2025 – 2028
Transportation Improvement Program

Appendix B

Federal Regulations Compliance

Performance Measures - System Evaluation Report

2022 PM3 Full Performance Period Report and
Baseline Performance Period Report

Updated June 28, 2024 for the Initial 2025-2028 TIP

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FIXING AMERICA's SURFACE TRANSPORTATION ACT

Fixing America's Surface Transportation Act's (FAST Act) final planning rules for the Metropolitan Planning Process, the Transportation Improvement Program, and the Regional Transportation Plan (RTP) became effective on May 27, 2018. The FAST Act builds on the changes made by MAP-21 and includes provisions to make surface transportation more streamlined, performance-based, and multimodal. The Act also includes measures to address challenges facing the U.S. transportation system, including safety, maintaining infrastructure condition, reducing traffic congestion, improving efficiency of the system and freight movement, protecting the environment, and reducing delays in project delivery. In 2021, the Infrastructure Investment and Jobs Act (IIJA) was enacted into law and continued the requirements of previous surface transportation legislation.

The FAST Act requirements include planning factors – consideration of intercity bus connections, transit asset management, resiliency, and federally required performance targets. H-GAC adopted performance measure targets within the time constraints imposed by FHWA, utilizing the performance-based planning process. As a data clearinghouse, H-GAC will provide regional data to the Texas Department of Transportation when updates become available. The planning factors and H-GAC's compliance are identified in Table B-1.

PLANNING FACTORS

Table B-1: Federal Requirements and Planning Factors

Federal Requirement	Federal Provision	Issues Addressed in 2025-2028 TIP	Where Addressed
Public Participation	23 CFR 450.316(a)	H-GAC's Public Participation Plan (PPP) was updated in 2017 to expand the list of stakeholders to be engaged in transportation planning process.	Public Participation Plan http://www.h-gac.com/transportation-public-outreach/documents/h-gac-public-participation-plan.pdf
Memorandum of Understanding	23 CFR 40.314(h)	The Memorandum of Understanding was executed between H-GAC, TxDOT and the region's transit providers for the cooperation of development and selection of performance measures.	Memorandum of Understanding https://www.h-gac.com/getmedia/fdcaeef0-93d3-4bcc-b153-d5cc15fd9896/Memorandum-of-Understanding-for-Performance-Measures
Consultation and Cooperation	23 CFR 450.316(b)	2025-2028 TIP was developed with continued consultation and cooperation with state and local officials and takes into consideration the planning activities of other agencies and organizations within the MPO region.	• Public Participation Plan • Disaster Preparedness • Travel and Tourism
Resiliency and Reliability	23 CFR 450.206(a)(9)	2025-2028 TIP incorporates an assessment of the vulnerability of transportation assets to extreme weather events and identifies initiatives to improve resiliency and increase the reliability of the regional transportation system.	• Resiliency and Reliability

Federal Requirement	Federal Provision	Issues Addressed in 2025-2028 TIP	Where Addressed
Stormwater Impacts	23 CFR 450.306(b)(9)	2025-2028 TIP identifies roadways susceptible to impact by stormwater and includes a choice of projects and strategies aimed at mitigating these impacts.	• Resiliency and Reliability
Disaster Preparedness	23 CFR 450.316(b)	2025-2028 TIP identifies local emergency management operations serving the Houston-Galveston metropolitan region, details the designated hurricane evacuation routes and the Zip-Zone map.	• Disaster Preparedness
Travel and Tourism	23 CFR 450.306(b)(10)	2025-2028 TIP includes a review of opportunities to engage in recreational travel and tourism in the planning region and considers strategies to promote growth in this transportation sector.	• Travel and Tourism • Public Participation Plan http://www.h-gac.com/transportation-public-outreach/documents/h-gac-public-participation-plan.pdf
Intercity Buses	23 CFR 450.316(b)	2025-2028 TIP examines the existing intercity bus services in the region and identifies opportunities to expand these services and grow additional routes and operations.	• Intercity Buses
Performance Measures	23 CFR 450.326 (c)(d)	2025-2028 TIP includes the federal performance measures linked to the vision, goals, and project prioritization, establishes targets and documents the condition and performance of the transportation system.	• Performance Measures System Evaluation Report

IMPROVE RESILIENCY AND RELIABILITY

One of the FAST Act's planning factors is to improve the resiliency and reliability of the transportation system and reduce or mitigate storm water impacts on surface transportation. Resiliency is defined as: "the ability of transportation infrastructure to maintain operations and be able to recover from disasters."

It is anticipated that due to a changing climate, extreme weather events will intensify and occur with greater frequency. In response, H-GAC's ongoing resiliency planning effort proposes strategies to mitigate the effects of flooding and other extreme weather impacts and incorporates a process to provide the responsible parties with regular update reports.

In 2017, Hurricane Harvey had a major impact on transportation networks and severely disrupted the movement of people and goods across the H-GAC's Metropolitan Planning Area. All twenty-two major bayous in Houston spilled over their banks with some exceeding 10 feet above the channel banks. Other recent major flooding events have been Tropical Storm Imelda, the Tax Day Flood, Memorial Day Flood, Hurricane Ike, and Tropical Storm Allison.

Expected Impacts to Transportation Infrastructure

Due to its low-lying coastal geography and semi-tropical climate, the Houston-Galveston region is vulnerable to extreme weather events like heat, drought, tropical storms, and flooding. The risk of these extreme events impacting the region's population, economy, and transportation infrastructure is expected to heighten because of the amplification of related stressors − land use change, explosive population growth, congested transportation systems, and climate change. Transportation systems and infrastructure are particularly vulnerable to extreme weather events. With the projected rise in sea level, temperature increases, and frequency of severe storms, it is anticipated that transportation services and infrastructure will suffer more frequent disruptions or permanent damage which would seriously impede the movement of goods and people throughout the region. A summary of expected impacts is shown in Table B-2.

Table B-2: Impact of Extreme Weather Events on Transportation Infrastructure

Expected Climate & Extreme Weather Impacts to Transportation Infrastructure		
Climate Variable	**Projection**	**Impact on Transportation Infrastructure**
Relative Sea Level	Over the last century, sea level at Galveston has risen more than 26 inches, which is significantly greater than the global average. In the next 50 years, Gulf Coast sea levels are expected to rise by 1 to 6 feet.	A 4-foot increase in relative sea levels would put a quarter of the region's interstates, 10 percent of rail lines, and nearly 75 percent of port facilities at risk.
Temperature	On average, the region already experiences more than 100 days above 90 °F per year. Average temperatures could increase 2° to 4°F by 2050. Temperature increases will be most severe in highly urbanized areas due to the heat island effect.	Higher temperatures will result in higher construction and maintenance costs. At temperatures above 90°F, highways, bridges, and rail lines deteriorate more quickly. Extreme heat can cause immediate damage such as buckling.
Hurricanes and Tropical Storms	Expected to become from frequent and powerful as the Atlantic Ocean and Gulf of Mexico warm.	Associated extreme rainfall, strong winds, and coastal flooding will damage infrastructure, cause road and evacuation route closures, and overwhelm storm drains.
Precipitation	Heavy rainfall events and droughts have increased; this trend is expected to continue with longer dry periods between extreme rain events.	Heavy precipitation can result in flash floods with impacts ranging from inconveniences (temporary road closures and transit service disruptions) to permanently destroyed infrastructure. Extreme rain events are also correlated to a higher incidence or crashes and delays.
Sources: • Transit and Climate Change Adaptation: Synthesis of FTA-Funded Pilot Projects, August 2014, FTA • The Gulf Coast Study Summary, Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: The Gulf Coast Study, Phase 1 Completed in 2008, FHWA • Gulf Coast Climate Change Adaptation Pilot Study, August 2013, FTA • Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I, March 2008, The Climate Change Science Program		

Understanding the region's risk to extreme weather, in 2010, H-GAC and local partners established resiliency as a regional priority in the "Our Great Region 2040" plan and adopted increasing the region's resiliency to disaster and a changing environment as a major goal. H-GAC planning reports such as "Our Region 2040" and the "Foresight Panel on Environmental Effects" analyze the impacts of weather on the region and its transportation system.

Regional Response to Federal Resiliency Requirements

To meet federal requirements, H-GAC is incorporating resilience into its transportation planning in the following ways:

a. **Regional Resilience Transportation Improvement Plan**

In 2023, H-GAC applied for $1.1 million in funding from the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program. H-GAC was awarded the funding in 2024. This funding will be used to develop a Regional Resilience Transportation Improvement Plan.

To better equip the eight-county MPO region with implementable project and planning guidance, this project will fine-tune previously developed resilient strategies, expand on previous resiliency planning efforts, and conduct a robust local sponsor and public input process with emphasis on environmental justice principles and disadvantaged communities. The outcome of the plan will include an Implementation Workbook that includes a list of prioritized transportation resilience projects as well as a Resilient Roadways Best Practices Toolkit with local examples for future training and educational use.

H-GAC would align this plan with the requirements for Resilience Improvement Plans under 23 U.S.C. 176(e)(2)(A) as well as the MPO's 2045 Regional Transportation Plan (RTP) Update's vision for the Houston-Galveston Region: "A Safe, Resilient, Equitable, and Reliable Multimodal Transportation System that Contributes to a Livable Region."

b. **Transportation Resilience and Durability Assessment Study**

In 2018, the Houston-Galveston region was selected to participate in a Federal Highway Administration's (FHWA) Resiliency and Durability Pilot Project. As part of this project, H-GAC worked with federal, state, and local partners to conduct a vulnerability and criticality assessment of major roadways and bridges in relation to the hazards of flooding, storm surge, and sea level rise in the MPO region.

The Resilience and Durability to Extreme Weather in the H-GAC Region Pilot program Report was finalized and submitted to FHWA in January 2021. The Pilot used FHWA's Vulnerability Assessment Scoring Tool (VAST) and methodology, considering the factors of exposure, sensitivity, adaptive capacity, economic impact, and risk. To assess criticality, a group of stakeholders representing relevant agencies and groups was convened to identify links critical to first responders, emergency evacuation, hospitals, and other critical destinations. The report identified the region's most critical and vulnerable major roadways and bridges, and resiliency recommendations were developed based on the results of the vulnerability and criticality assessments in the form of 25 mitigation strategies. Results will be used to help prioritize funding decisions for future transportation projects.

More information about the Pilot Program can be found at http://www.h-gac.com/resiliency-planning. -In addition to the report, H-GAC developed an online mapping tool with data developed during the pilot study. The Regional Resilience Tool is accessible by the public to view criticality and vulnerability scores on a sliding scale, from low to high, for the eight-county region, and can be found at https://datalab.h-gac.com/resilience/.

c. **Working Group**

In 2019, H-GAC formed a transportation resiliency working group with the initial goal of developing a multi-year strategy to meet resiliency-related federal requirements and identify additional resiliency efforts that would reduce risk and improve safety in the region. Through the working group, H-GAC will host workshops, coordinate resiliency work with emergency management (preparedness and response) efforts, develop a plan to reduce and mitigate storm water impacts on surface transportation and other related community emergency responses.

d. **Texas Resiliency and Planning Workshops**

H-GAC has participated in several resiliency workshops hosted by FHWA, TxDOT, the Texas A&M Transportation Institute (TTI), and other Metropolitan Planning Organizations. The purpose of these workshops has been to exchange information, data sources, and resiliency strategies. As part of its transportation resiliency agenda, H-GAC works to foster a dialogue about mitigating vulnerability regionally.

e. **Cedar Bayou Initiative**

The Cedar Bayou Initiative is a partnership of public and private sector stakeholders in the Cedar Bayou watershed. Its purpose is to identify and pursue priority projects to improve flood management, resiliency, and transportation goals throughout the Cedar Bayou watershed and the greater Chambers, Liberty, and Harris Tri-County area. For more information about this initiative: https://www.h-gac.com/cedar-bayou-initiative. Projects identified in 2018 can be grouped into three major categories:

- Dredging and other improvements to the main channel of Cedar Bayou, its tributaries and drainage channels.
- Stormwater infrastructure, detention, and runoff quality improvement.
- Improvements to transportation infrastructure to reduce flooding and improve evacuation capacity.

f. **Designing for Impact**

H-GAC is involved in the "Designing for Impact" study which is exploring strategies to reduce the impact of stormwater on the Houston-Galveston metropolitan region's infrastructure. Working through a voluntary partnership of engineers, developers, architects, landscape architects, municipal and county representatives, the project is examining the Low Impact Development (LID) strategy as an effective and economically advantageous approach to addressing the region's stormwater containment problems.

g. **Foresight Panel on Environmental Effects Report Update**

In 2021, H-GAC updated the 2008 Foresight Panel on Environmental Effects Report to reflect findings and recommendations from the Resilience and Durability to Extreme Weather in the H-GAC Region Pilot Program Report, finalized in January 2021. Appendices A, B, and C of the Report were updated to reflect the most recent data, events, and information, such as historical climate trends, impacts to bicyclist and pedestrian infrastructure, impacts on vulnerable population, and Hurricane Harvey flooding impacts. In addition to updating the Report, H-GAC developed an online mapping tool of all scenario layers that can be accessed by the public. The data dashboard also outlines each scenario's highlights and vulnerable population impacted by each scenario.

Disaster Preparedness

H-GAC is addressing extreme weather preparedness, mitigation, and evacuation through programming and regional partnerships. H-GAC, the Texas Division of Emergency Management (DEM), and 85 local

governments collaborated to develop a comprehensive Regional Hazard Mitigation Plan[1]. The plan identifies regional hazards and vulnerabilities and includes over 300 mitigation projects that could be implemented within the Houston-Galveston metropolitan region.

The "Together Against the Weather"[2] outreach campaign was initiated to help individuals with disabilities and other special needs plan for disruptions caused by hurricanes, floods, and other weather-related emergencies. The program encourages the formation of supportive partnerships that involve family members, community organizations, health care providers, and emergency management personnel, and recommends strategies for addressing the challenges that commonly arise during periods of emergency evacuation. Together Against the Weather offers several tool kits that include educational videos presented in English, Spanish, Vietnamese, and Chinese. Links are also provided to state, county, and municipal offices of emergency management. More information is available at: http://www.togetheragainsttheweather.com/.

As a web clearinghouse, the Together Against the Weather campaign offers service providers, emergency management officials, churches, and healthcare providers with materials to help at-risk populations in the event of a major hurricane landfall. Helpful resources available through the program include preparedness information, evacuation route maps, and links to the Office of Emergency Management. A goal of preparedness for natural disasters is also found in the Comprehensive Economic Development Strategy (CEDS}[3] and emphasizes affordable approaches to reducing vulnerability such as using natural landscape for absorbing floodwaters and storm surge and making smarter decisions regarding building locations. For protecting key infrastructure assets, the recommended approach is one that carefully targets structural solutions that keep costs lower. Another supporting strategy is to assist local governments to conduct economic vulnerability assessments, encompassing vulnerability to natural disasters. Along with reducing vulnerability risk, preparedness strategies involve speeding the rate of recovery to improve safety and quality of life.

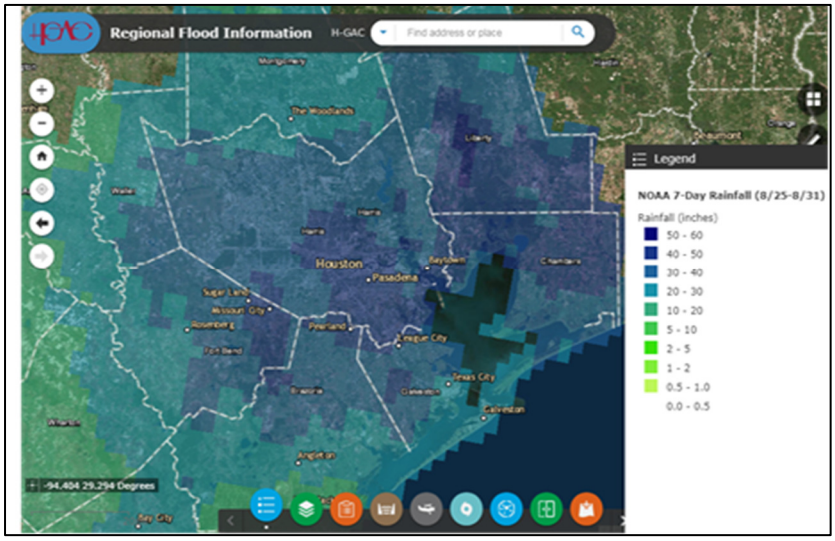

Figure B-2: 7-Day Rainfall Totals from Hurricane Harvey

H-GAC provides interactive mapping tools such as the Regional Flood Information viewer (see Fig. B-2) which portrays critical facilities including transportation, high-density areas, and vulnerable populations. H-GAC also administers the Emergency Preparedness program which promotes regional planning and response to man-made and natural disasters. The Regional Homeland Security Coordinating Council (RHSCC) assists and advises elected officials in their decision-making responsibilities on matters related to regional homeland security and emergency management. H-GAC is working closely with leadership from various counties, cities, and special purpose districts within the region to develop and update Hazard Mitigation Plans (HMP) and will continue to guide and assist HMP updates.

[1] Regional Hazard Mitigation Plan: http://www.h-gac.com/regional-hazard-mitigation-planning/
[2] Together Against Weather campaign: http://www.togetheragainsttheweather.com
[3] Comprehensive Economic Development Strategy https://www.h-gac.com/gulf-coast-economic-development-district/regional-economic-development-plan

Evacuation Plan

Evacuation routes are designated by the Texas Department of Public Safety (DPS) in coordination with local counties and municipalities. These routes are designated to evacuate the H-GAC 13 - County Regional Planning Area in the event of a natural or man-made emergency or other threats to public safety. The H-GAC Regional Planning Area has signed, state roadways designated as evacuation routes (Figure B-3). These evacuation routes are described in the Texas DPS Emergency Evacuation Traffic Management Plan. Houston TranStar serves as the regional emergency center and houses multi-agency operations that manage traffic incidents and respond to regional emergencies such as hurricanes and floods.

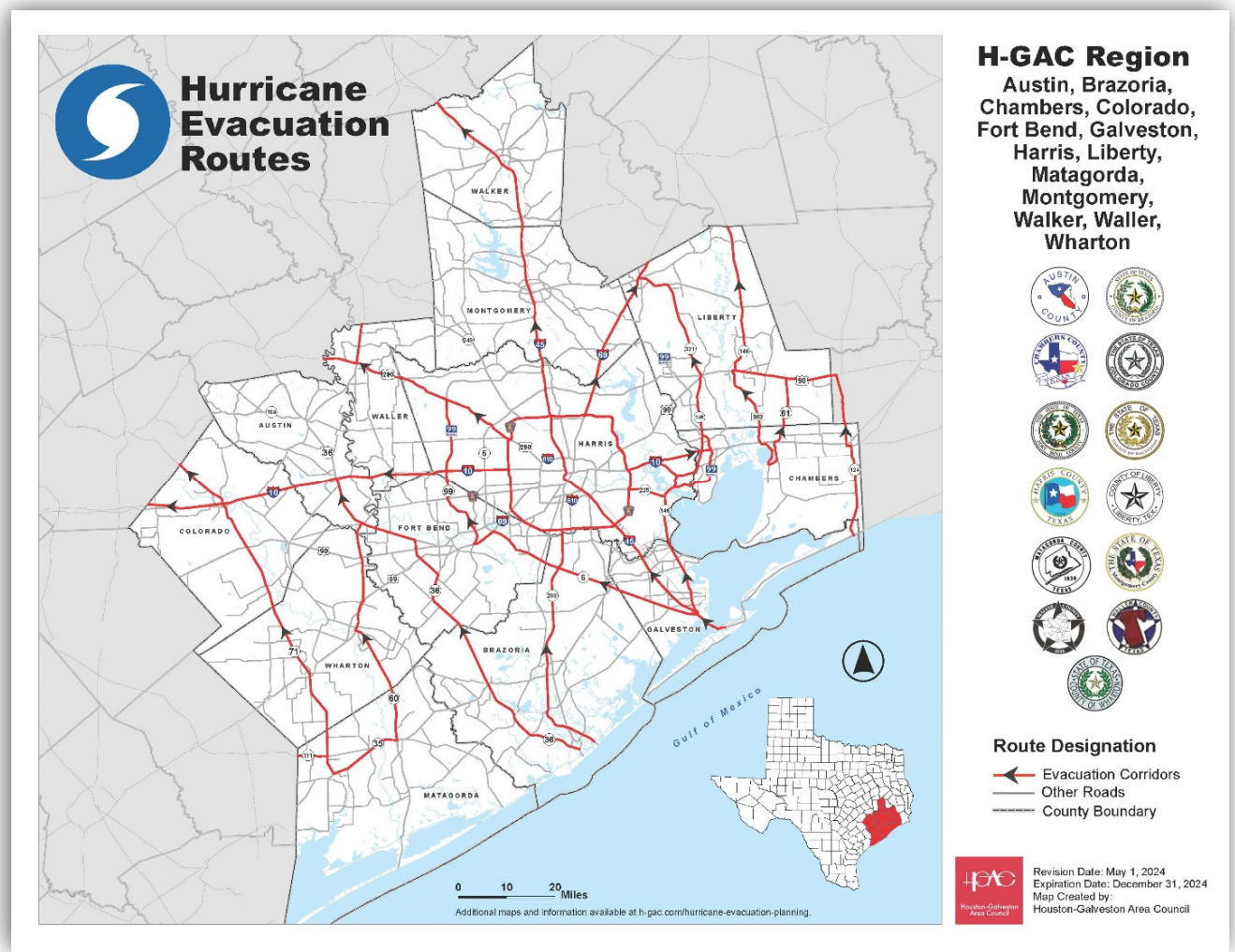

Figure B-3: H-GAC Hurricane Evacuation Routes

Hurricane Surge Zone Map

Each year, H-GAC produces a Hurricane Surge Zone Map (or "Zip-Zone Map") for distribution to the public (Figure B-4). The Zip-Zone Map is a public information tool which shows the parts of the H-GAC planning region that are most at risk for hurricane-related storm surges over a base map of postal zip codes. The Hurricane Surge Zone Map is super-imposed with the officially designated evacuation corridors and evacuation connections. Designation as an evacuation route is one criterion used in the H-GAC Regional Transportation Plan (RTP) for prioritizing capital improvement projects. It is a critical safety issue that regional evacuation routes are in good shape and have adequate capacity to handle the high levels of traffic that often ensue in a regional emergency.

The Zip-Zone map will typically be used by elected officials and emergency management personnel to conduct a phased evacuation of coastal counties based on the zip codes of the residents.

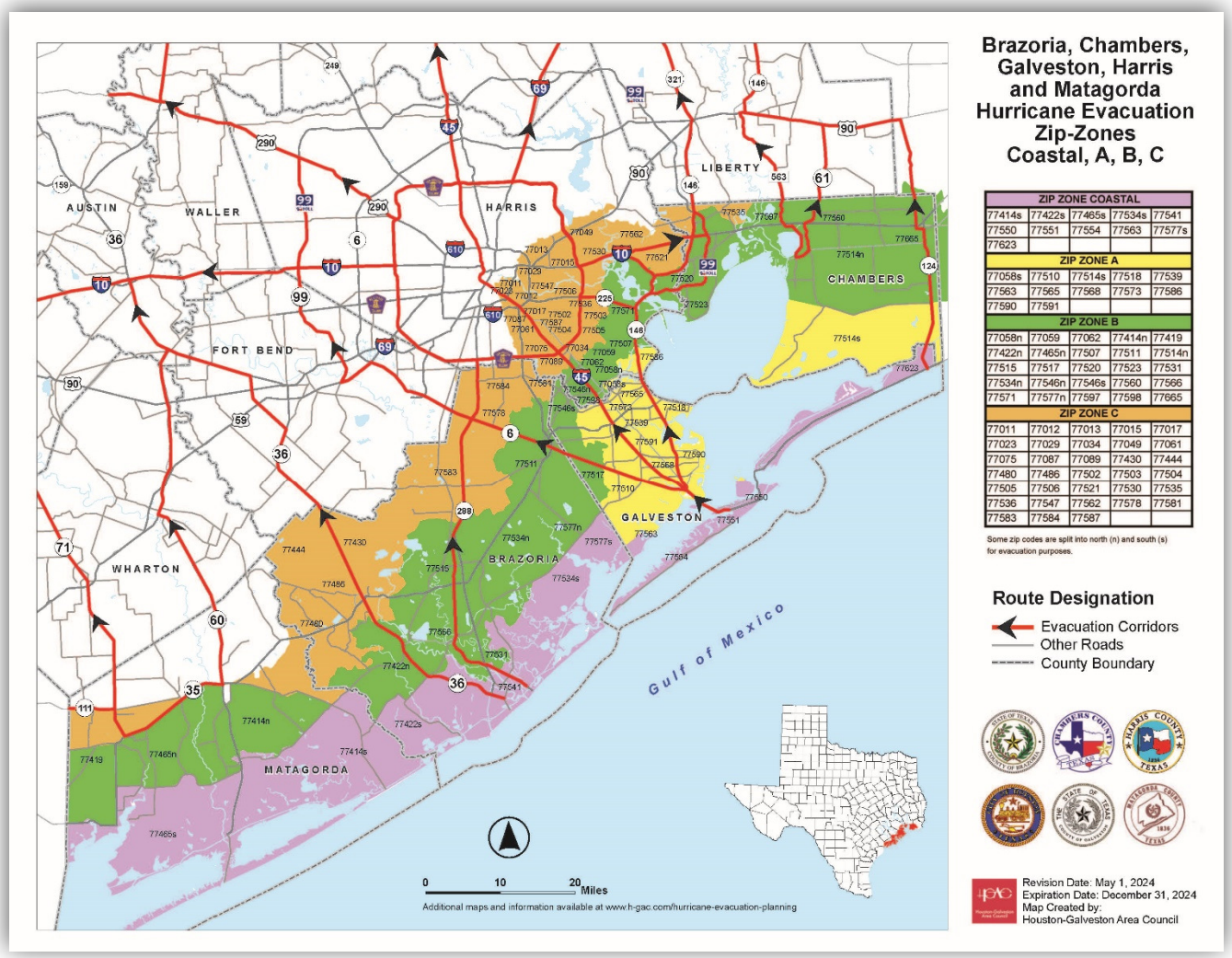

Figure B-4: H-GAC Hurricane Evacuation Zip Zone Map

ENHANCE TRAVEL AND TOURISM

The regional transportation network is an integral component of the tourism industry. The H-GAC MPO participated in a consortium to develop the "Our Great Region 2040" plan, consisting of a 24-member partnership who comprised a coordinating committee, government advisory committee, members of the public, local leaders and regional workgroups. Transportation strategies related to travel and tourism that emerged from the study include[4]:

- Optimize existing transportation network through a FIX IT First strategy and by using technology and improved incident management to maximize system capacity.
- Create a regional framework for expanding transit across the Region.
- Develop and implement policies to improve transit, pedestrian, and bicycle access between and within activity centers, connecting residents to job centers.
- Include economic, safety, and quality of life costs and benefits of transportation projects in funding prioritizations.

Travel and tourism is a growing industry in the Houston-Galveston metropolitan region and produces a large infusion of money to the local economy while providing for hundreds of jobs. The Houston-The Woodlands-Sugarland metropolitan statistical area attracts 18.3 million vistors annually and generates up to $1.1 billion in local and sales tax revenue. Local attractions include the museums, visual and performance arts, community festivals, sports (including special events such as the super bowl, final four, professional golf association tournaments, college and professional football, baseball and basketball), and world renown cuisine. Other local attractions include the Kemah Boardwalk, the Houston Livestock Show and Rodeo, Houston Zoo, Brazoria National Wildlife Refuge, George R. Brown Convention Center, shopping malls, NASA Space Center, and Galveston Cruise Terminals, (see Figure B-5). Galveston Island saw 6.5 million vistors in 2016. Almost 14 percent of these visitors were cruise travelers – an increase of 5 percent over the previous year.[5] In addition, people come from around the globe for medical treatment to the largest medical complex in the world, the Texas Medical Center with over 10 million patient visits per year.[6] Travel originating from outside the region is also generated from a significant business presence that includes five Fortune 500 companies and many high-density employment centers. The tourism industry supports more than 140,000 jobs in our region and contributed $16.5 billion to the local economy in 2017.[7]

The H-GAC 2045 Regional Transportation Plan Update has substantial investments dedicated to improve the roadway, transit, bicycle and pedestrian capacity that provide access to major attractions such as universities, medical facilities and other essential destinations mentioned above. The Economic Development Strategy (CEDS) and "Our Great Region 2040" plan regard tourism as regional needs and provide strategies and recommendations for further travel and tourism improvements. The H-GAC metropolitan planning region has also seen a host of local planning activities supported by Economic Development Administration grants and similar funding geared toward furthering economic development to attract business and encourage tourism.[8] Similar programs are being implemented by the Cities of Houston, Bay City, Conroe , Dayton, and Galveston among others.

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[4] http://www.ourregion.org/download/OurGreatRegion2040-FINAL.pdf (pages 30 and 31)
[5] https://www.chron.com/neighborhood/bayarea/news/article/Galveston-hits-record-high-tourism-revenues11175775.php
[6] http://www.tmc.edu/wp-content/uploads/2018/07/TMC_FactsFiguresOnePager_07052018-1.pdf
[7] https://www.visithoustontexas.com/media/press-releases/post/record-218-million-visits-to-houston-in-2017/
[8] http://www.h-gac.com/gulf-coast-economic-development-district/regional-economic-development-plan.aspx (page 13)

An engagement process soliciting the feedback of public officials and members of the public was utilized to perform a SWOT analysis, helping to shape the goals and stratgies of the CEDS. These goals have been aligned with the "Our Great Region 2040" plan, including the preservation of natural resources especially along waterways to promote recreation and tourism opportunities. One of the strategies suporting natural resource preservation recommends the creation of a regional campaign to promote eco-tourism, coastal, and wildlife tourism options across the region.

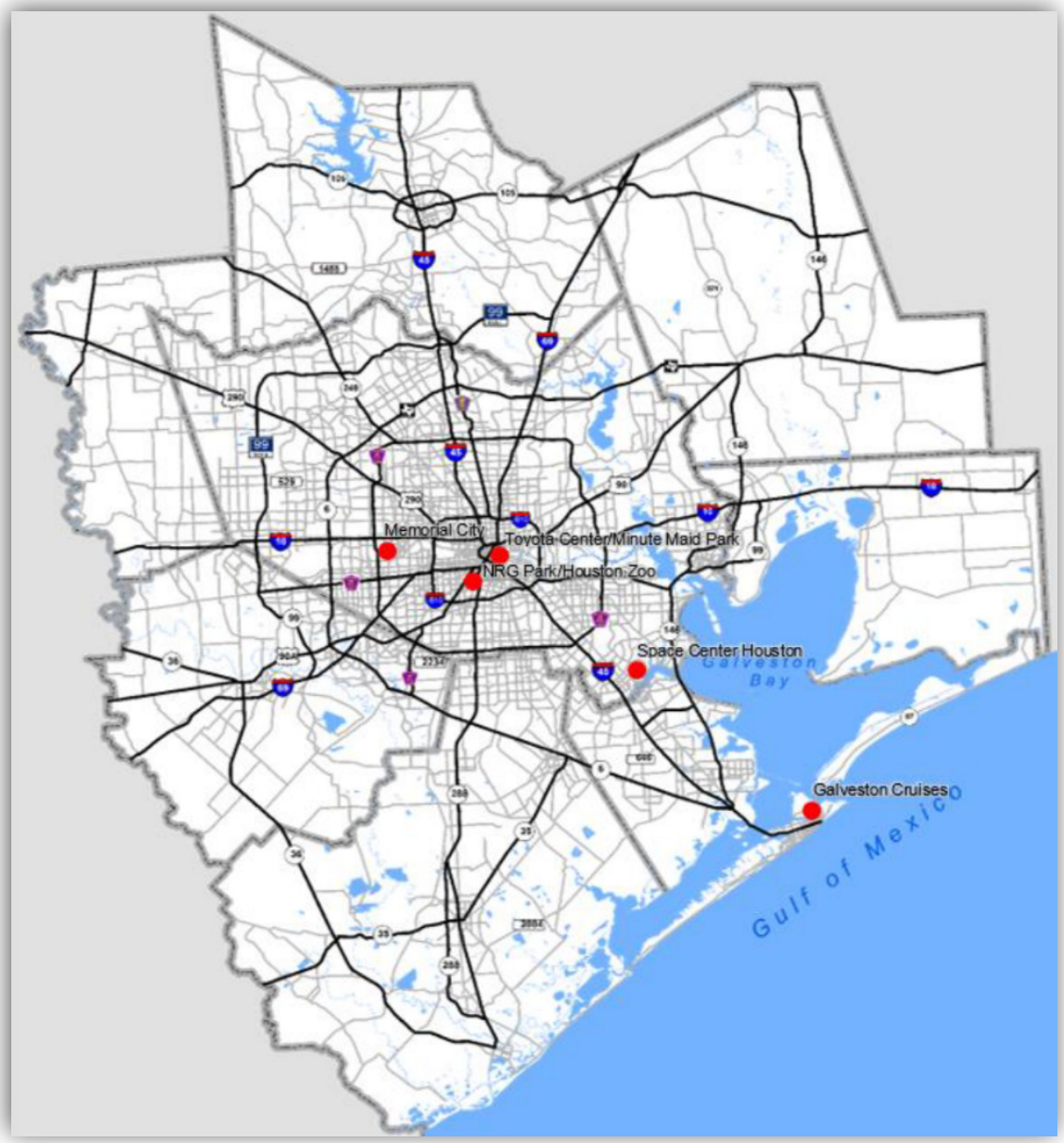


Figure B-5: Local Travel and Tourism Destinations

INTERCITY BUS INITIATIVES

Federal planning guidelines now require the "consideration of the role that intercity buses may play in reducing congestion, pollution and energy consumption in a cost-effective manner and strategies and investments that preserve and enhance intercity bus systems including those that are privately owned and operated".[9]

The Houston-Galveston region was the location of an innovative intercity bus project between the Brazos Transit District (BTD) and a private organization for several years. Since 2007, the Charles Wilson Veterans Administration (VA) Shuttle bus has been providing trips for disabled veterans traveling from Lufkin, Texas to medical appointments at the Michael E. DeBakey VA Medical Center in the Texas Medical Center in Houston (Figure B-6). The veterans are transported daily along the 248 mile route (round trip) at no cost to them; as of 2022 ridership was averaging 35 to 40 passengers a week. In the spring of 2022, operation of the Shuttle was transferred from the BTD to the VA itself.

Figure B-6: Charles Wilson VA Shuttle

Based on prior planning studies, there are several other emerging opportunities in the Houston-Galveston region to establish similar mobility options for veterans and other residents along major freeway corridors into Houston. These opportunities would involve developing relationships with representatives of private inter-city carriers to incorporate intermediate stops along their established routes. These stops could become intermodal facilities where passengers could have options to transfer to-and-from local and express buses in addition to carpools, vanpools, taxis, and other multimodal options.

Several locations within the H-GAC planning region have been identified as potential sites for such facilities. One potential location is along Interstate Highway 10 East, near State Highway 146. That location was identified in the Transit Plan for Liberty and Chambers counties as a potential site for a multi-modal transfer facility that would facilitate north-south and east-west travel patterns.[10] Another potential location for an intermodal terminal was identified along Interstate Highway 45 North Freeway in the City of Huntsville. This location was recommended in the Walker County Transit Plan, which envisioned moving the current Greyhound bus terminal from a small facility located near the center of downtown Huntsville to a larger multimodal facility closer to the I-45 Freeway corridor.[11]

Finally, H-GAC is currently working with TxDOT to begin the study of a potential Regional Bus network. This service type, which does not currently exist in the Houston-Galveston region, but exists on other parts of Texas, is recommended in the High Capacity Transit Task Force Priority Network (discussed in the

[9] [23 U.S.C. 134(i)(2)(H)]

[10] Liberty County Transit Plan, Houston-Galveston Area Council (H-GAC), 2009; Chambers County Transit Plan, H-GAC, 2009.

[11] Walker County Transit Plan, H-GAC, 2012.

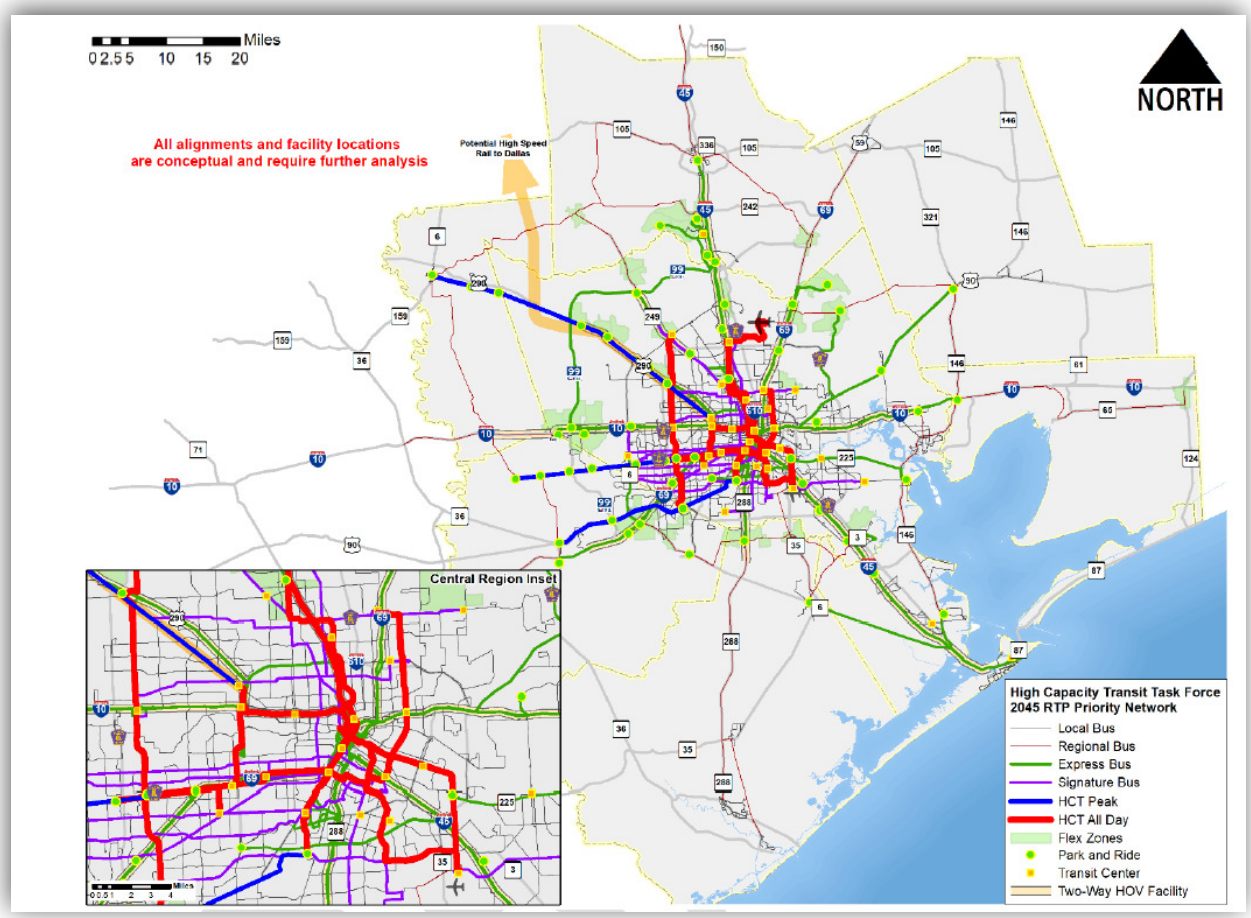
following paragraphs). It would connect outlying communities to each other as well as the urban core and serve a variety of trip purposes, including access to healthcare, education, and public services.

High Capacity Transit

The High Capacity Transit Task Force was created by the H-GAC Transportation Policy Council to research the need and opportunity for high capacity transit in the MPO planning region and, produced a financially constrained Priority Network for comprehensive regional transit service. The Priority Network, shown in Figure B-7 below, was incorporated into the 2045 Regional Transportation Plan as its transit element. The services specified in the High Capacity Transit (HCT) Priority Network are mode-, technology- and alignment neutral. All recommendations in the Priority Network are conceptual and are subject to further analysis and design. For more information, the High Capacity Transit Summary Report is located at http://www.h-gac.com/high-capacity-transit-task-force/default.aspx.

The Priority Network contains a variety of service types, including Express and Regional Bus services connecting outlying communities to the region's core as well as to each other. These Express and Regional services are intended to provide transit service to all eight counties in the H-GAC metropolitan planning area. Eventually, those express bus or cross-county routes could be designed to provide feeder bus services to larger multimodal terminals along the interstate highway system.

Figure B-7: High Capacity Transit Task Force Priority Network



PERFORMANCE MEASURES SYSTEM EVALUATION REPORT

The Moving Ahead for Progress in the 21st Century (MAP-21), the Fixing America's Surface Transportation (FAST) Act, and the Infrastructure Investment Jobs Act legislations enacted Transportation Performance Management into the Federal Highway Program, addressing challenges that face the transportation system on a national level, including:

- Improving safety
- Maintaining infrastructure condition
- Reducing traffic congestion
- Improving the efficiency of the system and freight movement
- Protecting the environment

The objective of transportation performance management is to focus federal funds on the achievement of national goals, increase accountability and transparency, and improve investment decision-making through performance-based planning and programming of transportation projects. The federal rulemaking requires metropolitan planning organizations and state departments of transportation to set targets for several performance measures and to periodically report on the progress made towards achieving those targets. H-GAC has the administrative responsibility for performance measures in the key areas of Safety, Pavement and Bridges, Reliability, Congestion, Air Quality, Transit Asset Management, and Public Transportation Agency Safety Plans.

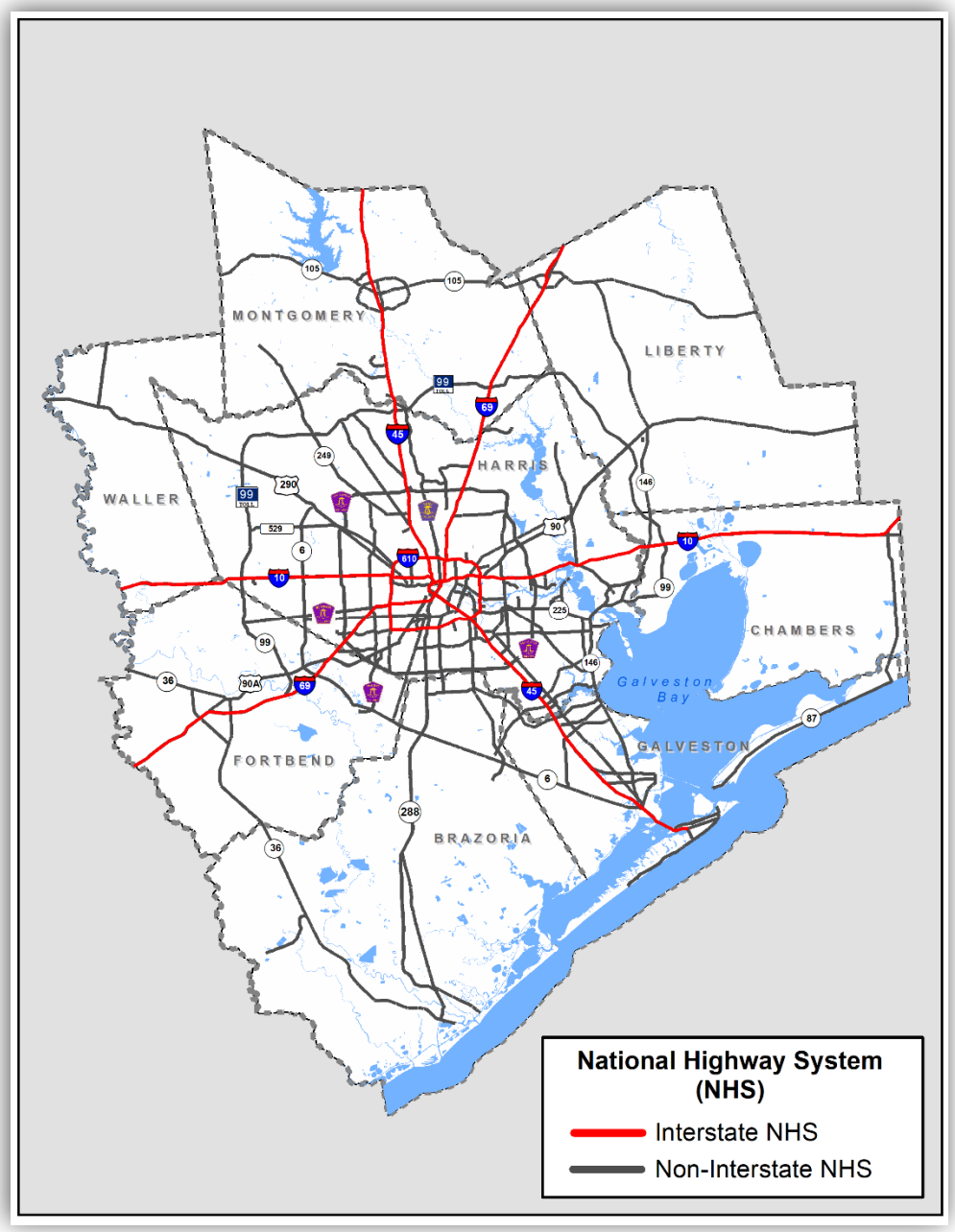
The final planning rules for the metropolitan planning process and the Regional Transportation Plan implementing the Fixing America's Surface Transportation (FAST) Act became effective on May 27, 2018. The FAST Act builds on changes made by MAP-21 to address challenges facing the U.S. transportation system – including provisions to make surface transportation more streamlined, performance-based, and multimodal. Under these rules, metropolitan planning organizations may support the state targets or establish their own regional targets. In 2018, H-GAC adopted performance targets with the performance-based planning process required by FHWA. The final set of performance targets were adopted on October 26, 2018. During the formulation of the planning targets, extensive collaboration occurred between the Texas Department of Transportation, public transportation providers and H-GAC.

Transportation Performance Management (TPM) is not a new concept to H-GAC. Many of the federal performance measures align with and complement H-GAC's existing performance measures. Performance management is a powerful analytical tool for tracking regional performance over time and can illustrate how the greater Houston region compares to other regions nationwide. Target setting, tracking and reporting of performance measures are conducted in a relatively short timeframe: from one to four years. TPM gives transportation planners the opportunity to link the short-term performance to long-range priorities for the region. One of the positive outcomes of performance management tracking is that it generates a heightened awareness in the transportation planners and fosters a renewed focus by on key performance areas that will likely remain at the forefront of planning practice for years to come. Additionally, the requirement to report the progress made towards achieving the performance measures improves accountability and transparency of the planning agencies.

Emphasis on the National Highway System

The federal performance measures place a strong emphasis on the National Highway System (NHS). The NHS is a network of highways that are considered critical to the nation's economy, defense and mobility, and include those assets that link major airports, ports, public transportation facilities, rail and truck intermodal terminals. The H-GAC 2045 Regional Transportation Plan is focused on maintaining all major roads of the metropolitan planning region's transportation network and not just those on the National Highway System. However, as many as 8,784 lane-miles of highways in the H-GAC metropolitan planning region are on the National Highway System.

Figure B-8: The National Highway System in the H-GAC Planning Region



TRANSPORTATION PERFORMANCE MEASURES AND THE 2045 RTP

As discussed earlier, the federal government passed three transportation bills, the Moving Ahead for Progress in the 21st Century (MAP-21) in 2012 and the Fixing Surface Transportation in the 21st Century (FAST Act) in 2015, and the Infrastructure Investment Jobs Act (IIJA) legislations in 2021, which together have substantially changed the milieu of transportation planning practice. Among other things, the bills require Metropolitan Planning Organizations (MPOs) to establish performance-based planning routines. In order to comply with federal legislation, MPOs across the country adopted and implemented programs and performance targets, and set priorities based on performance measures. The FAST Act and the Infrastructure Investment and Jobs Act reaffirm these requirements.

According to the laws, performance will be judged on a system-wide level and should be tied to project prioritization. As such, the 2045 RTP proposes certain performance measures to represent this principle at a regional level (Figure B-9). Because MAP-21 requires that transportation system challenges be addressed through a data driven, performance-based approach, measures selected were chosen mainly because they were focused on system performance and assets, sensitive to various transportation modes, and had a nexus to the established goals.

Several challenges exist for some of the performance measures, such as the lack of available, useable or consistent data. H-GAC and TxDOT are addressing these deficiencies by improving data collection methods and expanding collection efforts to obtain data suitable to accurately set performance targets. For example, TxDOT is adapting its pavement collection methods to align with the federal criteria. Additionally, H-GAC is exploring new data collection for the System Performance measures. As required by the federal rules, H-GAC will periodically review, analyze performance measure data, and will report how target progress has been achieved by the MPO for the target years of 2020, 2022, 2024 and 2026.

The following section describes each performance measure, detailing the way it is measured and describing the desired outcome. The performance measures include factors like asset management, congestion, safety, environment, and economic competitiveness, which are intended to help the assessment of progress towards meeting the 2045 RTP plan's vision and goals. While the desire is to see a dramatic improvement in each performance measure area, limited funding and other factors that influence system utilization may work in such a way that selected performance measures might not always be reduced in absolute terms.

Figure B-9: 2045 RTP Update Vision, Goals, and Performance Measures

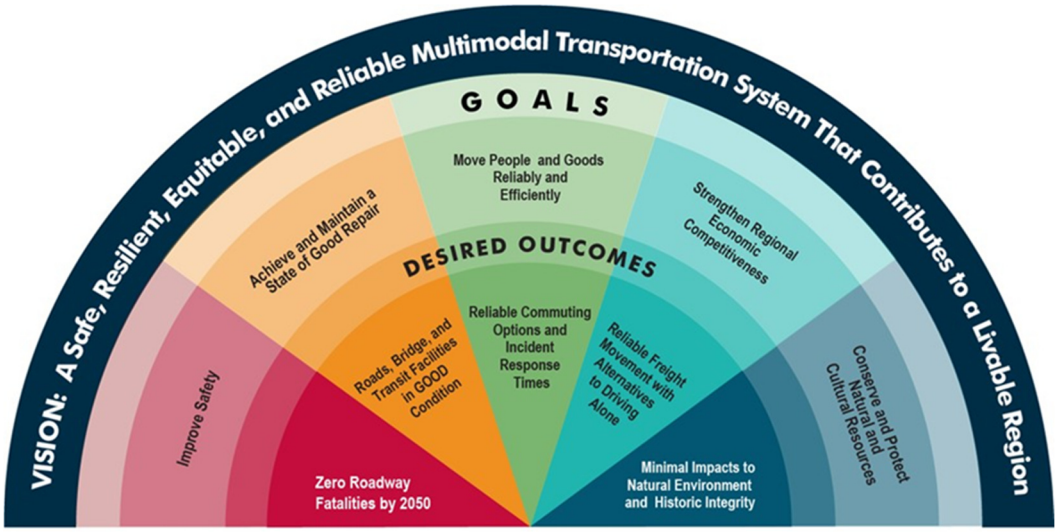


Table B-10: Highway and Transit Performance Measures

Category	Performance Measure	Applicability	Reporting Frequency
Safety	Number of fatalities	All public roads	Annually
	Rate of fatalities		
	Number of serious injuries		
	Rate of serious injuries		
	Number of non-motorized fatalities and serious injuries		
Pavement and Bridge Condition	Percentage of pavements of the Interstate System in Good condition	Interstate System	Biennially with four-year performance periods
	Percentage of pavements of the Interstate System in Poor condition		
	Percentage of pavements of the non-Interstate NHS in Good condition	Non-Interstate NHS	
	Percentage of pavements of the non-Interstate NHS in Poor condition		
	Percentage of NHS bridges classified in Good condition	National Highway System (NHS)	
	Percentage of NHS bridges classified in Poor condition		
System Performance	Percent of the person-miles traveled on the Interstate that are reliable (Level of Travel Time Reliability)	Interstate System	Biennially with four-year performance periods
	Percent of the person-miles traveled on the Non-Interstate NHS that are reliable (LOTTR)	Non-Interstate NHS	
	Truck Travel Time Reliability (TTTR) Index	Interstate System	
	Annual Hours of Peak Hour Excessive Delay Per Capita	National Highway System (NHS)	
	Percent of Trips with Non-Single Occupancy Vehicles	Urbanized area	
	Total Emissions Reduction	Urbanized area	
Transit Asset Management	Rolling Stock - percentage of revenue vehicles that exceed the Useful Life Benchmark (ULB)	Region's transit providers who are recipients and subrecipients of federal transit assistance and H-GAC	Biennially
	Equipment - percentage of non-revenue service vehicles that exceed the ULB		
	Facilities - percentage of facilities that are rated less than 3.0 on the Transit Economic Requirements Model (TERM) Scale		
	Infrastructure - percentage of rail track segments (by mode) that have performance restrictions	METRO & Island Transit	
Transit Safety	Fatalities - total amount and rate of fatalities per total vehicle revenue miles	Region's transit providers who are recipients and subrecipients of federal transit assistance and H-GAC	Biennially
	Injuries - total amount and rate of injuries per total vehicle revenue miles		
	Safety Event - total amount and rate of safety events per total vehicle revenue miles		
	System Reliability (State of Good Repair) – mean distance between major mechanical failures		

The investments identified in the 2045 RTP were guided by a vision and supported by the goals and strategies. This framework articulated the regional needs and priorities in four key areas of transportation investments.

Mobility - Alternative Modes - Air Quality - Planning

The 2045 RTP Vision, Goals, and Strategies were established by the Transportation Policy Council (TPC), Technical Advisory Committee (TAC), and relevant TPC and TAC subcommittees. Building on the investment area structure established in the 2040 RTP, the TPC established 21 investment categories aligned with the 2045 RTP goals and strategies, as priority areas of investments. In the table below, Table B-11, shown below, illustrates the linkage between the 2040 RTP Investment Type, 2045 RTP Investment Strategy, 2045 RTP Investment Categories and the performance measures and targets they directly contribute towards achieving.

Table B-11: Relationship Between Investment Type, RTP Strategy, Investment Category & Performance

Investment Type	RTP Strategy	Investment Category	Performance Measures						
			Safety	Pavement & Bridge	Reliability	Freight (Truck Travel Time)	Congestion/ Air Quality	Transit Asset Management	Transit Safety
Mobility. Alternative Modes, Air Quality	Expand, Manage, Maintain	Major Investments	●	●	●	●	●	●	●
Mobility	Expand	Roadway Added Capacity/New Construction	●	●	●	●			
		Innovative Freight Movement	●	●	●	●	●		
	Manage	Incident Management (Towing)	●		●	●	●		
		Incident Management (MAP)	●		●	●	●		
		Access Management/Safety/Grade Separations	●	●	●	●	●		
		Intelligent Transportation System Infrastructure	●	●	●	●	●		
	Maintain	Infrastructure Resiliency	●				●		
		Roadway Reconstruction and Rehabilitation	●	●					
Alternative Modes	Expand, Manage, Maintain	Active Transportation	●						●
	Expand	Transit Expansion (Vehicle Purchase)	●		●	●	●	●	●
		Transit Passenger Facilities	●		●	●	●	●	●
	Manage	Transit Priority Infrastructure	●		●	●	●		●
		Transit Regional Fare Collection	●		●	●	●		
	Maintain	Transit Passenger Facility State of Good Repair	●		●		●	●	●
Air Quality	Expand	Regional ITS (TranStar)	●		●	●	●		●
		Pilot Commuter Transit			●	●	●		
		Regional Vanpool			●	●	●		
	Manage	Commute Solutions			●	●	●		
	Maintain	Clean Cities/Clean Vehicles					●		
Planning	Expand, Manage, Maintain	Sub-Regional Planning							

Out of twenty-one Investment categories, eight categories were recommended to be programmed and funded annually for the 10-year period from FY 2019 through FY 2028, identified in Table B-12. This was approved in a cooperative consultative process involving the local governments. and state transportation agencies, the Transportation Policy Council, the Technical Advisory Committee, and relevant subcommittees.

Table B-12: RTP Investment Categories in the H-GAC 10-Year Plan (2019-2028)

2040 RTP Investment Type	2045 RTP Strategy	2045 RTP Investment Category
Mobility	Manage	Incident Management (Towing)
		Incident Management (MAP)
Alternative Modes	Manage	Transit Regional Fare Collection
Air Quality	Expand	Regional ITS (TranStar)
		Pilot Commuter Transit
		Regional Vanpool
	Manage	Commute Solutions
	Maintain	Clean Cities/Clean Vehicles

2018 Call for Projects Evaluation Criteria:

The 2018 Call for Projects evaluation and selection criteria were developed in a cooperative manner by consulting with local agencies, the Transportation Policy Council (TPC) , the Technical Advisory Committee, and relevant subcommittees. All projects submitted through the 2018 Call for Projects (2018 CFP) were evaluated based on 50% score (100 points) given to its benefit/cost ratio and 50% score (100 points) given to various planning factors. The benefit cost analyses were calculated within a spreadsheet template that evaluated the project's benefits in three major areas:

- Safety – reduction in crashes
- Delay – reduction in travel delay
- Emissions – reduction of on-road vehicle emissions

The remaining 50% of the score was based on multiple planning factors with a direct linkage to performance measures and the RTP goals and strategies and relative to each investment category. Planning factors for highway and transit projects include, but are not limited to, the improvement to multimodal level of service; freight system priority/evacuation route, life cycle maintenance strategies, corridor level of travel time reliability, reduction in vehicle miles traveled, connectivity to employment, transit reliability, transit vehicle and facility life cycle maintenance strategies.

The 2018 Call for Projects application submittal period began on September 4th and concluded on October 31, 2018. During this period, H-GAC received a total of 193 applications from various local partners and TxDOT. Out of 193 project applications, a total of thirty-six (36) projects in various investment categories were recommended for funding for the 10- year period, between FY 2019 and FY 2028. The TPC approved

projects across thirteen Investment Categories, listed in Table B-13, through the competitive Call for Projects process.

Table B-13: TPC Approved Projects Across Investment Categories

2040 RTP Investment Type	2045 RTP Strategy	2045 RTP Investment Category
Mobility, Alternative Modes, Air Quality	Expand, Manage, Maintain	Major Investments
Mobility	Expand	Roadway Added Capacity/New Construction
		Innovative Freight Movement
	Manage	Access Management/Safety/Grade Separations
		Intelligent Transportation System Infrastructure
		Autonomous and Connected Vehicle Infrastructure
	Maintain	Infrastructure Resiliency
		Roadway Reconstruction and Rehabilitation
Alternative Modes	Expand, Manage, Maintain	Active Transportation
	Expand	Transit Expansion (Vehicle Purchase)
		Transit Passenger Facilities
	Manage	Transit Priority Infrastructure
	Maintain	Transit Passenger Facility State of Good Repair

Transportation Improvement Program and the Project Selection Process

The project selection process utilized during development of the 2025-2028 TIP assessed major investment-level applications based on the 2045 RTP's five goals and performance measures. By incorporating 2045 RTP goals into short-range programming activity, the performance measures have achieved a strong coordination between the region's vision for the future and the investments made today.

HIGHWAY SAFETY

Safety is a top regional priority. Although motorists are the largest group of system users injured or killed in crashes, pedestrians and cyclists are also at risk. Addressing this goal will not only benefit regional health, but the community's quality of life and economic competitiveness. A safe regional transportation system operates reliably, delivers goods and services on time, and returns users home at the end of their trip.

The Houston-Galveston Regional Safety Plan sets a baseline for safety crash data, analyzes regional trends, and is used to inform performance target setting. The report data serves as a baseline for subsequent years to measure whether there was significant improvement compared to previous years. The Texas Strategic Highway Safety Plan estimates the probable number of fatalities and serious injuries for the target year of 2022. Federal rulemaking requires Metropolitan Planning Organizations to either support state targets or establish their own specific targets for the five safety performance measures for all public roads in the MPO planning area, within 180 days after the State establishes statewide targets. The MPO then reports targets to the State, when requested. Statewide, when at least four out of five targets are met or the outcome for the performance measure is better than the baseline performance for the year prior to the target year, a determination of significant progress will be made.

During safety target setting discussions of the Transportation Policy Council (TPC) and the Transportation Advisory Committee (TAC), aspirational goals for the long-term were expressed. While the H-GAC region is forecasted to experience a high level of economic and population growth, subsequently, it results in a rise in travel, crashes, and fatalities. For the purposes of short-term target setting, the targets were set to reflect the probable number of fatalities and serious injuries. However, the increasing trends in fatalities and crashes do not reflect the intent and commitment of the TPC to improve traffic safety in the Houston-Galveston region. H-GAC has committed to participate in advancing crash reduction strategies through the Regional Safety Plan and will annually analyze and assess trends and progress on Safety Performance Measures while reviewing TxDOT's annual updates to statewide targets.

In February 2017, H-GAC's Transportation Policy Council approved a resolution to support the State's adopted safety targets for the five performance measures. H-GAC set targets that represent a two percent (2%) reduction from the trend line projection in the five (5) safety performance measures for the period from 2017 to 2022. The decline is expected to begin gradually in 2018 and progress to the two percent (2%) reduction by the target year 2022.

H-GAC, by the passage of Resolution 2019-05 on February 22, 2019, agreed to support the State's effort to achieve its safety performance measure targets. Supporting the State's efforts includes using the same or similar methodology to set these targets. The State methodology uses a five-year rolling average to set the targets for the State safety performance measures. H-GAC has adopted a similar methodology to calculate the regional safety performance measure targets. The data used to calculate the targets is from the Texas Department of Transportation (TxDOT) Crash Record Information System (CRIS) data from 2018 to 2022 to calculate the 5-year rolling average for the 2023 targets. H-GAC submits the Region's Safety Performance Measure Targets to TxDOT in February, annually.

The TPC passed resolutions in February 2017 and February 2019, supporting the State's safety targets. In 2020, the Transportation Policy Council (TPC) approved a Vision Zero policy by resolution (Resolution 2020-26) on October 23, 2020, committing to support transportation projects and programs to eliminate traffic fatalities in the region by the year 2050. The TPC receives the safety measures reporting annually that is submitted to TxDOT, therefore, per H-GAC policies, resolutions are not passed annually because TPC previously approved supporting the State's safety targets.

Trends and progress are reviewed and discussed by the Transportation Safety Committee. Additionally, TxDOT's annual updates to statewide targets are reviewed. Annually, by the end of February, H-GAC reports on the progress toward meeting regional targets to the TPC and to TxDOT.

Table B-14 shows the H-GAC safety performance measure targets and the actuals or observed performance totals, based on data as of January 2024.

Figure B-14: H-GAC Safety Performance Measure Results

Performance Measure	**2021 Targets**	**2021 Actuals**	**2022 Targets**	**2022 Actuals**	**2023 Targets**	2023 Actuals	**2024 Targets**
Fatalities	674	826	**697**	839	**727**	779	**765**
Fatality Rate	1.1	1.23	**1.05**	1.41	**1.23**	1.13	**1.26**
Serious Injury	3,287	4,125	**3,424**	4,264	**3,668**	4,239	**3,911**
Serious Injury Rate	5.2	6.14	**5.15**	7.17	**6.18**	6.13	**6.42**
Non-Motorized Fatalities & Serious Injuries ††	648	759	**667**	806	**713**	883	**764**

Actuals based on TxDOT CRIS data as of January 2024; 2021 and 2022 Fatality Rates and Serious Injury Rates based on projected Annual VMT

Trends and progress are reviewed and discussed by the Transportation Safety Committee each year. Additionally, TxDOT's annual updates to statewide targets are reviewed. Annually, by the end of February, H-GAC reports on the progress toward meeting regional targets to the Transportation Policy Council and to TxDOT.

The safety performance measures, methodology, applicability and reporting frequency are identified below.

Fatalities

Measure – Five-year rolling averages of the number and rate of vehicular fatalities in the H-GAC region.

Methodology – Fatality numbers and rates are obtained from the national Fatality Analysis Reporting System (FARS). Fatality rates are calculated per 100 Million Vehicle Miles Traveled in the region.

Applicability – All public roads and highways

Reporting Frequency - Annually

Serious Injuries

Measure – Five-year rolling averages of the number and rate of vehicular serious injuries in the H-GAC region.

Methodology – Serious injury numbers and rates are obtained from the Texas Crash Records Information System (CRIS) databases. Serious injury rates are calculated per 100 Million Vehicle Miles Traveled (VMT) in the region.

Applicability – All public roads and highways

Reporting Frequency – Annually

Non-Motorized Fatalities and Serious Injuries

Measure – Five-year rolling average of the number non-motorized fatalities and non-motorized serious injuries for bicyclists and pedestrians in the H-GAC region.

Methodology – Serious injury numbers and rates are obtained from the national Fatality Analysis Reporting System (FARS) and the Texas Crash Records Information System (CRIS) databases.

Applicability – All public roads and highways

Reporting Frequency – Annually

Integrating Safety Performance Measures into the Transportation Planning Process

"The Regional Safety Plan was developed as a comprehensive plan that addresses the region's safety issues and offers feasible solutions. It serves as a framework for strategies and implementation actions to leverage safety programs and resources to the greatest extent possible. The performance measure targets in this plan are tangible goals for the region to work towards to support the State of Texas' crash reduction efforts, and its strategies support the State Highway Safety Plan and federal safety initiatives." *(Source: 2018 HGAC Regional Safety Plan)*

Adopted in 2018, the Regional Safety Plan identifies five traffic safety focus areas. These focus areas were crash types with the highest percentage of fatalities in the region. The Transportation Safety Committee has been charged with developing implementation plans to address the focus areas over the next four years. The MPO will continue to publish an annual State of Safety Report to assess progress toward reducing the number of crashes, fatalities, and serious injuries throughout the region. In addition, the MPO will launch a series of intersection safety audits at high crash frequency intersections to identify crash characteristics and develop low-cost recommendations to address traffic safety issues at each location. The MPO will continue to coordinate its efforts with federal, state, and local partners to leverage resources and maximize results to enhance traffic safety in the Houston-Galveston area.

H-GAC incorporates performance measures into its programming activities by designating safety as one of the five foundational goals of the Regional Transportation Plan. Furthermore, H-GAC integrates the safety targets in the form of quantifiable strategies and goals within the regional transportation planning process. The primary method for the programming of projects is the Call for Projects issued by H-GAC. Embedded in the Call for Projects (CFP) selection criteria, the safety benefit cost analysis template indicates the number of crashes that will be reduced for each CFP project. Linking the programming of projects to quantifiable performance targets validates the success of performance-based planning.

2025–2028 TIP and 2045 RTP Update transportation investments targeting safety improvements

H-GAC, along with state and local government partners, has made significant investments in transportation infrastructure improvements through the 2025-2028 Transportation Improvement Program (TIP) and the 2045 Regional Transportation Plan Update. H-GAC adopted the Regional Safety Plan to recommend crash reduction strategies. A total investment of $148 million of Intelligent Transportation Systems, safety projects and programs is programmed in the 2025-2028 Transportation Improvement Program which is expected to contribute towards achieving the safety targets. Additionally, the Houston and Beaumont TxDOT Districts have programmed $41 million of Category 8 Safety funding that will enhance safety.

H-GAC developed a Regional Safety Plan that identifies traffic safety focus areas, recommends crash reduction strategies and countermeasures. The Regional Safety Plan is anticipated to be updated in fiscal year 2025. The fiscally constrained 2045 RTP recommends a significant level of investments in ITS and safety projects and programs. This combined effort of planning, programming of projects, implementation of the safety plan, and critical transportation investments are expected to support and contribute to achieving the safety performance targets while greatly enhancing traffic safety for the region. The fiscally constrained 2045 RTP recommended approximately $579 million of investments in ITS and Safety projects and programs. These investments are not part of the Corridor-based Major Investments of the 2045 RTP.

Table B-17: 2045 RTP Investments in ITS and Safety Programs

RTP 2045 STRATEGIES	STRATEGY 1 MANAGE [System Management and Operations]	STRATEGY 2 MAINTAIN [Asset Management]	STRATEGY 3 EXPAND [Transportation Network Capacity]	TOTAL
REGIONAL INVESTMENT PROGRAMS				
ITS/Safety: *(Includes certain roadway improvements, installation of computerized traffic control systems, Incident Management)*	$517,457,158	$62,269,438	NA	$579,726,596

Safety Resources
Highway Safety Improvement Program https://safety.fhwa.dot.gov/hsip/
Strategic Highway Safety Plan https://www.texasshsp.com/
Regional Safety Plan http://www.h-gac.com/transportation-safety-program/default.aspx
Transportation Safety Committee https://www.h-gac.com/transportation-policy-council/transportation-safety-committee

PAVEMENT CONDITIONS

Ensuring the preservation of pavements and bridges is critical to safety, the movement of goods and people, economic development. While the demand on the transportation system is greater than ever, pavements and bridges are steadily deteriorating due to traffic, weather and time. In effect, this highlights the importance for an emphasis on asset management and the preservation of pavement. "Pavement preservation programs and activities employ a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety, and meet road user expectations." *(source: PL 112-141, Moving Ahead for Progress in the 21st Century Act.)*

Implementing pavement asset management, along with performance target setting, provides an opportunity for moving the transportation system to a state of good repair, protects our investments in the transportation roadway system and stretches taxpayer dollars, as far as possible. An asset management program can improve system resiliency in the aftermath of extreme weather events, such as Hurricanes Harvey and Ike, changing climate conditions, and shifts in the regional economy.

Roadways on the National Highway System, (NHS) are mostly owned, maintained, and operated by the Texas Department of Transportation; however, a portion of the NHS is under the jurisdiction of cities, counties, and toll authorities. Federal Performance Asset Management prescribes the establishment of pavement targets for all roadways on the interstate and non-interstate highway system, regardless of ownership. While the federal performance measures are focused on National Highway System, H-GAC is concerned with the conditions of all pavements and bridges. In the state of Texas, there are 69,000 National Highway System lane miles; approximately, 14% are in the H-GAC region.

Pavement condition data is a critical component of any pavement management system. TxDOT is responsible for collecting the necessary measurements and inspections to determine the conditions ratings defined by the federal performance measures rules. The federal criterion bases the pavement condition on the International Roughness Index (IRI), rutting, cracking, and faulting. Essentially, the IRI is the overall ride quality of a roadway. The pavement analysis is based on distress ratings and ride quality measurements. TxDOT used historical measurements of pavement and bridge conditions to establish statewide targets.

Federal transportation bills require TxDOT to implement transportation asset management practices and set performance targets to a desired condition. The federal performance measures place a high priority on maintaining the good pavements and on raising the pavements in poor condition to a state of good repair. A good condition pavement rating suggests that no major investment is necessary, and conversely, a fair condition suggests that major reconstruction of the pavement is needed.

The pavement condition thresholds applicable to National Highway System roadways are shown in the table below.

Table B-18: Pavement Condition Ratings

Interstate & Non-Interstate System Rating Thresholds			
	Good	Fair	Poor
IRI (in/mile)	< 95	95 - 170	> 170
Cracking %	< 5	5 - 10	> 10
Rutting (in)	< 0.2	0.2 - 0.4	> 0.4
Faulting (in)	< 0.05	0.05 - 0.15	> 0.15

The calculations of the pavement performance for Interstate and Non-Interstate roadways are explained in the table below.

Table B-19: Rating the National Highway System (NHS)

Rating the Interstate & Non-Interstate Roadways of the NHS			
	Pavement Types		
Overall Condition Rating	3 metric ratings ACO - (IRI, Cracking, Rutting) JCP - (IRI, Cracking, Faulting)	2 metric ratings CRCP - (IRI and Cracking)	Measures
Good	All three metrics rated "Good"	Both metrics rated "Good"	% Lane Miles in "Good" Condition
Fair	All other combinations	All other combinations	% Lane miles in "Fair" Condition
Poor	≥ 2 Metrics rated "Poor"	Two metrics rated "Poor"	% Lane miles in "Poor" Condition

Key= Asphaltic Concrete Overlay (ACO), Joint Concrete Pavement (JCP), Continuously Reinforced Concrete Pvmt.(CRCP)

The historical pavement condition data from the Texas Department of Transportation's Pavement Management Information System (PMIS) were translated into the corresponding pavement condition measures for MAP-21/FAST Act requirements. The data was used to develop the historical trends for pavement condition measures. A five-year moving average was used to calculate the performance targets.

The second federal performance period began January 1, 2022, and ends December 31, 2025 and is for the Calendar Years (CY) of 2022 to 2025. Updates to H-GAC's regional targets are formulated with the analyses of TxDOT's statewide data and TxDOT's revisions to statewide targets at the beginning of the performance period and may be adjusted at, the mid-point of the performance period.

Pavement Conditions – Interstate and Non-Interstate National Highway System

Measure – Percentage of pavements of the interstate and non-interstate National Highway System with a condition rating of "good" and "poor" relative to the ride quality.

Methodology – Pavement conditions are based on the evaluation scores of the International Roughness Index (IRI), rutting, faulting, and cracking. The condition scores are obtained from the Highway Performance Monitoring System (HPMS) and TxDOT's Pavement Management Information System (PMIS) databases.

Applicability – Interstate highways and Non-interstate highways of the National Highway System

Reporting Frequency – Biennially with four-year performance periods

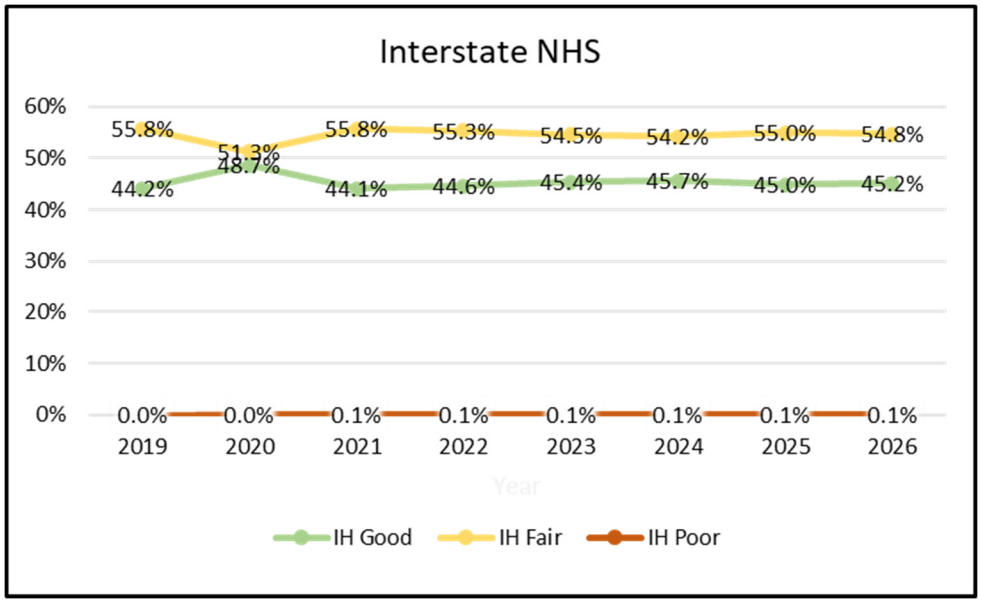
Targets and Conditions - Despite the fact that historical trends indicate pavement conditions are declining over time, H-GAC adopted 2024 targets based on future estimates based on 4-year moving average for 2024 and the 2026 targets were held flat with the goal of maintaining current conditions and a desire for aspirational goals that indicate improvement of pavement conditions in the long-term.

Figure B-20: Interstate and Non-Interstate Pavement Targets and Conditions

PAVEMENT TARGETS					
Performance Measure	**2022 Targets / Actuals**	**2022 Targets achieved**	**Desired Trend**	**2024 Targets**	**2026 Targets**
Interstate pavement in good condition	42.1% / 44.6%	Yes	⬆	45.7%	45.7%
Interstate pavement in fair condition	57.8% / 55.3%	Yes	⬇	54.2%	54.2%
Interstate pavement in poor condition	0.1%/ 0.1%	Yes	⬇	0.1%	0.1%
Non-Interstate NHS pavement in good condition	34.4% / 38.3%	Yes	⬆	34.7%	34.7%
Non-Interstate NHS pavement in fair condition	40.8% / 40.2%	Yes	⬇	62.0%	62.0%
Non-Interstate NHS pavement in poor condition	24.8% / 21.5%	Yes	⬇	3.2%	3.2%

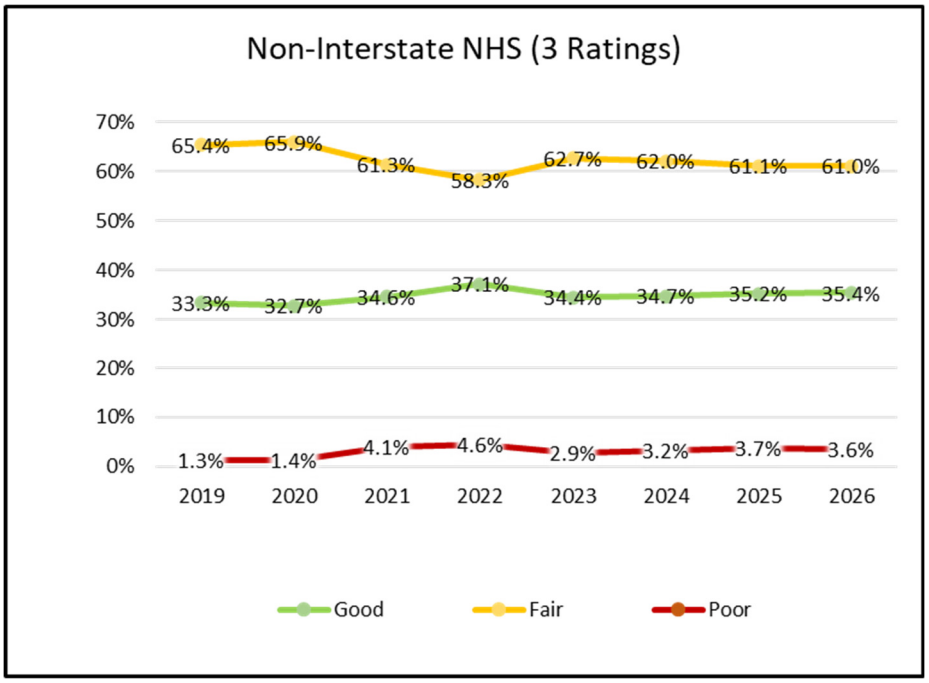
For Non-Interstate National Highway System (NHS) pavement measures, the 2022 the condition calculation was based on only one condition rating, the International Roughness Index (IRI). For 2024 and 2026, the condition calculation was changed to three ratings, the IRI, Cracking, and Rutting or Faulting (based on the pavement types of asphalt concrete, jointed concrete, and continuously reinforced concrete pavement). This explains the noticeable difference between the Non-Interstate pavement targets in Fair condition in 2022 of 40.8% and in 2024 of 62.0%.

Figure B-21a: Interstate Pavement Conditions



The values in the figure above reflect the historical and estimated future conditions. Future ratings are estimates based on 4-year moving averages.

Figure B-21b: Non-Interstate National Highway System (NHS) Pavement Conditions



The values in the figure above reflect the historical and estimated future conditions. Future ratings are estimates based on 4-year moving averages. The three (3) ratings used to measure the condition of the Non-Interstate roadways of the NHS are the International Roughness Index (IRI), cracking, and rutting or faulting.

BRIDGE CONDITIONS

Asset management seeks to optimize lifecycle costs by setting and sustaining a desired target condition with the goals of improving the durability and extending the life of the region's bridges.

Performance measures and targets are applicable to all bridges on the National Highway System (NHS), which include on and off-ramps connected to the NHS within a State, and bridges carrying the NHS that cross a State border, regardless of ownership. A portion of the NHS system is under the jurisdiction of cities, counties, and toll authorities. For the approximately 2,500 bridges in the H-GAC region, 88% are owned by TxDOT and 12% are owned by other entities. The consideration of bridge performance targets should be determined from asset management analyses to achieve a state of good repair over the life cycle of assets.

Bridge conditions are based on the National Bridge Inventory evaluation ratings for the bridge's deck, superstructure, substructure, and culvert. The condition rating of good, fair, or poor are determined by the lowest rating of the deck, superstructure, substructure, or culvert. For example, if the lowest rating of one or more of the four bridge components is less than or equal to four, the bridge's classification is rated as poor.

Table B-22: Bridge Inventory Ratings

	Good	Fair	Poor
Bridge Inventory Rating	≥ 7	< 7 and > 4	≤ 4

The bridge targets are expressed in the percent of total bridge deck area. Deck area is computed using the structure length and deck width. For culverts, the deck area is calculated using the approach roadway width and structure length.

The historical pavement condition data was gathered from the Texas Department of Transportation's (TxDOT) Bridge Inventory. TxDOT surveys all bridges on the National Highway System and reports the conditions to the National Bridge Inventory. Historical bridge condition trends are based on a trend-line analysis. Historical trends indicate bridge conditions are slowly declining. Due to the lengthy lead time associated with environmental clearance, right of way purchase, design and the construction of a bridge, any new bridge being considered right now will have little or no influence on bridge conditions for the next three to five years.

The second performance period began January 1, 2022 and ends on December 31, 2025 and is for the Calendar Years (CY) of 2022 to 2025. Updates to H-GAC's regional targets are formulated with the analyses of TxDOT's statewide data and TxDOT's revisions to statewide targets at the beginning of the performance period and may be adjusted at the midpoint the four-year performance period.

Bridge Conditions Performance Measure Statistics

Measure – Percentage of bridge deck area of the National Highway System with a condition rating of "good" and "poor".

Methodology – Bridge deck conditions are based on the evaluation scores of the National Bridge Inventory.

Applicability – Bridges on the National Highway System

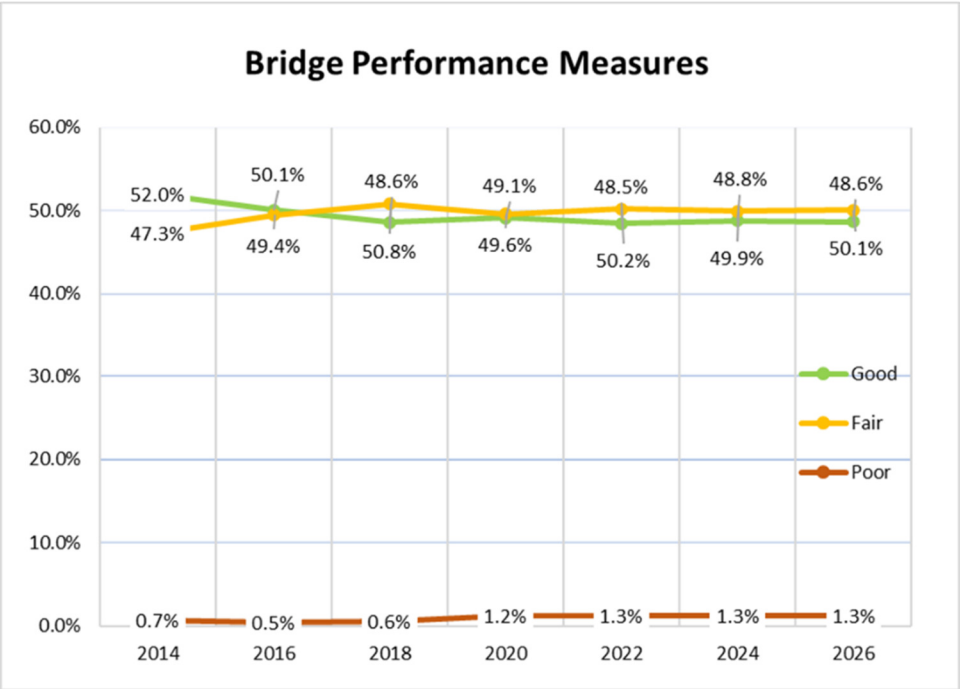
Reporting Frequency – Biennially with four-year performance periods

Targets and Conditions – Despite the fact that historical trends indicate bridge conditions are slightly declining over time, H-GAC adopted 2024 targets based on future estimates based on 4-year moving average for 2024 and the 2026 targets were held flat with the goal of maintaining current conditions and a desire for aspirational goals that indicate improvement of bridge conditions in the long-term.

Figure B-23a: Bridge Targets and Conditions

BRIDGE TARGETS					
Performance Measure	**2022 Targets / Actuals**	**2022 Targets achieved**	**Desired Trend**	**2024 Targets**	**2026 Targets**
National Highway System bridge deck area in good condition	49.1% / 48.5%	No	⬆	49.9%	49.9%
National Highway System bridge deck area in fair condition	49.7% / 50.2%	No	⬇	48.8%	48.8%
National Highway System bridge deck area in poor condition	1.2%/ 1.3%	No	⬇	1.3%	1.3%

Figure B-23b: National Highway System Bridge Conditions



The values in the figure above reflect the historical and estimated future conditions. Future ratings are estimates based on 4-year moving averages.

Integrating Pavement and Bridge Performance Measures into the Transportation Planning Process

Both the short and long-range planning processes afford the opportunity for advancing the transportation system to a State of Good Repair. One of the core strategies of the Call for Projects is Maintain Asset Management: to improve and preserve the condition of existing transportation infrastructure at the least practicable cost through the application of sound asset management techniques. The RTP 2045 project evaluation system was designed to be performance-based when prioritizing projects for the region. To highlight the significance of maintaining pavement and bridge infrastructure, the Call for Projects designated a separate category for Rehabilitation and Reconstruction aimed at improving the State of Good Repair for the region's infrastructure. Additionally, investments in the RTP investment category, Infrastructure Resiliency, will contribute to improved conditions of the transportation system.

Given the fiscal constraints of transportation funding, performance-based planning can help identify the best cost-effective projects to so the investment decisions in our transportation system will be allocated to the highest priorities of the pavement or bridge asset preservation program. In addition to designated reconstruction and rehabilitation projects, every added capacity, new construction, Complete Street, grade separation and access management project will contribute to achieving the pavement and bridge performance targets. As a result, the projects programmed in the RTP 2045 are expected to have a positive impact on achieving the pavement and bridge performance targets.

The challenge with transportation asset management is that H-GAC has the responsibility to report progress, but MPOs don't control the management of the transportation assets. Not all NHS roadways are owned and maintained by the TxDOT. For the non-interstate NHS roadways, 66% are owned by TxDOT and 34% are owned by other agencies. For the interstates, 100% are state-owned. H-GAC is coordinating NHS pavement data sharing between TxDOT and Non-TxDOT agencies.

H-GAC facilitates the dialogue and discussion between TxDOT and local agencies to serve as the conduit for information sharing. In addition, H-GAC is facilitating the coordination with other agencies, data sharing, understanding how each agency measures and collects data, discussing uniform data collection, and understanding the future investment plans for NHS roadways with TxDOT. Currently, the TxDOT is committed to expanding their data collection to align with the federal measures. One of the positive outcomes of Transportation Asset Management is that it affords the opportunity to focus and collaborate with all agencies responsible for the maintenance of our critical transportation network.

Of particular challenge, the tremendous increase in population and truck traffic, expected in the Houston-Galveston region over the next twenty-five years, will add additional wear and tear and will impact the targets for pavements and bridges.

2025–2028 TIP and 2045 RTP Update transportation investments targeting pavement and bridge improvements

H-GAC, along with state and local government partners, has made significant investments in transportation infrastructure improvements through the 2040 Regional Transportation Plan, the 2025-2028 Transportation Improvement Program (TIP), and the 2045 Regional Transportation Plan Update. The investments of new roadways, roadway expansions, preventive maintenance, rehabilitation, and bridges are expected to contribute towards achieving the Pavement and Bridge Performance Targets. A combined effort of planning, programming of projects, collaborative data sharing, and critical transportation

investments are expected to support and contribute to achieving the asset management targets for pavement and bridge while moving the system to a State of Good Repair. In the 2025-2028 TIP, a total of approximately $543 million is programmed for Category 1 (Preventive Maintenance and Rehabilitation) that includes $433 million specifically for National Highway System roadways. In the 2025-2028 TIP, a total of approximately $266 million is programmed for Category 6 (Structures Replacement and Rehabilitation) that includes $132 million specifically for National Highway System bridges. These are programming amounts by the Texas Department of Transportation Houston and Beaumont Districts.

H-GAC has made strategic investments in transportation infrastructure improvements through the 2045 RTP Update. The fiscally constrained 2045 RTP Update recommends a significant level of investments in pavement and bridges and recommends approximately $48 billion of investments for State of Good Repair projects and programs. Other types of projects, such as new roadways and highways, thoroughfare expansions, reconstructions, Complete Streets, and other improvements are expected to make additional contributions toward the State of Good Repair.

Table B-24: 2045 RTP Asset Management Investments

RTP 2045	Strategy 2 - MAINTAIN [Asset Management]
Corridor-Based Major Investments & Regional Investment Programs	$48,464,706,593

Pavement and Bridge Resources

Condition of Texas Pavements: Pavement Management Information System (PMIS) Annual Report - https://library.ctr.utexas.edu/Presto/content/Detail.aspx?ctID=UHVibGljYXRpb25fMTE2MTA=&rID=MjcwODU=&ssid=c2NyZWVuSURfMTQ2MDk=

Texas Transportation System Performance Dashboard Pavement and Bridges- http://www.dot.state.tx.us/dashboard/preserving-our-assets.htm

National Bridge Inventory - https://www.fhwa.dot.gov/bridge/nbi.cfm

SYSTEM PERFORMANCE

The System Performance Group contains a set of performance measures aimed at evaluating and improving the overall performance of the National Highway System. These measures focus on personal travel, as well as freight, reducing congestion and tailpipe emissions, and increasing multi-occupancy vehicles use. Improving the system performance of the transportation network means there will be more reliable and less congested roadways, an increased use of alternative transportation modes and an increase in multi-occupancy commuting vehicles, resulting in less vehicle emissions.

States and MPOs must establish two and four-year targets and may adjust four-year targets at the Mid-Performance Period Progress Report in 2020 and 2024. The first federal performance period began January 1, 2018 and ended December 31, 2021. The second federal performance period began January 1, 2022 and ends December 31, 2025. Updates to H-GAC's regional targets are formulated with the analyses of TxDOT's statewide data and TxDOT's revisions to statewide System Performance targets at the beginning of the performance period and may be adjusted at , the midpoint of the performance period.

Reliability

One of the goals of System Performance Measures is to assess the reliability of the National Highway System. Travel reliability is when the travel time on a roadway remains consistent. Reliability measures the difference of travel time across hour and day for both personal travel and freight and examines peak travel over a year. Essentially, the measure of travel reliability compares a bad day of traffic to a normal day.

Three travel time reliability performance measures are:

- Personal travel time on the interstate
- Personal travel time on the non-interstate roadways of the National Highway System
- Truck travel time on the interstate

The Reliability measures utilize two metrics:

- Level of Travel Time Reliability (LOTTR) ratio for personal travel. LOTTR measures the difference of travel time across hour and day. Expressed as a ratio, LOTTR is the ratio of travel time in a bad condition in relationship to the travel time in an average condition. LOTTR ratios below a 1.50 threshold are labeled as "reliable". The measure is calculated separately for the interstate and the non-interstate segments of the National Highway System.
- Truck Travel Time Reliability Index (TTTR) for truck travel on the interstate highways.

PERSONAL TRAVEL

Figure B-25: Level of Time Reliability (LOTTR) Performance Measure Statistics

Measure (LOTTR) – Percentage of person-miles traveled on the National Highway System that are reliable, as defined by the measure, the Level of Travel Time Reliability (LOTTR). LOTTR is a ratio of the 80th percentile (bad day of traffic) to the 50th percentile (normal) travel time for a roadway segment. A ratio below 1.5 is considered to be "reliable"; and a ratio of 1.5 or greater are "unreliable".

Reporting is divided into four time periods:

Weekday (AM Peak) 6 a.m. to 10 a.m. Weekday (Mid-day Peak) 10 a.m. to 4 p.m.
Weekday (PM Peak) 4 p.m. to 8 p.m. Weekend Peak 6 a.m. to 8 p.m.

If the roadway segment is unreliable during any one of the four time periods, the roadway segment is labeled as "unreliable".

Methodology – Reliable person-miles are calculated using data from the National Performance Management Research Data Set (NPRMDS) which contains travel time by roadway segment every 15 minutes. The average occupancy value used for the Houston-Galveston region is 1.69.

Developed in collaboration with the twenty-five Texas Metropolitan Planning Organizations, the Texas Transportation Institute (TTI) calculated Level of Travel Time Reliability (LOTTR) targets for the entire state. Their methodology is based on an assumed growth of regional travel demand, but does not consider potential travel time improvements from upcoming projects in the Transportation Improvement Program and the Regional Transportation Plan, such as added capacity projects, the Tow & Go Program and TranStar. The methodology assumes that anything close to being unreliable now is expected to be unreliable in the future. The NPRMDS data was collected by HERE Technologies from 2014 to 2016. In 2017, FHWA changed the vendor to INRIX which created data inconsistencies for target setting.

The range for reliable is 0% to 50% and unreliable is 51% or greater (times than average). For example, for a trip that normally takes 60 minutes, on a bad day of traffic, it will take 90 minutes or more (60 mins. x 50% = 90 mins.), therefore, the trip is considered to be unreliable. Based on the TTI methodology used across the state, for the Houston region, currently, 63% of person-miles traveled on the Interstate are reliable and is forecasted to be 50% reliable by 2022, with less reliability. As illustrated in the table below, the Non-Interstate National Highway System roadways in the region are more reliable than the Interstate. The higher the percentage, the more reliability there is.

Applicability – All roadways on the National Highway System

Reporting Frequency – Biennially with four-year performance periods

Targets and Conditions (LOTTR) - Despite the fact that the TTI methodology indicates that reliability conditions for personal travel are worsening, H-GAC chose to adopt flat targets with a desire for aspirational goals that indicate better reliability in the long-term.

Performance Measure	Baseline	2020 Target	2022 Target
Percent of Person-Miles traveled on the Interstate that are Reliable / (LOTTR)	63%	63%	63%
Percent of Person-Miles traveled on the Non-Interstate NHS that are Reliable / (LOTTR)	73%	73%	73%

For the reliability measures of personal travel and truck/freight travel, States and MPOs must establish two and four-year targets and may adjust four-year targets at the mid-point of the four-year performance period. The second performance period begins January 1, 2022 and ends on December 31, 2025 and is for the Calendar Years (CY) of 2022 - 2025. For the reporting of the 2022 baseline and future 2024 and 2026 targets, refer to the 2022 System Performance Measures Reporting and Scorecards Report on page B-64.

FREIGHT TRAVEL

Freight movement is assessed by the Truck Travel Time Reliability (TTTR) Index on the interstate. The truck reliability measure considers factors that are unique to the freight industry, such as the use of the transportation system during all hours of the day and the need to consider impacts to the system in

planning for on-time deliveries and arrivals. Recognizing the importance of on-time deliveries, this measure assesses the reliability of freight movement on the interstate with a high standard of making on-time deliveries, 95% of the time.

Figure B-26: Travel Truck Time Reliability Performance Measure Statistics

Measure (TTTR) – Truck Travel Time Reliability ratio is calculated by dividing the 95th percentile travel time (very bad day of traffic) by the 50th percentile (normal) travel time for each roadway segment of the interstate. The TTTR index is generated by multiplying each segment's largest ratio of the five time periods by its length, then dividing the sum of all length-weighted segments by the total length of the interstate.

Reporting is divided into five time periods:

Monday through Friday:

- Morning peak 6 a.m. to 10 a.m.
- Mid-day 10 a.m. to 4 p.m.
- Evening peak 4 p.m. to 8 p.m.

Weekends: 6 a.m. to 8 p.m.

Overnights for all days: 8 p.m. to 6 a.m.

Methodology – The TTTR index is calculated using data from the National Performance Management Research Data Set (NPRMDS) which contains travel time by roadway segment every 15 minutes.

Developed in collaboration with the twenty-five Texas Metropolitan Planning Organizations, the Texas Transportation Institute (TTI) calculated Truck Travel Time Reliability targets for the entire state. The methodology is based on an assumed 2% annual growth of truck unreliability, but does not consider potential travel time improvements from upcoming projects in the Transportation Improvement Program and the Regional Transportation Plan, such as added capacity projects, the Tow & Go Program and TranStar. The NPRMDS data was collected by HERE Technologies from 2014 to 2016. In 2017, FHWA changed the vendor to INRIX which created data inconsistency problems for target setting.

Based on the TTI methodology used across the state, for the Houston region, the baseline for Truck Travel Time Reliability (TTTR) index is 2.1. The truck index is the amount of time a truck driver needs to add to a median trip length to arrive on-time, 95% of the time. For example, for a truck trip of 30 minutes, using the regional baseline of 2.1, a total time of 63 minutes would need to be scheduled for the truck to arrive, on-time, 95% of the time. (30 mins x 2.1 baseline = 63 mins)

Applicability – Interstate highways

Reporting Frequency – Biennially with four-year performance periods

Targets and Conditions - Despite the fact that the TTI methodology forecasts freight reliability conditions are worsening, H-GAC chose to adopt flat targets with the goal of maintaining current conditions and a desire for aspirational goals that indicate better truck reliability in the long-term. Better estimates and targets may be updated after two years when improved datasets are available.

Performance Measure	Baseline	2020 Target	2022 Target
Truck Travel Time Reliability Index on the Interstate	2.1	2.1	2.1

For the reporting of the 2022 baseline and future 2024 and 2026 targets, refer to the 2022 System Performance Measures Reporting and Scorecards Report on page B-64.

Congestion

FHWA established two performance measures to assess traffic congestion applicable to metropolitan planning organizations who receive Congestion Mitigation Air Quality (CMAQ) funding.

- Annual Hours of Peak Hour Excessive Delay Per Capita
- Percent of Non-Single Occupancy Vehicles

Annual Hours of Peak Hour Excessive Delay (PHED) – This measure refers to the additional time spent in congested traffic, in addition to the regular peak hour congestion, based on an established speed threshold. The federal threshold for excessive delay on a roadway is 60% of the speed limit. On a segment with a speed limit of 60 mph, the excessive delay (60% of 60 mph) would be 36 mph. Peak periods are defined as Monday through Friday 6:00 a.m. to 10:00 a.m. and 3:00 p.m. to 7:00 p.m.

Figure B-27: Annual Hours of Peak Hour Excessive Delay (PHED) Performance Measure Statistics

Measure (PHED) – Annual Hours of Peak Hour Excessive Delay (PHED) per capita - This is the number of extra travel time spent in peak traffic, under excessive delay conditions, annually.

Methodology – The PHED is calculated using all vehicle data from the National Performance Management Research Data Set (NPRMDS) which contains travel time by roadway segment every 15 minutes, with volumes in the Highway Performance Monitoring System (HPMS) and occupancy factors.

TxDOT enlisted the Texas Transportation Institute (TTI) to establish a statewide methodology and recommend future year targets for all MPOs in the state for the System Performance Group. TTI calculated the base-year measurement from observed data and formulated future year targets. The TTI methodology does not include estimates for the impact of project investments and congestion mitigation projects that H-GAC is implementing at a regional level.

Applicability – National Highway System in urbanized areas

Reporting Frequency – Biennially with four-year performance periods

Targets and Conditions - Based on the feedback received by TAC members during the October 2, 2018 TAC Workshop, staff has proposed to use the TTI methodology for the baseline and set targets for 2020 and 2022 to be same as the 2018 baseline numbers for Percent of Trips that are Annual Hours of Peak Hour Excessive Delay. H-GAC adopted flat targets. Better estimates and targets may be updated after two years when improved data sets are available.

Congestion Performance Measure	Baseline	2020 Target	2022 Target
Annual Hours of Peak Hour Excessive Delay per capita	14	14	14

For Peak Hour Excessive Delay, States and MPOs must establish two and four-year targets and may adjust four-year targets at the mid-point of the four-year performance period. The second performance period begins January 1, 2022 and ends on December 31, 2025 and is for the Calendar Years (CY) of 2022 - 2025. For the reporting of the 2022 baseline and future 2024 and 2026 targets, refer to the 2022 System Performance Measures Reporting and Scorecards Report on page B-64.

Percent of Trips that are made in Non-Single Occupancy Vehicles (Non-SOV) – The goal of this measure is focused on reducing congestion by increasing the number of work trips where commuters are sharing a ride with others. In the H-GAC region, 78.9% of commuters drive alone and 21.1% of commuters are sharing a ride, such as carpooling, using regional vanpool, riding public transportation, walking, bicycling and other means.

Figure B-28: Percent of Trips that are Non-SOV Performance Measure Statistics

Measure (Non-SOV) – Percent of Trips that are Non-SOV, any travel mode other than driving alone in a motorized vehicle, including travel avoided by telecommuting, based on work commute types.

Methodology – Percent of Trips that are Non-SOV is calculated from H-GAC's travel demand model and compared with the U.S. Census American Community Survey data.

Applicability – All roadways in the urbanized areas of the 8-county H-GAC region.

Reporting Frequency – Biennially with four-year performance periods

Targets and Conditions – Based on the feedback received by TAC members during the October 2, 2018 TAC Workshop, staff considered using the TTI methodology for the baseline and set targets for 2020 and 2022 to be same as the 2018 baseline numbers for the Percent of Trips that are made in Non-Single Occupancy Vehicles. For the Percent of Non-Single Occupancy Vehicles measure, staff utilized the H-GAC travel demand model for target setting. Based on the model data and calculations, staff projected the mode share for Non-SOV to grow due to strategies implemented at the regional level. In light of the H-GAC region's forecast of high levels of economic and population growth, resulting in more travel and commuters, H-GAC chose to adopt targets with a desire for aspirational goals that indicate an increase in multi-occupacy vehicle use in the long-term.

Congestion Performance Measure	Baseline	2020 Target	2022 Target
Percent of Trips in Non-Single Occupancy Vehicles	20.1%	21.1%	22.1%

For Percent of Trips that are made in Non-Single Occupancy Vehicles~~,~~ States and MPOs must establish two and four-year targets and may adjust four-year targets at the mid-point of the four-year performance period. The second performance period begins January 1, 2022 and ends on December 31, 2025 and is for the Calendar Years (CY) of 2022 - 2025. For the reporting of the 2022 baseline and future 2024 and 2026 targets, refer to the 2022 System Performance Measures Reporting and Scorecards Report on page B-65.

Air Quality / On-Road Mobile Source Emissions Measures

FHWA established air quality performance measures to assess vehicle emissions with a goal of reducing emissions resulting in better air quality. Congestion Mitigation Air Quality performance measures are applicable to areas designated nonattainment or maintenance for ozone, carbon monoxide or particulate matter. The Houston-Galveston Area council is required to set targets for on-road mobile source emission reductions and to develop a CMAQ Performance Plan. The reporting period is biennially, with four-year performance periods.

Due to the requirements from the FAST Act, MPOs that receive Congestion Mitigation and Air Quality Improvement (CMAQ) funds must work with state DOTs to develop performance management targets for the Nitrogen Oxide (NOx) and Volatile Organic Compound (VOC) emissions reduced by projects programmed with CMAQ funding. For the Houston-Galveston region, this includes targets for NOx and VOC emissions. In response to this requirement, the Texas Department of Transportation reached out to the MPOs in Texas nonattainment regions for collaboration in the development of emissions reduction estimates. Through consultations with H-GAC and two other nonattainment MPOs, an alternative methodology was developed. The baseline and performance targets shown in the table below were developed using current CMAQ projects and their actual emissions from projects scheduled from 2018 through 2022 as part of the Transportation Improvement Program.

In 2020, at the midpoint of the performance period, rather than base the revised four-year target on a direct accounting of planned projects as was done initially, H-GAC has used a revised methodology that was devised in conjunction with the Texas Department of Transportation and other Metropolitan Planning Organizations within Texas. This new methodology takes the variability of regional transportation projects into account. The revised four-year target uses a combination of verified outcomes from 2018 and 2019, as reported to the FHWA CMAQ Public Access System, as well as an estimate of future project outcomes derived from an average of Houston-Galveston region CMAQ projects funded over the last four full fiscal years between 2016 and 2019. This average was then doubled to determine an estimate of CMAQ-funded emissions reductions for fiscal years 2020 and 2021. Finally, the results from 2018 and 2019 were added to the averages for 2020 and 2021 to determine an estimated revised four-year target. Finally, this estimate is reduced by approximately 65% to account for the anticipated annual improvements to regional emissions due to on-road fleet turnover. The revised four-year target resulting from this analysis can be found in the table below. The full summary of the history and methodology of setting baselines and targets are documented in the CMAQ Performance Plan for the first performance period. The four-year emission reduction target from CMAQ funded projects is a conservative estimate, as once the 2023 Call for Projects are submitted and approved, more CMAQ funded projects are likely to be added which will increase the expected emissions reduced.

Figure B-29: Emission Reduction Baseline and Performance Measure Targets

Targets and Conditions – H-GAC adopted the emission reduction baseline and performance targets for Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC) expressed in kilograms per day.

On-Road Mobile Source Emission Reductions				
Performance Measure	2018 Baseline	2020 2-Year Target	2022 4-Year Target	2022 Adjusted 4-Year Target
Emission Reductions NO_x (kg/day)	453.741	1,419.426	1883.294	1,429.077
Emission Reductions VOC (kg/day)	66.850	169.301	200.809	234.604

For the Total Emissions Measure, States and MPOs must establish two and four-year targets and may adjust four-year targets at the mid-point of the four-year performance period. The second performance period began on October 1, 2021 and ends on September 30, 2025 and is based on emission reductions from CMAQ funded projects in the Federal Fiscal Years of 2022 to 2025. Regarding the second performance period, a reporting of 2022 baseline and future (2024 & 2026) targets, refer to the 2022 System Performance Measures Reporting and Scorecards Report on page B-65 and the CMAQ Performance Plan.

Integrating System Performance Measures into the Transportation Planning Process

Moving People and Goods Efficiently and Strengthen Regional Economic Competitiveness are two of the five foundational goals of the Regional Transportation Plan, H-GAC is integrating the System Performance targets in the form of quantifiable strategies within the regional transportation planning process. H-GAC incorporates performance measures into its programming activities through the core strategy, Manage, as related to system management and operations.

The RTP 2045 project evaluation system was intended to be performance-based for prioritizing projects for the region. The primary method for the programming of projects is the Call for Projects. Fifty percent of the project's score is calculated from benefit cost analyses in three key areas: reduction of travel delay, on-road vehicle emissions reductions, and safety improvements to reduce crashes. With a heightened focus on the improving the performance of the transportation system, the benefit cost analysis types have a direct linkage to the reliability, congestion, and air quality performance measures.

2025–2028 TIP and 2045 RTP Update transportation investments targeting improvements to System Performance

H-GAC, along with state and local government partners, have made strategic investments in transportation infrastructure and programs through the 2045 RTP Update. The fiscally constrained 2045 RTP Update recommends a significant level of investments for System Performance. A combined effort

of planning, programming of projects, improved data collection, and critical transportation investments are expected to support and contribute to achieving the targets for System Performance.

Reliability and Congestion – The fiscally-constrained 2045 RTP recommended approximately $37 billion of investments of Corridor-based Major Investments and Regional Investment Programs from the 2045 RTP Strategy 1, Manage for addressing Reliability and Congestion, as shown in the table below.

Table B-30: 2045 RTP Corridor-Based Major Investments/Regional Investment Programs

RTP 2045	Strategy 1 - MANAGE [System Management and Operations]
Corridor-Based Major Investments & Regional Investment Programs	$37,004,441,916

Additionally, a total of $8.4 billion is programmed in the 2025-2028 Transportation Improvement Program which is expected to contribute towards achieving the Reliability and Congestion targets.

Table B-31: 2025-2028 TIP Funds Programmed Towards Achieving Reliability and Congestion Targets

Transportation Improvement Program Investments	
Category 2 – Metropolitan and Urban Area Corridor Projects	$2,403,959,681
Category 4 – Statewide Connectivity Corridors Projects	$1,771,499,278
Category 5 – Congestion Mitigation and Air Quality Improvement	$746,758,937
Category 7 – Surface Transportation Block Group/ Metropolitan Mobility & Rehabilitation	$1,032,061,036
Category 12 – Strategic Priority & Texas Clear Lanes	$3,447,351,198
Total	**$8,369,569,094**

Air Quality – Total Emission Reductions - The fiscally-constrained 2045 RTP recommended approximately $46.7 billion of investments of in the categories of ITS/Safety, Local High Capacity Transit, Pedestrian/Bicycle, Transit Capital Program and Air Quality projects and programs for improving air quality and achieving the performance targets, as described in the table below. These investments are not part of the Corridor-based Major Investments of the 2045 RTP.

Table B-32: 2045 RTP Air Quality - Total Emission Reduction Investment

RTP 2045 STRATEGIES	STRATEGY 1 MANAGE [System Management and Operations]	STRATEGY 2 MAINTAIN [Asset Management]	STRATEGY 3 EXPAND [Transportation Network Capacity]	TOTAL
REGIONAL INVESTMENT PROGRAMS				
Air Quality Related	$254,598,000	NA	NA	$254,598,000
ITS/Safety: (Includes certain roadway improvements, installation of computerized traffic control systems, Incident Management)	$517,457,158	$62,269,438	NA	$579,726,596
Local High Capacity Transit: (Includes non-corridor light rail, park and ride, transit centers, demand management strategies)	$15,908,231,556	$99,598,227	$13,790,549,267	$29,798,379,050
Pedestrian/Bicycle: (Includes on-street facilities, hike and bike trails and paths, and reconstruction)	$130,247,249	$51,178,297	$1,626,470,674	$1,807,896,220
Transit Capital: (Includes all other new or expanded facilities, services, and vehicles)	$4,272,120,809	$2,404,429,566	$7,669,280,587	$14,345,830,962
TOTAL	**$20,082,654,772**	**$2,617,475,528**	**$23,086,300,528**	**$46,786,430,828**

Air Quality

Additionally, a total of $789 million is programmed in the 2025-2028 Transportation Improvement Program which is expected to contribute towards achieving the air quality targets.

Table B-33: 2025-2028 TIP Investments Towards Achieving Air Quality Targets

Transportation Improvement Program Investments	
Category 5 – Congestion Mitigation Air Quality (CMAQ) Improvement	$746,758,937
Category 9 – Transportation Alternatives Program (TAP) /TA Set Aside (Grouped Projects)	$42,128,736
Total	**$788,887,673**

TRANSIT ASSET MANAGEMENT

The Moving Ahead for Progress (MAP-21), Final Rule 49 USC 625 established a strategic and systematic process of operating, maintaining, and improving public capital assets effectively through their entire life cycle. This rule became effective October 2016 and includes the definition of "Transit Asset Management Plan" (TAM) and "State of Good Repair". Additionally, the rule establishes performance measures for equipment, rolling stock, infrastructure, and facilities asset categories to assist when making investment decisions. Transit providers that receive federal funds and either own, operate or manage capital assets used in providing public transportation are required to develop and implement TAM Plans and submit performance measures, annual condition assessments, and targets to the National Transit Database.

Transit Asset Management is a strategic and systematic process of operating, maintaining, and improving public capital assets effectively through their entire life cycle. The capital asset inventories include transit rolling stock (revenue vehicles), non-revenue vehicles, equipment, facilities, and rail infrastructure. Investment prioritizations, decision support tools, as well as, risk mitigation, maintenance, acquisition and renewal strategies are the core activities of the TAM Plans.

The majority of the assets in our region belong to Tier I provider METRO. The Tier II providers that receive FTA Section 5307, 5310 & 5311 funding can either set their own targets, as direct recipients, or opt to be included in TxDOT's Group Plan. Colorado Valley Transit was the only provider that opted to be included with TxDOT's Group Plan. H-GAC collaborated with TxDOT, Tier I, and Tier II providers to set regional targets, as required by the Final Rule.

Tier I transit providers:

- METRO (Harris County Metropolitan Transit Authority)
- Island Transit (Galveston)

Tier II transit providers:

- Brazos Transit District
- Colorado Valley Transit
- Connect Transit / Gulf Coast Transit District
- Conroe Connection Transit
- Fort Bend Transit
- Harris County Transit
- The Woodlands Transit

The Regional Transit Coordination Committee held meetings during 2017 and 2018 to discuss the process required to formulate TAM Plans and targets. In May 2018, the Transportation Policy Council (TPC) approved an interagency Memorandum of Understanding between the region's transit operators, TxDOT, and H-GAC to facilitate regional collaboration and promote a performance-based planning process.

H-GAC led the coordination efforts for initial target setting and TAM Plan development with the Regional Transit Coordination Subcommittee (RTCS) and the Texas Department of Transportation in 2018. The RTCS established a TAM Plan Working Group with the objective of developing H-GAC regional targets and to promote State of Good Repair of capital assets. The working group formulated a methodology for the regional targets in the four areas of rolling stock, equipment, facilities, and infrastructure. The TAM Plan Working Group endorsed a methodology for setting the region's targets based on a weighted average of asset management scores for Tier I and Tier II transit providers for their rolling stock, equipment, facilities, and rail infrastructure.

Transit Asset Management Performance Measures	
Rolling Stock (revenue vehicles)	Percent of vehicles that have met or exceeded their **Useful Life Benchmark***
Equipment (non-revenue vehicles)	Percent of non-revenue vehicles that have met or exceeded their **Useful Life Benchmark***
Facilities (buildings and structures)	Percent of facilities with a condition rating of Marginal or Poor (rating below 3.0 on the **TERM Scale****)
Infrastructure (rail tracks, signals & systems)	Percent of rail infrastructure with performance/speed restrictions

***Useful Life Benchmark (ULB)** is the expected lifecycle of a capital asset for a transit provider's operating environment, or the acceptable period of use in service for a transit provider's operating environment.
****Transit Economic Requirements Model (TERM) Scale:** Facility condition assessments reported to the National Transit Database (NTD) have one overall TERM rating per facility.

TERM Scale Condition Rating	Rating Range
Excellent	5.0 – 4.8
Good	4.7 – 4.0
Adequate	3.9 – 3.0
Marginal	2.9 – 2.0
Poor	1.9 – 1.0

The FTA requires public transportation providers to update their Transit Asset Management (TAM) Plans annually, adjust targets and report progress toward their targets. Additionally, H-GAC is required to update the regional TAM targets and report progress with each new or update to the Transportation Improvement Program (every two years) and the Regional Transportation Plan (RTP) every four years. Annually, H-GAC monitors and gathers updates to the transit provider's TAM Plans for their impact to the regional targets. Updates to H-GAC's regional TAM targets are formulated with the review and analyses of the region's transit providers, the Regional Transportation Coordination Subcommittee, and the Transportation Advisory Committee. The Texas Department of Transportation is represented in these H-GAC committees. At the mid-point of the performance period, in 2020, H-GAC reported the achievement of the 2020 targets, and the 2022 regional TAM target for Rolling Stock was adjusted from 11% to 10%, due to the improved State of Good Repair of the region's assets. The 2020 Mid-Performance Period Performance Report documents the 2020 target achievements and adjustments to the 2022 Rolling Stock TAM target.

In 2022, based on data collection of the region's transit provider's TAM Plans, and an improvement to the region's assets, H-GAC reported target achievement of 2022 targets across the four asset categories. Notably, for the Facilities measure, the percent of facilities with a condition rating of Marginal or Poor was 55% in 2020 and the assets improved to 45% in 2022. Since a lower percentage indicates better conditions of the transit assets, this is an indication of the region's transit assets are moving to a State of Good Repair. There are over $40 million transit investments in the region from METRO, the City of Conroe, and The Woodlands Township that are expected to help move the region's assets to an improved State of Good Repair. Additionally, Fort Bend County Transit is investing in 28 buses for a new service to downtown.

Based on the weighted average method, the 2024 and 2026 regional targets were reviewed and approved by the Regional Transit Coordination Subcommittee and the Transportation Advisory Committee in 2022. The Transportation Policy Council approved the regional transit targets on May 20, 2022, as described in the following table.

Table B-34: Transit Asset Management (TAM) Performance Measures Targets by Asset Category

TAM Performance Targets and Actuals by Year									
	2018	2020			2022			Targets	
Asset Category	Baseline	Targets	Actuals	Target Met?	Targets	Actuals	Target Met?	2024	2026
Rolling Stock (revenue vehicles)	11%	11%	10%	✔	10%	10%	✔	10%	10%
Equipment (non-revenue vehicles)	46%	46%	46%	✔	46%	46%	✔	46%	46%
Facilities (buildings and structures)	55%	55%	55%	✔	54%	45%	✔	45%	45%
Infrastructure (rail tracks, signals & systems)	0%	0%	0%	✔	0%	0%	✔	0%	0%
Note: A lower percentage indicates better conditions of the transit assets.									

TRANSIT SAFETY

On July 19, 2018, the Federal Transit Administration (FTA) published the Public Transportation Agency Safety Plan (PTASP), Final Rule, which requires transit providers who are recipients and subrecipients of federal transit assistance under FTA's Urbanized Area Formula Grants (5307) to develop safety plans and Safety Management Systems focused on protecting passengers and employees. The objective of Safety Management Systems is to create a collaborative approach for management and labor to work together to identify risk, control risk and allocate resources to mitigate risk.

The requirements of a Public Transportation Agency Safety Plan (PTASP) include:

- Processes and procedures to implement Safety Management Systems
- Safety Performance Targets
- Employee Reporting Program
- Emergency Preparedness Plan (applies to rail agencies)

Table B-35: Public Transportation Agency Safety Plan Performance Measures

Measure	Metric
Fatalities	Total amount and rate of fatalities per total vehicle revenue miles by vehicle mode. Fatalities are a confirmed death within 30 days of a reported event.
Injuries	Total amount and rate of injuries per total vehicle revenue miles. Injuries requiring medical attention for two or more individuals are reported.
Safety Events	Total amount and rate of safety events per total vehicle revenue miles. Events are a collision, derailment, fire, hazardous material spill, or evacuation.
System Reliability	Mean distance between major mechanical failures is calculated by the total number of vehicle revenue miles divided by major mechanical failures.

Public transit operators must certify they have a safety plan in place meeting the requirements of the FTA Final Rule and set safety performance targets by December 31, 2020. Transit operators report past performance along with setting targets for future goals. All transit agencies incorporated Vision Zero with respect to fatalities in their targets. The Public Transportation Agency Safety Plan (PTASP) must be updated and certified by the transit agencies annually. As the Metropolitan Planning Organization (MPO), H-GAC set regional transit safety targets. FTA suggests that MPOs identify one regionwide target for each of the seven measures by transit mode. The goal is to enable the MPO to assess progress towards region-wide attainment of transit safety and a State of Good Repair and better determine how funding decisions support regional targets. In addition, the FTA Final Rule establishes new requirements for MPOs to coordinate with transit providers, set performance targets, and integrate those performance targets and performance plans into their planning documents.

In early 2021 and 2023, in coordination with the region's transit providers, the Texas Department of Transportation, the Regional Transportation Coordination Subcommittee, the Transportation Safety Committee, the TIP and RTP Subcommittees, and the Transportation Advisory Committee, H-GAC formulated Public Transportation Agency Safety Plan (PTASP) the performance targets as stipulated in 23 CFR 450.306 (d) (4). Consistent with FTA guidelines for Transit Asset Management, H-GAC divides transit agencies into two reporting tiers to develop aggregate targets. H-GAC developed performance targets for Tier I and Tier II transit agencies based on the transit agency's PTASPs. The FTA requires public transportation providers to update their PTASP annually and report progress toward achieving targets. Additionally, H-GAC is required to update public transportation safety targets and report progress with each new or update to the Transportation Improvement Program every two years and the Regional Transportation Plan (RTP) every four years.

Tier I Target Setting Methodology and Results

Tier I public transportation providers are transit agencies that operate a rail fixed guideway public transportation system or have 101 or more vehicles in revenue service during peak regular service. Tier I agencies include the Metropolitan Transportation Authority of Harris County (METRO) and Island Transit in Galveston. METRO comprises approximately 95% of all total transit vehicle revenue miles in the Houston-Galveston region. Targets for Tier I are driven primarily by METRO's data due to the size of the agency's transit service.

In alignment with the region's goals of Vision Zero, METRO and Island Transit have set aspirational targets of zero fatalities related to all three modes: rail, fixed route, and demand response, and the Tier II transit agencies have set future targets to zero to align with the region's Vision Zero Policy set by the Transportation Policy Council. Targets for injuries, safety events, and Mean Distance Between Failures (MDBF) remain relatively consistent with their five-year rolling averages between 2015 and 2019, as submitted to FTA with its 2020 targets. For Tier I, across all modes, roughly half of the targets were met. For targets that were not met, the effects of COVID and driver shortages and higher turnover rates may have played a role in targets that weren't achieved. For both Tiers, the region's 2023 targets are set for the absolute number of injuries to improve or remain level across service areas as compared with the 2021 Target or 2021 actual performance. With vehicle revenue miles in flux due to service changes related to COVID, the injury rates in some cases may see a slight increase. The one exception is for the Bus Rapid Transit mode, which is a new service set to expand with insufficient history to analyze a five-year average. The Tier I 2021 regional PTASP targets, detailed in the following table were approved by the Transportation Policy Council on June 25, 2021, and the 2023 targets on April 28, 2023.

Table B-36
Tier I* Regional Performance and Targets
Transit agencies operating rail service or greater than 100 vehicles
Public Transportation Agency Safety Plan

Rates per 100,000 Vehicle Revenue Miles	Mode	2021 Targets	2021 Actuals	2023 Targets
Fatalities	Bus	0	4	0
Fatality Rates		0	0.008	0
Injuries		194	203	175
Injury Rates		0.258	0.426	0.425
Safety Events		136	265	136
Safety Event Rates		0.258	0.556	0.33
Mean Distance Between Failures		10,084	7,503	6,750
Fatalities	Paratransit	0	0	0
Fatality Rates		0	0	0
Injuries		35	41	35
Injury Rates		0.174	0.258	0.174
Safety Events		39	32	39
Safety Event Rates		0.19	0.202	0.289
Mean Distance Between Failures		22,039	25,346	21,000
Fatalities	Rail	0	1	0
Fatality Rates		0	0.032	0
Injuries		50	32	45
Injury Rates		1.466	1.035	1.886
Safety Events		121	81	100
Safety Event Rates		3.51	2.62	4.715
Mean Distance Between Failures		9,292	17,975	15,000
Fatalities	Bus Rapid Transit	N/A**	0	0
Fatality Rates		N/A**	0	0
Injuries		N/A**	1	10
Injury Rates		N/A**	0.67	2.651
Safety Events		N/A**	2	10
Safety Event Rates		N/A**	1.339	2.651
Mean Distance Between Failures		N/A**	5,417	4,000

The 2021 Actuals are shown in green text for targets achieved, and in red text for targets not achieved.
*Tier I public transportation providers operate a rail fixed guideway transportation system or have 101 or more vehicles in revenue service during peak regular service.
** Bus Rapid Transit service began in August 2020, therefore, there was insufficient data to calculate a 5-year rate.

Tier II Target Setting Methodology and Results

Tier II small public transportation providers have 100 or fewer vehicles in revenue service during peak regular service and do not operate a rail fixed guideway transportation system. Five transit agencies comprise Tier II in the Houston-Galveston region. They are Fort Bend County Transit, Harris County Transit, The Woodlands Township, Gulf Coast Transit District, and Conroe Connection. H-GAC has developed seven regional performance targets for fixed route (including commuter service) and demand response service for this tier. The five agencies in Tier II used a consultant hired by TxDOT to complete their Public Transportation Agency Safety Plan reports. In alignment with the region's goals of Vision Zero, every Tier II transit provider set aspirational targets of zero fatalities related to the two modes of fixed route and demand response. According to the most recent 2019 National Transit Database, the level of vehicle revenue miles for fixed route and demand response services of these five agencies varies considerably. As a result, a calculation of weighted averages to vehicle revenue miles among the Tier II agencies was used to develop the remaining targets. The Tier II 2021 regional PTASP targets, detailed in the following table were approved by the Transportation Policy Council on June 25, 2021, and the 2023 targets were approved on April 28, 2023. For Tier II, all 2021 targets were met.

Table B-37
Tier II* Regional Performance and Targets
Transit agencies operating 100 or fewer revenue vehicles
Public Transportation Agency Safety Plan

Rates per Vehicle Revenue Mile	Mode	2021 Targets	2021 Actuals	2023 Targets
Fatalities	Fixed Route	0	0	0
Fatality Rates		0	0	0
Injuries		0.49	0	0.28
Injury Rates		0.0000008	0	0.0000010
Safety Events		0.82	0.04	0.53
Safety Event Rates		0.000002	0.00000018	0.000002
Mean Distance Between Failures		82,544		150,207
Fatalities	Demand Response	0	0	0
Fatality Rates		0	0	0
Injuries		1.34	3.58	1.68
Injury Rates		0.0000013	0.0000044	0.0000015
Safety Events		1.93	1.8	1.9
Safety Event Rates		0.0000015	0.0000026	0.0000020
Mean Distance Between Failures		386,106	---	288,488

The 2021 Actuals are shown in green text for targets achieved, and in red text for targets not achieved.
*Tier II small public transportation providers have 100 or fewer vehicles in revenue service during peak regular service and do not operate a rail fixed guideway transportation system.

Integrating Transit Asset Management and Transit Safety Performance Measures into the Transportation Planning Process

Both the short and long-range planning processes afford the opportunity for advancing the transportation system to a state of good repair while improving safety and reliability. Two the core strategies of the Call for Projects applicable to Transit Asset Management are: 1). Maintain Asset Management: to improve and preserve the condition of existing transportation infrastructure at the least practicable cost through the application of sound asset management techniques; and 2). Expand Multimodal Network Capacity: add capacity across all modes of travel with a focus on the interconnections between different networks and services that provide users with greater choices. The RTP 2045 project evaluation system was designed to be performance-based when prioritizing projects for the region. To highlight the significance of managing the assets of the transit programs that also has positive impacts on transit safety, the Call for Projects designated four transit investment categories: Transit Priority Infrastructure, Transit Facility State of Good Repair, Transit Passenger Facilities, and Transit Expansion for vehicle purchases. The Transit Investment Strategies for the RTP 2045 are highlighted in the table below.

Table B-38: Transit Investment Strategies

Transit Investment Strategies		
MANAGE *System Management & Operations*	**MAINTAIN** *Asset Management*	**EXPAND** *Transportation Network Capacity*
• Regional Fare Collection • Transit Priority Infrastructure	• Vehicle Replacement and Overhaul • Facility State of Good Repair	• Passenger Facilities (Park & Ride/Pool, Transfer Points, Super Stops, Shelters) • Vehicle Purchase

Given the fiscal constraints of transportation funding, performance-based planning can help identify the best cost-effective projects to so the investment decisions in our transportation system will be allocated to the highest priorities of the Transit Asset Management (TAM) Program and Public Transportation Agency Safety Plans (PTASP). As a result, the projects programmed in the RTP 2045 Update are expected to support and contribute towards achieving the TAM and PTASP performance targets.

2025–2028 TIP and 2045 RTP Update transportation investments targeting improvements to Transit Asset Management and Public Transportation Agency Safety Performance Measures

Regional transit provider's TAM Plans summarize revenue rolling stock vehicles, including buses and light rail vehicles, non-revenue service vehicles, light rail track maintenance right of way assets, public facilities, and operating facilities. TAM Plans have outlined how each provider will monitor, update, and evaluate the TAM plan to ensure continuous improvement. On an annual basis, transit providers will track their agency's progress toward the targets, report on their progress, and have the option to revise their targets, if needed.

Funding will be used to focus on Transit Asset Management (TAM) and Public Transportation Agency Safety Plans (PTASP), and planning, life cycle and safety of equipment, vehicles and other assets and infrastructure used by transit agencies, such as buses and vans, building and other rail assets. Through the implementation of TAM Plans and PTASP, each of the region's transit providers are carefully

evaluating their funding for projects that will contribute to achieving their individual transit asset management and transportation agency safety performance targets. As a result of these activities, TAM Plans are expected to have a significant impact toward achieving the Transit Asset Management and Public Transportation Agency Safety targets.

H-GAC, along with state and local government partners, have made strategic investments in transit projects and programs through the 2045 RTP Update. The fiscally constrained 2045 RTP Update recommends a significant level of investments for transit operations and asset management. A combined effort of collaborative planning, programming of projects, and critical investments in the region's transit system are expected to support and contribute to achieving the targets for Transit Asset Management and Public Transportation Agency Safety Plans. The fiscally constrained 2045 RTP Update recommended approximately $14 billion of investments in the Transit Capital category to achieve a State of Good Repair over the life cycle of transit assets. These investments are not part of the Corridor-based Major Investments of the 2045 RTP Update.

Table B-39: 2045 Regional Transportation Plan Transit Capital Investments to Achieve a State of Good Repair and Improve Public Transportation Safety

RTP 2045 STRATEGIES	STRATEGY 1 MANAGE [System Management and Operations]	STRATEGY 2 MAINTAIN [Asset Management]	STRATEGY 3 EXPAND [Transportation Network Capacity]	TOTAL
REGIONAL INVESTMENT PROGRAMS				
Transit Capital: (Includes all other new or expanded facilities, services, and vehicles)	$4,272,120,809	$2,404,429,566	$7,669,280,587	$14,345,830,962

Additionally, a total of $147.8 million is programmed in the 2025-2028 Transportation Improvement Program which is expected to contribute towards achieving the Transit State of Good Repair and the Public Transportation Agency Safety performance targets.

Table B-40: 2025-2028 Transportation Improvement Program Investments to AchieveTransit State of Good Repair and the Public Transportation Safety Performance Targets.

Transportation Improvement Program Investments	
FTA Section 5337 – State of Good Repair	$56,705,209
FTA Section 5339 – Bus & Bus Facilities	$91,153,198
Total	**$147,858,407**

2022 SYSTEM PERFORMANCE MEASURES REPORTING & SCORECARDS

Reliability, Congestion and CMAQ Air Quality Measures (PM3)

Full Performance Period Progress Report for the First Federal Performance Period (2018-2021) and
Baseline Performance Period Report for the Second Federal Performance Period (2022-2025)

SEPTEMBER 2022

About the System Performance Scorecards

H-GAC is federally required to set performance targets and is reporting if the 2022 performance targets have been achieved. For each of the performance areas, the progress achieved towards meeting the targets are detailed in the tables that follow. For all measures, the 2022 actual conditions are based on the best data available, as of June 2022, therefore, the conditions reported may contain traffic data from 2021 or previous years, as prescribed by federal regulations. As of this writing, the first federal performance period (2018-2021) has ended, and the second performance period (2022-2025) is beginning. From April to September 2022, H-GAC staff worked with the Texas A&M University Transportation Institute, numerous H-GAC Subcommittees, the Transportation Advisory Committee (TAC) and the Transportation Policy Council (TPC) to analyze, discuss and finalize the draft targets and reports. A public comment period was held from July 15 to August 14, 2022.

Understanding the Reliability, Congestion, and Air Quality Measures

Percent of person-miles traveled that are Reliable (Interstates and Non-Interstate National Highway System (NHS) roadways)

Travel reliability is calculated by comparing a bad day of traffic to a normal day using a ratio of the 80th to the 50th percentile. For example, a trip that should normally take 30 minutes can take up to 45 minutes and still be considered "Reliable". A trip is considered "Unreliable" if the trip takes more than 45 minutes. An increase in the reliability percentage indicates better conditions.

Truck Travel Time Reliability Index (Interstates only)

Truck reliability is calculated by comparing a very bad day of traffic to a normal day using a ratio of the 95th to the 50th percentile. There is no official standard for reliable and unreliable in this measure. Unlike the previous reliability measure, the truck reliability measure is an index. The truck index is the amount of time a truck driver needs to add to a median trip length to arrive on-time, 95% of the time. For example, when the truck index is 2.0, for a normal truck trip of 30 minutes, a driver would need to plan for twice the drive time of 60 minutes to arrive, on-time, 95% of the time. A decrease in the truck index indicates better conditions.

Annual Hours of Peak Hour Excessive Delay (NHS roadways in the Houston and Conroe-The Woodlands Urban Areas)

This is the number of extra travel time hours spent in peak traffic, annually. The federal threshold for excessive delay on a roadway is 20 mph or 60% of the speed limit, whichever is greater. On a segment with a speed limit of 60 mph, the excessive delay (60% of 60 mph) would be 36 mph. A decrease of excessive delay hours indicates improvement.

Percent of Trips that are Non-Single Vehicle Occupancy Travel (Commuter trips in the Houston and Conroe-The Woodlands Urban Areas)

The goal of this measure is focused on increasing the number of work trips where commuters are sharing a ride with others, thus reducing congestion. In the Houston Urban Area, 21.1% of commuters are sharing a ride, such as carpooling, using regional vanpool, riding public transportation, telecommuting, walking, bicycling, and by other means, and 78.9% of commuters drive alone. In the Conroe-The Woodland Urban Area, 19.7% of commuters are sharing a ride, and 80.3% of commuters drive alone and. An increased percentage of Non-SOV travel indicates improvement.

Congestion Mitigation Air Quality (CMAQ) On-Road Mobile Source Emission Reductions (in the 8-county region)

FHWA established air quality performance measures to assess on-road vehicle emissions with a goal of reducing emissions resulting in better air quality. These measures look at the Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC) emission reductions from CMAQ-funded projects and programs that went to construction or obligated in a period of two and four years. The target setting methodology uses planned TIP projects for the second federal four-year performance period to calculate future targets. Next, it applies a project delivery success rate determined by using project delivery data from the first performance period to account for difficulties in moving programmed TIP project towards receiving the final federal obligation. An increase in the emission reductions indicates improvement.

Assessment of 2022 Targets and Target Setting for 2024 & 2026

The 2022 targets were achieved, due in part to the COVID-19 pandemic and its effects on travel conditions. Data from 2021 and traffic conditions are used to report 2022 target achievement per federal requirements for reporting performance. The 4-year targets for the Congestion Mitigation Air Quality measures were not achieved. The reasons for not meeting the targets were project delays, some due to COVID, and funding changes from CMAQ to another funding category.

For the performance measures of Person Miles Reliability, Truck Reliability Index, Peak Hour Excessive Delay and Non-Single Occupant Vehicles, considerations for setting 2024 and 2026 targets included a review and analysis of historical traffic conditions and several assumptions, as follows. The COVID-19 Pandemic shifted commuter travel by more employees working from home and the trend is likely to continue. Traffic conditions of 2021 were considered an outlier and future targets were made based on a look back to pre-COVID conditions. Additionally, the region's population continues to grow significantly which will increase vehicle miles traveled, and, in turn, may increase congestion. For future Congestion Mitigation Air Quality (CMAQ) targets, the target setting methodology is based on a project success rate. The project delivery success rate is calculated by comparing the previous projects programmed in the TIP to those projects that came to fruition. The success rate is applied to future TIP projects to create the future 2-year and 4-year targets. The targets and actual performance conditions of the Reliability and Congestion measures are illustrated in the following table.

RELIABILITY & CONGESTION							
	2018 Baseline*	2020 Targets / Actuals	2022 Targets / Actuals	2022 Target achieved?	Desired Trend	2024 Targets	2026 Targets
Interstate Reliability of Person Miles Traveled	65%	63% / 71%	69% / 79%	✓	↑	70%	71%
Non-Interstate Reliability of Person Miles Traveled	75%	73% / 82%	80% / 89%	✓	↑	75%	77%
	(An increased value indicates improvement.)						
Interstate Truck Travel Time Reliability Index	2.0	2.1 / 2.1	2.2 / 1.9	✓	↓	2.2	2.2
Peak Hour Excessive Delay – Houston Urban Area	16.8	14.0 / 14.0	14.0 / 13.5	✓	↓	16.0	16.0
Peak Hour Excessive Delay – Conroe-The Woodlands Urban Area	5.1	NA / 6.4	NA /8.1	Not applicable	↓	8.0	8.0
	(A decreased value indicates improvement.)						

	2018 Baseline*	2020 Targets / Actuals	2022 Targets / Actuals	2022 Target achieved?	Desired Trend	2024 Targets	2026 Targets
Non-Single Occupant Vehicle Trips – Houston Urban Area	20.1%	21.1% / 21.1%	20.0% / 21.1%	✓	↑	21.1%	22.0%
Non-Single Occupant Vehicle Trips – Conroe-The Woodlands Urban Area	18.9%	NA / 19.0%	NA /19.7%	Not applicable	↑	20.0%	20.0%
	(An increased value indicates improvement.)						

**2018 Baselines were updated in 2022 based on updated HPMS and NPMRDS data sets and used for consistency purposes for historical trends when formulating the 2024 & 2026 targets.*

The targets and actual performance conditions of the Congestion Mitigation Air Quality (CMAQ) measures are illustrated in the following table.

CONGESTION MITIGATION AIR QUALITY						
On-Road Mobile Source Emission Reductions						
	2018 Baseline	2020 Targets / Actuals	2022 Targets / Actuals	2022 Target achieved?	2024 Targets	2026 Targets
Emission Reductions of NOx (kg/day)	453.741	1,419.426 / 158.319	1,429.077/ 1,383.040	✗	221.251	601.465
Emission Reductions of VOC (kg/day)	66.850	169.301 / 52.010	234.604 / 98.863	✗	69.939	172.864

Nitrogen Oxides (NOx)
Volatile Organic Compounds (VOC)

Timeline

July 15 to August 14, 2022
Public Comment Period

August 2022
Subcommittees, Transportation Advisory Committee (TAC), and Transportation Policy Council (TPC) Discussion

September 2022
Subcommittees, Transportation Advisory Committee (TAC), and Transportation Policy Council (TPC) Approval