelling on a given stretch of road take less time to travel that segment) divided by the average (half the trucks travelling on that segment take less time), using approved data from FHWA's National Performance Management Research Data Set (NPMRDS) or equivalent. The TTTR Index

requires 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. The desire is a number as close to 1.0 as possible.

On October 17, 2018, the Transportation Policy Board voted to support the Tennessee Department of Transportation's individual four-year system performance targets by planning and programming projects so they contribute to the accomplishment of the overall statewide targets, thereby fulfilling the aforementioned requirements related to system performance measure target setting established under MAP-21 and the FAST Act.

While FHWA will determine whether a State DOT has met or made significant progress toward meeting these targets, it will not directly assess progress toward meeting targets at the regional level. GNRC will continue to review these performance measures and will update these targets on a two-year cycle, following updates completed by the state.

Figure 6-7. Established System Performance Targets

PERFORMANCE MEASURES	BASELINE	TDOT TARGETS	
	2017	2-Year (2020)	4-Year (2022)
Interstate Reliability	87.7%	85.3%	83.0%
Non-Interstate NHS Reliability	89.7%	N/A	87.8%
Freight Reliability	1.35	1.35	1.33

Transit Asset Management Performance Measures Targets

The final rule on Transit Asset Management, effective October 1, 2016 requires transit providers and metropolitan areas to set state of good repair (SOGR) targets by class for the following assets:

- Rolling Stock –percent of revenue vehicles exceeding the useful life benchmark (ULB)
- Equipment – percent of nonrevenue service vehicles exceeding the useful life benchmark (ULB)
- Facilities – percent of facilities rates under 3.0 on the TERM scale
- Infrastructure – percent of track segments under performance restriction

On October 17, 2018, the Transportation Policy Board voted to adopt regionally-calculated transit asset management targets, thereby fulfilling the aforementioned requirements related to transit asset management performance measure target setting established under MAP-21 and the FAST Act. GNRC will continue to review these performance measures and will update these targets on a four-year cycle.

Figure 6-8. Transit Asset Management Performance Targets

PERFORMANCE MEASURES	TARGET
Rolling Stock	25%
Equipment	50%
Facilities	25%
Infrastructure	13.5%

Congestion Management Process

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A congestion management process (CMP) is a systematic and regionally accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs.

Federal regulations (23 CFR 450.320) require that the transportation planning process carried out by GNRC across the Nashville metropolitan planning area – and all other U.S. metropolitan areas with a population exceeding 200,000 – incorporate a CMP using the following 8 steps:

1. Develop regional objectives for congestion management,
2. Define the CMP (transportation) network,
3. Develop multi-modal performance measures,
4. Collect data and monitor system performance,
5. Analyze congestion problems and needs,
6. Identify and assess strategies,
7. Program and implement strategies, and
8. Evaluate strategy effectiveness.

As the fourth step, or action, identified in the federally-required CMP, GNRC and its planning partners are committed to gathering data to monitor system performance as TDOT, transit agencies, and local governments work to manage and mitigate traffic congestion across the greater Nashville area.

Federal regulations (23 CFR 450.320(c)3) establish that the CMP include "a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources and coordinated with operations managers in the metropolitan area."

In developing and carrying-out this requirement, the federal guidance recognizes that metropolitan areas across the nation approach obtaining data for the CMP in several ways depending on a number of factors. The Federal Highway Administration does not prescribe the datasets that should incorporate into its CMP, but it offers the following as examples of common types of data used by regional planning organizations:

- Traffic volume counts,
- Speed and travel time data,
- Archived ITS and Operations data,
- Other electronic traffic datasets such as cell phone data,
- Aerial photography-based congestion data,
- Transit data,
- Bicycle and pedestrian data,
- Crash data, and
- Travel survey data.

The data collection and monitoring framework for the Nashville metropolitan area CMP is developed through a coordinated effort among GNRC, TDOT, area transit agencies, and local public works and planning departments and is driven by the performance measures established to track progress toward achieving regional objectives related to congestion management.

The Policy Guidance outlined in Chapter 4 includes six Regional Goals. Goal #3 is to "Mitigate Congestion to Keep the Region Moving," and includes the following objectives for congestion management.

- Objective 1 – Minimize travel delays
- Objective 2 – Improve corridor-level travel time reliability
- Objective 3 – Increase access to non-single occupant vehicles options
- Objective 4 – Reduce travel distances

The policy framework also identifies 64 individual performance measures. Thirty-three (33) of those are directly related to the CMP and the regional objectives for congestion management.

Figure 6-9. List of Congestion Management Performance Measures

Miles of Federal-Aid routes with bicycle facility	Roadway volume to capacity ratio
Miles of Federal-Aid routes with sidewalks	Travel speed as a percentage of expected free flow
Number of transit revenue hours	Peak hour excessive delay
Frequency of transit service (headway)	Percent of VMT on congested routes
Percent of park-n-ride lots with transit service	Percent of Freight VMT on congested routes
Vehicle miles traveled (VMT)	Vehicle hours traveled (VHT)
Roadway volumes	Interstate reliability
Percent of roadway volume classified as freight	Non-Interstate NHS reliability
Number of transit boardings and alightings at stops	Public transit service reliability (on-time)
Number of transit trips (ridership)	Freight reliability on NHS
Number of transit passenger miles	Average commute travel distance and time
Percent of commute destinations within county of residence	Pedestrian level of service
Percent of trips made by non-single occupant vehicles	Bicycle level of service
Number of employers participating in transit pass programs	Percent of households within 1/4 miles of frequent transit service
Number of employers participating in other formal TDM programs	Percent of households within 2 miles of park-n-ride lot
Number of crashes (traffic incidents)	Percent of jobs within 1/4 miles of frequent transit service
Number of crashes involving freight	

There are an increasing number of tools available to monitor performance of the system by geography, such as the system, subarea, or corridor level or by time of day, day of week, or year. GNRC has expanded its offering of tools through its Data Portal and recently launched online dashboards to provide greater access and visibility into the datasets used to monitor system performance. Some of the available tools include:

Online Geographic Information Systems (GIS) Portal

GNRC's online GIS portal includes maps and geographic files related to the Congestion Management Process including a link to congested corridors and projected traffic volumes and travel speeds. Maps can be explored at GNRC.org/Maps.

Online Data Dashboards

GNRC has recently launched online data dashboards to provide greater access and visibility into the datasets used to monitor system performance. Each can be explored at GNRC.org/Dashboards.

- Middle Tennessee Traffic Congestion, 2016-2019
- Middle Tennessee Crashes, 2015-2019
- Middle Tennessee COVID-19 Tracking (including mobility trends)
- Middle Tennessee Migration Flows
- Middle Tennessee County to County Commuter Flows

Partner Responsibilities

GNRC relies on coordination with state agencies, regional transit operators, and local governments to gather the necessary data to monitor the performance of the system. As a convener of transportation agencies and governmental jurisdictions, GNRC is well-suited to leverage data sources to ensure congestion problems are

identified and analyzed, but it is not responsible for the management and operations of the transportation system or for the implementation of upgrades and physical improvements to area roadways or transit systems.

All transportation planning partners are strongly encouraged to coordinate their plans to collect data and to be willing to share data with GNRC and other partners in the Congestion Management Process.

Planned Projects in Congested Corridors

As part of the Call-for-Projects issued by the Transportation Policy Board on October 16, 2019, approximately 350 applications were submitted by agencies through an online application and project evaluation tool located at Apply.NashvilleMPO.org. While only a subset of those projects has been selected for funding made available through this Plan, each project was evaluated to determine how the proposed improvement could help address current or future traffic congestion. The results of that analysis is provided as part of Appendix E.

6.5 Plan Revisions and Updates

Under federal law, the Regional Transportation Plan shall be updated at least every five years. As such, the next major update is scheduled to be completed by February 2026. Until then, minor revisions to the adopted RTP will be carried out in the form of amendments or administrative adjustments.

Amendments are intended to document major changes to the plan and require review by the public and state and federal partners prior to their adoption by the Transportation Policy Board. The following list contains some typical examples of revisions that would require a formal amendment:

- The addition of major roadway projects that add vehicular capacity which were not included the adopted RTP.
- The addition of a major roadway or transit project whose federal share of funding was not accounted for in the adopted RTP.
- Changes to the financial plan that are required due to significant differences in assumed revenue and actual appropriations.
- Any changes requiring a regional air quality conformity (not currently applicable).

Administrative adjustments can be used to document minor changes to the approved RTP. The following is a list of some typical changes that can be made through the adjustment process. Administrative adjustments do not require Transportation Policy Board approval but will be communicated to the Board and posted to GNRC's website along with the original or amended RTP document.

- Minor changes to project costs so long as the RTP remains fiscally constrained, nor require a formal amendment to the Transportation Improvement Program.
- Minor changes or clarification to the description of projects which do not affect air quality conformity (if applicable) or substantively impact the project's costs.
- Moving projects between horizons of the RTP as long as the plan remains fiscally-constrained and in compliance with any applicable air quality conformity requirements.
- Adjustments in revenue to match actual revenue receipts or federal, state, and local government appropriations.
- Additional text, data, or analysis that helps better communicate the goals and objectives of the RTP.
- Technical or clerical corrections that do not substantively alter the RTP's fiscal constraint or air quality conformity (if applicable).

Any future revisions to the Regional Transportation Plan will follow the procedures outlined in the most recently adopted Public Participation Plan available on GNRC's website at www.GNRC.org.