

*Bridging*  
OUR COMMUNITIES

2035



THE 2035 HOUSTON-GALVESTON  
REGIONAL TRANSPORTATION PLAN

**Final — October 26, 2007**

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## 2035 Regional Transportation Plan

*Our community will have a better quality of life through improved mobility, better access and a healthier environment.*

With over 3 million new residents expected by the horizon year of 2035, the new Regional Transportation Plan (RTP) addresses greater regional growth and its attendant mobility needs than any previous plan. Based on expected growth patterns, the demand for vehicle travel will double during the plan's time horizon. The movement of goods, however, may triple in volume over our network of highways and rail corridors during this same time period. As an outcome, mobility on our roadways, transit network and freight rail system may deteriorate to such a level that the assumptions about future growth will become increasingly less likely.

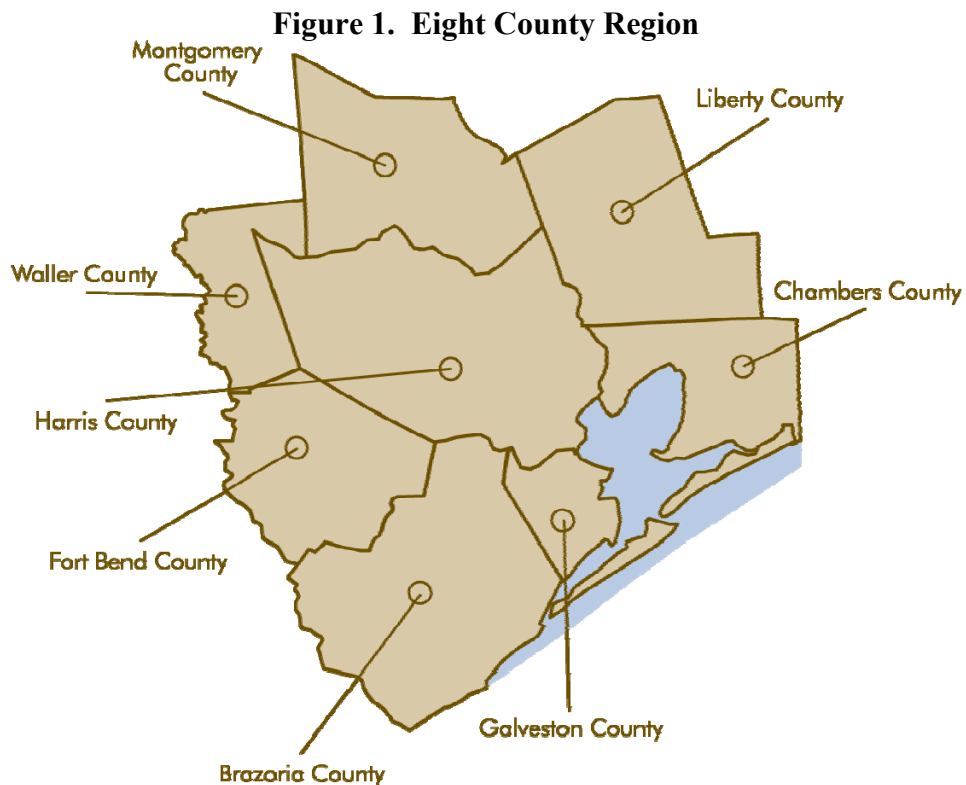
The **2035 RTP** explores how the core values of our region's residents relate to the way in which our region will grow and the quality of life which this growth will afford. This plan explores potential benefits from changing our planning paradigm from one that is a reaction to growth trends to a toolbox for achieving the plans of local governments, their citizens and businesses. The Plan explores the impact of two potential growth scenarios on a wide range of performance measures related to preservation of open space, reduced flood risk, improved air quality and mobility.

The **2035 RTP** is the new long-range transportation plan for the Houston-Galveston region that identifies common values and goals for our region, alternative strategies to meet these goals, and priority actions to be implemented to achieve them. The purpose of the RTP is to ensure the region's transportation investments work to achieve the goals and values identified by the communities comprising the region. By seeking out the articulated goals of the region's citizens, this RTP introduces a new dimension in public participation and public understanding for the transportation planning process. That process incorporates the region's projected mobility needs and fiscal limitations while promoting the transportation outcomes needed to support the region's goals and values.

**The 2035 RTP Goals are:**

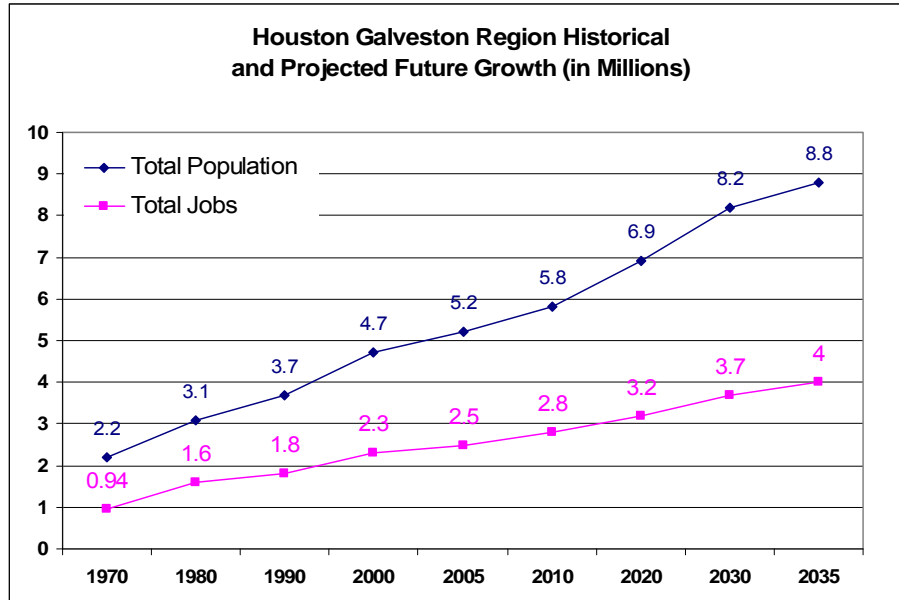
- 1. Improve mobility, reduce congestion.**
- 2. Improve access to jobs, homes & services.**
- 3. Increase transit options.**
- 4. Coordinate transportation and land use plans.**
- 5. Create a healthier environment.**

The RTP is updated at a minimum, every four years and considers the transportation needs of the Houston-Galveston region. The geographic area covered by this plan includes the eight county Transportation Management Area (TMA) which encompasses Harris and the seven adjacent counties, a region of more than 7,000 square miles and 5 million residents.



The region is projecting a significant increase in population and employment over the next 20 years. The additional population will bring total regional population to 8.8 million persons by 2035. Based on the projected job growth, a 60% increase in employment is expected.

**Figure 2. Population and Employment Forecast**



The Houston-Galveston Area Council (H-GAC) has been designated by the State of Texas as the Metropolitan Planning Organization (MPO) charged with coordinating transportation planning for the region. H-GAC’s Transportation Policy Council (TPC) is responsible for the development of the long-range, 20-year transportation plan. The TPC provides coordination with regional stakeholders including cities and counties in the eight-county area, the Texas Department of Transportation (TxDOT), other transportation and transit agencies, plus citizens of the region.

The U.S. Environmental Protection Agency (EPA) has designated the eight-county Houston-Galveston-Brazoria area as nonattainment for ground-level ozone (O<sub>3</sub>). While transportation is not this region’s sole source of ozone pre-cursor pollutants, continued reductions of pollutants from on-road vehicles is an essential part of our plan to attain clean air standards. Consequently, the RTP is required to conform to emission limits set by the Texas Commission on Environmental Quality (TCEQ) and approved by the EPA.

**Transportation Planning Process.** To examine the impacts of future growth, the 2035 RTP departs from the traditional forecast allocations of population and employment to predict future traffic and travel conditions, and introduces our region to a new visioning concept. In 2005-2006, H-GAC began this new approach with envision+Houston Region (e+HR). e+HR is a broad based public outreach initiative involving hundreds of stakeholders, elected officials, students and citizens throughout the region. e+HR

stakeholders participated in a series of visioning workshops and forums and contributed their ideas for a future transportation system through statements and the spatial allocation of future jobs and housing. The outcome of the e+HR process includes citizen created common goals and values. These citizen driven common goals and values have guided the development of the 2035 RTP.

An additional outcome of e+HR are four land use scenarios, Scenarios A, B, C, and ultimately D. The scenarios describe a range of possible future land use forecasts and transportation choices. The traditional or “Trend Scenario” was originally referred to as Scenario A, and represents a continuation of standard transportation planning practices of allocating growth and development based on population and employment estimates. The Trend Scenario is characterized by low-density housing development in largely undeveloped areas with office, retail and some mixed-use developments along major roadways. Scenario B represents the e+HR participants’ ideal growth pattern. This scenario did not use projected H-GAC county growth forecasts, and placed population and employment in ideal locations using participant’s subjective criteria. Scenario B is characterized by development along major roadways, in a radial pattern, with local centers at major intersections. Scenario C incorporates H-GAC county growth forecasts and places housing and jobs in closer proximity. This scenario clusters mixed-use development in satellite cities and along major roadways in a radial pattern with satellite employment centers emerging throughout the region.

The “Envision Scenario” (originally referred to as Scenario D) portrays the e+HR goals as a realistic, alternative forecast. The Envision Scenario was developed after Scenarios A, B, and C were developed and analyzed. Unlike Scenarios B and C, which incorporate land use changes into the forecast immediately, the Envision Scenario uses the Trend Scenario (Scenario A) forecast for population and employment distributions through the year 2015 and assumes land use changes thereafter. The reasoning is that many projects are already planned and programmed for the next ten years and any changes to the current scheduling of projects will not likely respond as quickly as reflected in Scenarios B and C. Additionally, the expectation is that over the next ten years local policy incentives and regulations by local governments will begin to allow the alternative development patterns portrayed in the Envision Scenario.

The major policy goals that the Envision Scenario emphasizes mirror goals established during the Envision Houston Region workshops and forums. These major policy goals



are:

- Densification along transit corridors and in ‘centers’
- Reduction of new development in the floodplains

This scenario achieves a modest decrease in vehicle miles traveled, fewer emissions from on-road vehicles, increases in transit ridership, and lower levels of congestion on area roadways, resulting from incremental land use changes. Additional information about the scenarios and scenario planning may be found in the Executive Summary.

The 2035 RTP shows that with just a few proactive strategies regarding how and where we grow, new, more sustainable communities can develop as the region’s continuing mobility dilemmas are addressed. These dilemmas, including congestion and insufficient capacity, are a reflection of the continued growth this region is projected to have. This plan proposes finding the most efficient and cost effective approach to improving regional mobility while seeking measures to decrease the rate of congestion growth.

A methodology has been outlined with succinct steps for the next phase of planning as the concepts developed in this Plan are taken to the local level for the next plan iteration, the 2040 RTP. This document presents recommendations from a regional transportation planning process including many sub-areas and corridor level plans. In depth technical information is provided by topic in the appendices of this report.

## Summary of 2035 RTP System Benefits

With the projected population and employment growth in the region it is *not likely* that peak period congestion levels will be reduced compared to today's levels. A reduction in the *rate of growth* in regional traffic congestion can be achieved with the implementation of the projects, programs and strategies in the 2035 RTP. Some of the potential benefits are *summarized* below:

- Reduced travel costs of \$ 3 billion annually as measured by the value of time and gasoline saved in 2035, if the projects in the RTP are implemented.
- A doubling of transit usage from current levels if higher density development patterns are coupled with the RTP projects.
- A healthier environment through improved air quality from reduced on-road emissions and expansion of programs such as the Clean Cities program,
- More travel options through expansion of the Commute Solutions and regional Bicycle and Pedestrian programs.
- Almost \$ 400 million annual reduction in the cost of vehicle crashes.

The preliminary results of the system-wide benefits analyses are presented in terms of regional: vehicle miles traveled (VMT); vehicle hours traveled (VHT), transit patronage, and average speed. In 2007, VMT was approximately 139 million daily miles. As depicted in Figure 3, by 2035, VMT is expected to increase to about 266 million daily miles, an increase of 91%. With the Envision Scenario, VMT results are approximately 10% lower than the Trend Scenario.

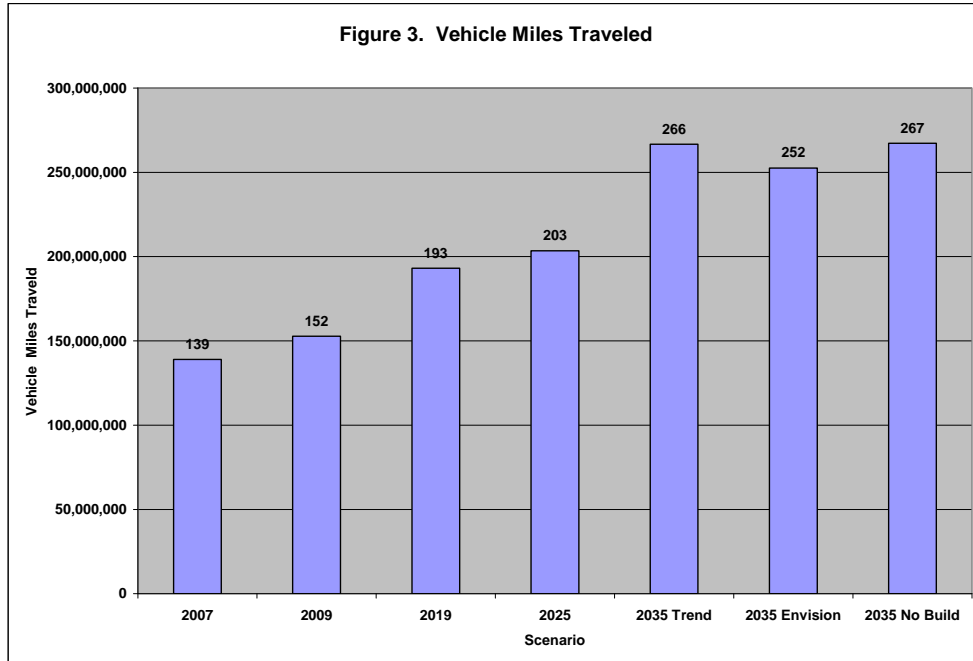
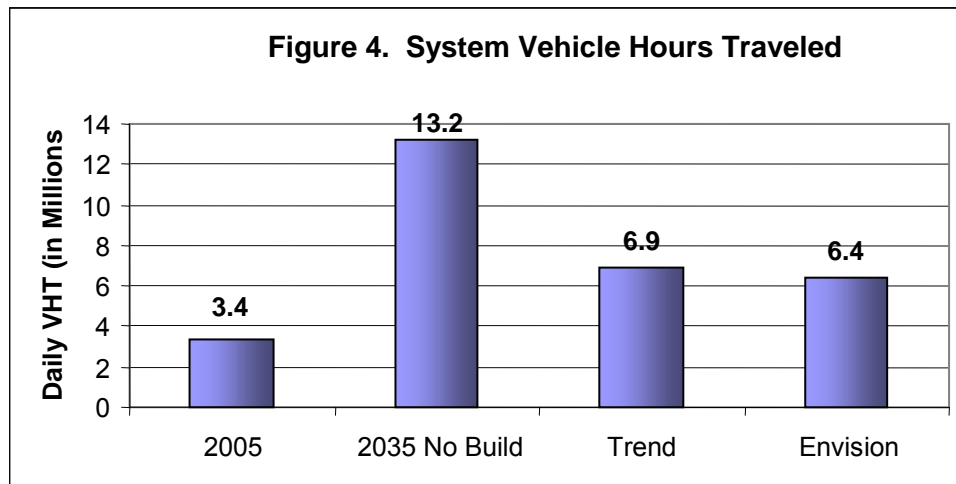
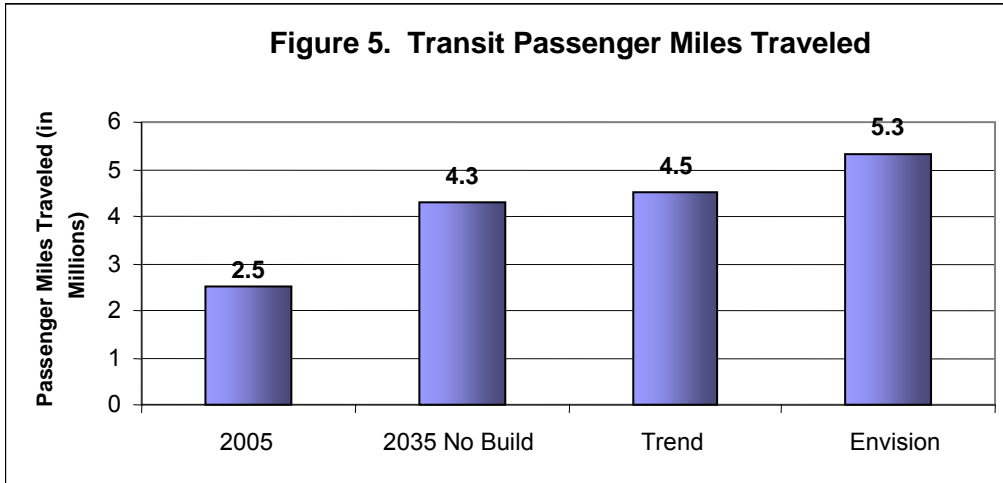


Figure 4 shows that VHT is currently estimated to be approximately 3.4 million daily hours of travel. By 2035 under a no-build scenario, the region's daily VHT would increase to over 13 million hours. However, by implementing the projects contained in the 2035 RTP, a significant reduction in vehicle hours is anticipated through both the Trend and e+HR scenarios. The e+HR Scenario offer an impressive 200% reduction in VHT when compared to the no-build scenario.

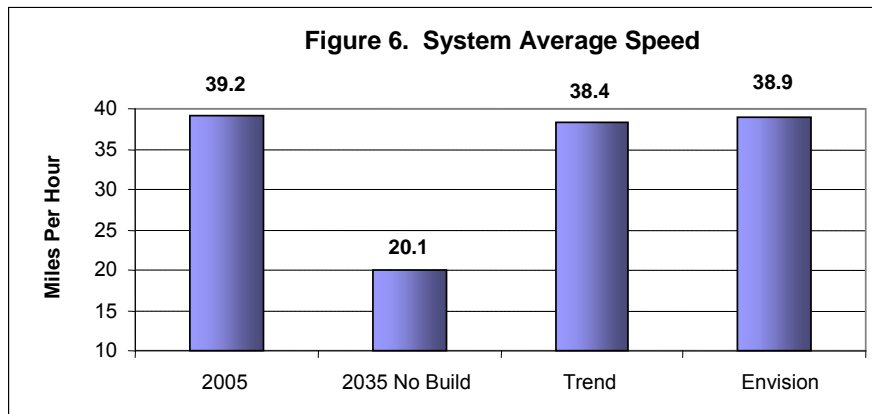


Transit passenger miles (PMT) are also expected to increase significantly with the implementation of the 2035 RTP. PMT are highest under the Envision Scenario, and are

expected to more than double by 2035, Figure 5. The 2035 RTP includes the 2035 METRO Long Range Plan elements. Projects in the RTP expand the number of employment locations accessible within 30 minutes by local transit from 100,000 to 200,000 by 2035.



Average system speeds (Figure 6) show that with the implementation of the 2035 RTP, travelers will experience an improvement in average travel speeds when the no-build scenario is compared to any of the other scenarios. Although the attainment of free-flow speed is unlikely under any set of travel conditions, the overall performance of the roadway is expected to improve through the investments contained in the RTP. Additionally, a noticeable decline in average speeds is not expected with the implementation of e+HR, this slight decline in speed is remarkable given the significant increases in population and employment anticipated in 2035.



## The Four Major Strategies

The 2035 RTP proposes a collection of solutions to moderate the rate of congestion growth associated with our growing population. This combination of strategies, programs, and projects is expected to improve regional mobility and foster a better quality of life for all residents by providing more travel options. The 2035 RTP employs four major strategies: increase highway and transit capacity, reduce peak-period travel, improve the efficiency of existing facilities, and coordinate land use and transportation investments. To the extent that these strategies can be implemented, the goals of improving regional mobility and safety, and reducing the rate of congestion while minimizing the associated negative air quality impacts can be achieved more effectively. Any reductions in congestion will be evidenced by improved levels-of-mobility or similarly, improved levels-of-service.

### ◆ **System Capacity**

Though the region cannot build itself out of congestion, adding system capacity cannot be avoided and is thus an important strategy for improving mobility. Table 1 provides an overview of the recommended system capacity improvements contained in the 2035 RTP.

<b>Table 1 ◆SURFACE TRANSPORTATION: PERCENTAGE CHANGE 2005 - 2035</b>						
<b>Roadway</b>			<b>Transit</b>		<b>Non-Motorized</b>	
	Freeway	Arterial	METRO Solutions		Bikeway	
Increase in lane miles	31	52	Increase in Bus Service	50	Increase in lane miles	57

### **Roadway**

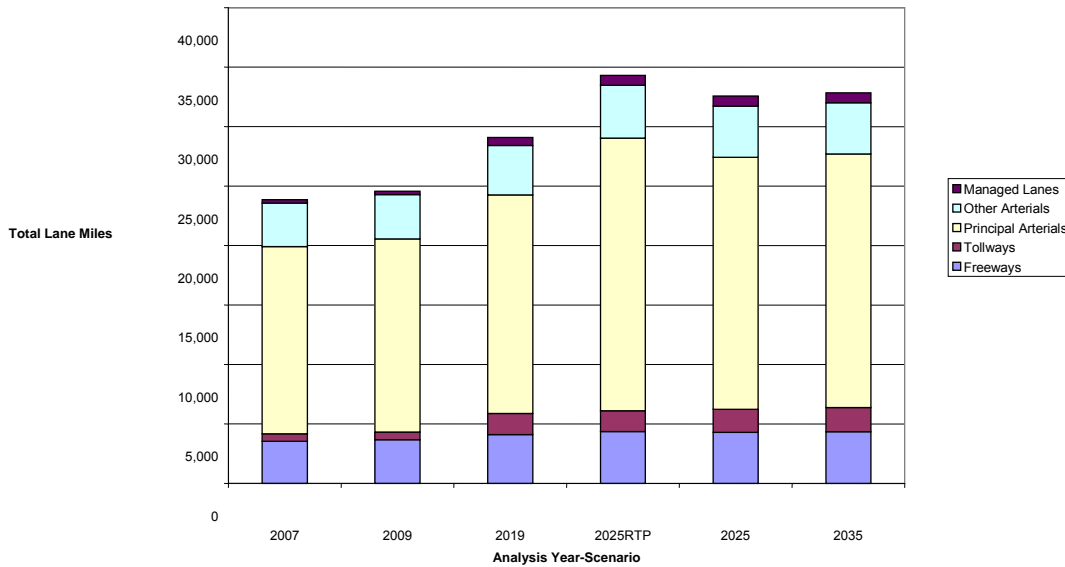
Even with the implementation of the 2035 RTP, congestion levels will increase over today's levels. However, if the RTP were not implemented, future congestion would more than double by 2035. Due to limited growth in traditional funding, toll roads and other managed facilities will play a greater role in the expansion of our roadway system. Table 2 provides a summary of the total roadway lane miles.



Figure 7 depicts the anticipated 2035 Regional Roadway System. Key elements of the 2035 network include: an upgrade of SH 249 to freeway status between BW 8 and the Grand Parkway, and more managed lanes throughout the region particularly on freeway segments inside IH 610. Other major roadways such as US 59, US 290, IH 45 and SH 288 also show an increase in managed lanes.

Figure 8 provides detailed information on the total lane miles by functional class projected between 2007 and 2035.

**Figure 8. Lane Miles by Category**



**Mode Share Analysis.** More than five million people live in our eight-county Texas Gulf Coast region making 1.8 million trips every day according to the 2000 census. More than 78% of daily trips are by private automobile. Public transportation also plays a critical role in the region’s travel patterns. While 4.7 percent of all trips in the U.S are taken on transit, in our eight county region this share is slightly lower at 3.3% in 2000.

<b>Table 3. Percent Work Trips By Mode Share</b>			
	1990	2000	2005
Drive Alone	76.1	77.0	78.2
Carpool/Vanpool	14.6	14.2	12.79
Public Transit	3.8	3.3	2.71
Walk/Bicycle	2.3	1.6	1.38

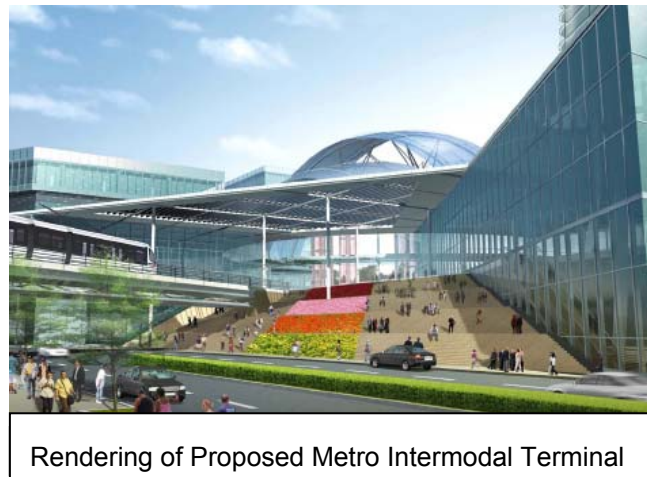
Source: 1990 & 2000 from Census; 2005 from American Community Survey

## Transit

As regional population and employment continues to grow, transit will become an increasingly important tool for improving mobility. Transit is forecast to significantly increase from its current 485,000 daily boardings, to over 725,000 daily passenger boardings by 2035. This significant increase will be attributed to:

- Expansion of transit services (increased bus and rail transit services),
- New transit modes (commuter rail transit and signature express bus service),
- Transit connectivity to multiple employment centers, and
- Coordination of transit services among regional public transportation providers.

**METRO Solutions.** The 2035 METRO Long Range Plan is an iterative process incorporating the 2025 METRO Solutions Plan and future mobility needs identified in regional planning efforts. METRO's 2035 Long Range Plan recommends significant expansion of the current transit system and includes a network of integrated high capacity



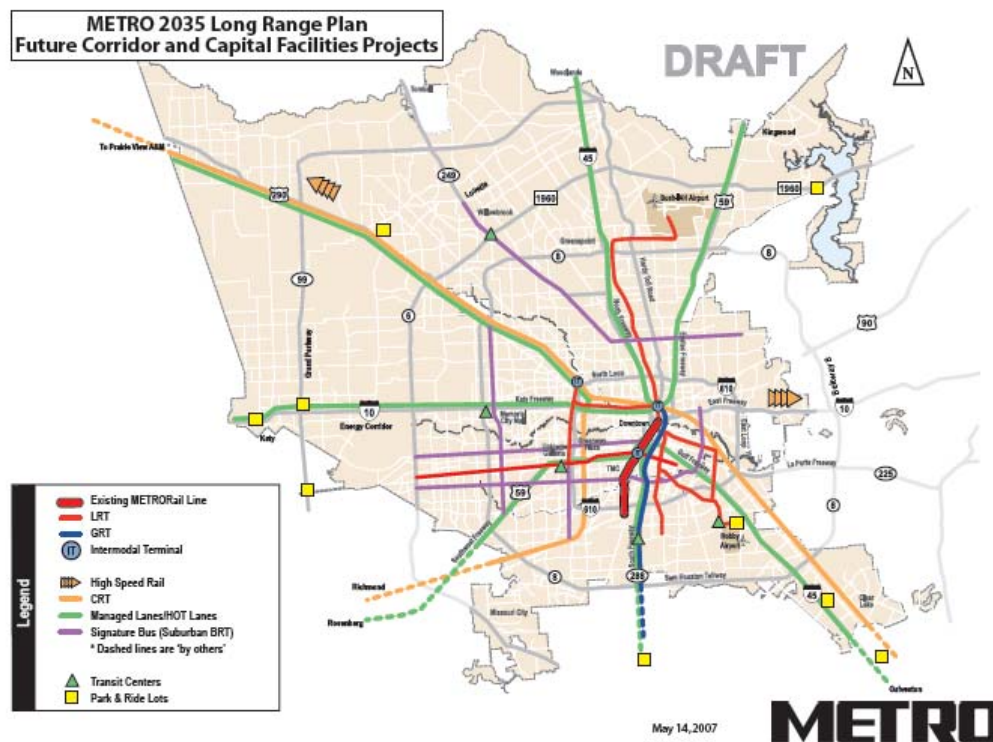
Rendering of Proposed Metro Intermodal Terminal

transit facilities on major travel corridors. This plan also identifies significant service expansions beyond the METRO service area. New improvements scheduled for implementation through the year 2035 include high occupancy tolls, a new intermodal terminal, a new park-n-ride facility in Cypress, and several new high capacity transit corridors throughout the region. Additional key elements of the METRO Solutions plan include:



- 89 miles of fixed guideway transit – LRT
- 84 miles of CRT
- 40 miles of Signature Bus

**Figure 9. METRO Solutions Transit Plan**



**Other Transit Activities.** As the primary transit provider for the region, METRO supplies transit services for more than two-thirds of Harris County and portions of Fort Bend and Montgomery counties. H-GAC estimates that 1.2 million people living outside METRO’s service area are potential candidates for some form of fixed-route transit service. In some cases, basic and very limited transportation services are being provided by social service agencies for clients that meet financial and/or medical eligibility criteria as shown in Figure 10.

Since the 2025 RTP, the Texas Legislature passed House Bill 3588 during the 78<sup>th</sup> Legislature mandating the coordination of public transportation services and funding among health and human service agencies, the Texas Workforce Commission, and the Texas Department of Transportation (TxDOT). H-GAC is serving as the lead agency for the development of the Regional Transportation Coordination Plan for the 13-county

Gulf Coast Region.

In 2006 H-GAC commissioned a one-year study to develop a plan of action for improving coordination of the public transportation system. The goals of the study include:

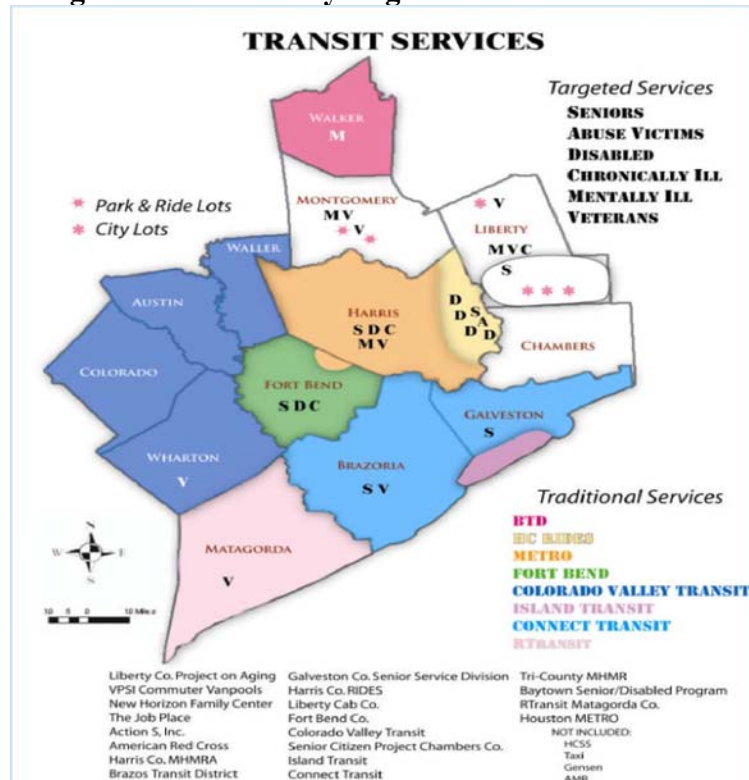
- eliminate waste in the provision of public transportation services;
- generate efficiencies that will permit increased levels of service; and
- further the state’s efforts to reduce air pollution.

A team of consultants and the Regional Steering Committee (RSC): reviewed regional demographics, conducted extensive public outreach, transit surveys, and focus group meetings; and facilitated discussions with stakeholder agencies. The RSC in response to a determination of regional transportation needs; identified gaps in service, barriers to the coordination of transportation activities, developed recommendations and devised an action plan.

2035 RTP transit recommendations, based on the Regional Public Transportation Coordination Planning and Regional Transit Needs Assessment (RTNA), include:

- Expand public transportation services by filling gaps inside and outside the METRO service area and expanding service to cover the 13-county Gulf Coast region.
- Improve connectivity, by exploring opportunities for expanding and developing transit facilities that serve as multi-modal transportation hubs for connecting local and express buses, taxis, vanpools, and airports shuttles.
- Work with local transportation providers to develop flexible, seamless fare policies that will allow customers to use a single ticket or pass to travel on all providers of public transportation.
- Explore projects utilizing public-private partnerships to fast-track commuter rail

Figure 10. 13-County Regional Transit Providers



in the US 90A, US 290 and SH-3 corridors.

- Promote Jobs Access and Reverse Commute programs (JARC) to assist former welfare recipients and other low-income residents with obtaining access to public transportation.
- Explore other potential High Capacity Transit (HCT) Corridors. Currently, H-GAC has identified corridors along US 249, US 290, SH 521, SH 288, SH 225 - SH 146 and SH 35 as meriting consideration for HCT.

**Non-Motorized Transportation.** According to the 2000 Census three percent of all journey-to-work trips were attributed to bicyclists, with an even higher share in other areas throughout the region. Based on demographic, land use and transportation factors, several areas throughout the region appear to be much more conducive to additional walking and bicycling infrastructure. Since the 2025 RTP, H-GAC has begun a process of identifying districts where there are significant opportunities to replace vehicle trips with pedestrian or bicycle trips and to improve pedestrian and bicycle safety. These areas also tend to have the most tightly clustered trip destinations and comparatively higher levels of existing pedestrian-bicyclist travel.

To date, H-GAC has worked with local partners to develop comprehensive pedestrian and bicyclist plans in five of these districts within the City of Houston and the City of Galveston, with a sixth scheduled in Sugar Land. Several RTP and TIP projects have been identified through this process and the program is proposed for continuation. The existing bikeway network is currently 617.34 miles throughout the 8-county region, with the majority of the network in Harris County. Communities with extensive bikeway or pedestrian networks include Alvin, Conroe, City of Houston, Lake Jackson, La Porte, Missouri City, Pasadena, Sugar Land, and The Woodlands. H-GAC plans to continue to work with sponsors to identify projects that further the development of the local bikeway and pedestrian network. All such projects will be carefully coordinated with roadway infrastructure planning and existing and planned developments. A 57% increase in bicycle lane miles is expected by 2035, and the RTP has identified \$274 million for specific bicycle and pedestrian improvements. The Plan also includes guidelines to insure proper consideration of bicycle and pedestrian needs during project development, design, and selection for all transportation projects.

## ◆ Demand Management

### Travel Demand Management Programs

Travel demand management plans focus on moving people, rather than moving vehicles. Its primary goal is to modify travel habits so that demand is lessened and/or shifted to a non-peak period or other modal option through incentive or disincentive programs. Such programs encourage increased utilization of other modes, non-peak period travel, and alternate routing. The underlying concept is that mobility on the mainlanes can be significantly improved by switching traffic from facilities operating at capacity to other modal options better equipped to accommodate the negative impacts resulting from an overflow of single-occupancy vehicles. Toward this end, H-GAC has three major travel demand programs: Commute Solutions, Clean Air Action, and Clean Cities – Clean Vehicles. Table 4 summarizes the two components of regional demand management.

<b>Table 4 ◆ TRAVEL DEMAND MANAGEMENT: EXPECTED CHANGES BETWEEN 2007 – 2035</b>			
<b>Programs (mil \$'s)</b>		<b>Managed Lanes</b>	
Commute Solutions	404	HOV	8% increase
Clean Air Action	28	HOT	N/A
Clean Cities/Vehicles	460	Toll	200 % increase

N/A or new facility

**Commute Solutions.** Commute Solutions supports the promotion of transit, vanpools, carpools, telework, and other transportation-related options and services as an alternative to driving alone. The use of these commute alternative strategies will: help employees and commuters with major cost savings, including reduced gasoline, parking, car maintenance and insurance expenses; relieve commute and parking-related stresses; and provide faster commuting times using high occupancy vehicle (HOV) lanes. Employers also benefit from the Commute Solutions Program because it produces more positive and productive employees, less employee tardiness and fewer absences. Increased retention of employees and an enhanced corporate image has also been noted by employees and employers using alternative commute programs. As the “one-stop” resource on commute alternatives, Commute Solutions offers advice, answers and assistance to employers and

employees on all commuting options.

**Clean Air Action.** Clean Air Action is a federally funded public education program that focuses on the health hazards of exposure to high levels of ozone smog from on-road motor vehicles; and encourages voluntary actions to reduce vehicle emissions. Program elements include media and public service programs, public affairs programming, and other public relations campaigns and special events. This outreach and education initiative aims to reduce pollutant emissions through greater public awareness and participation in air quality improvement efforts. This initiative also provides marketing and administrative support for companion programs such as Commute Solutions, Clean Cities/Clean Vehicles, Houston-Galveston Area Emissions Reduction Credit Organization (AERCO), the Smoking Vehicle Program, and the Low Income Vehicle Replacement Assistance Program (LIRAP), also referred to as the AirCheck Texas Program. Additionally, Clean Air Action makes information available to the public on topics ranging from the ozone alert system, upcoming conferences, grant funding, and air quality studies.

**Clean Cities – Clean Vehicles.** The Clean Cities/Clean Vehicles Program provides subsidies to public and private entities to facilitate the voluntary usage of cleaner burning fuels and engines. The primary goal of this program is to reduce emissions from mobile-source pollutants and particulate matter, while maximizing the usage of cleaner fuel and low-emissions vehicles operating within the region. An ongoing partnership with the Texas Department of Transportation, local governments, and area businesses has empowered fleet operators within the 8-county non-attainment area to retrofit, upgrade, and replace their vehicles for the benefit of their organizations and the larger community. Outreach and education for fleet managers are key components of the program, through which new technologies are better understood and opportunities for action are optimized to attain the best, most cost-effective results.

**Peak Period Pricing and Managed Lanes.** Much as the hotel industry charges more for rooms during peak tourist seasons, and the airline industry offers off-peak discounts, peak period pricing sets tolls based on levels of congestion. Also referred to as, value pricing, toll rates on participating facilities would vary according to congestion levels by time of day. Charging for road usage based on congestion levels creates incentives for drivers to modify behavior by changing some of their trips to off-peak times, other routes or using

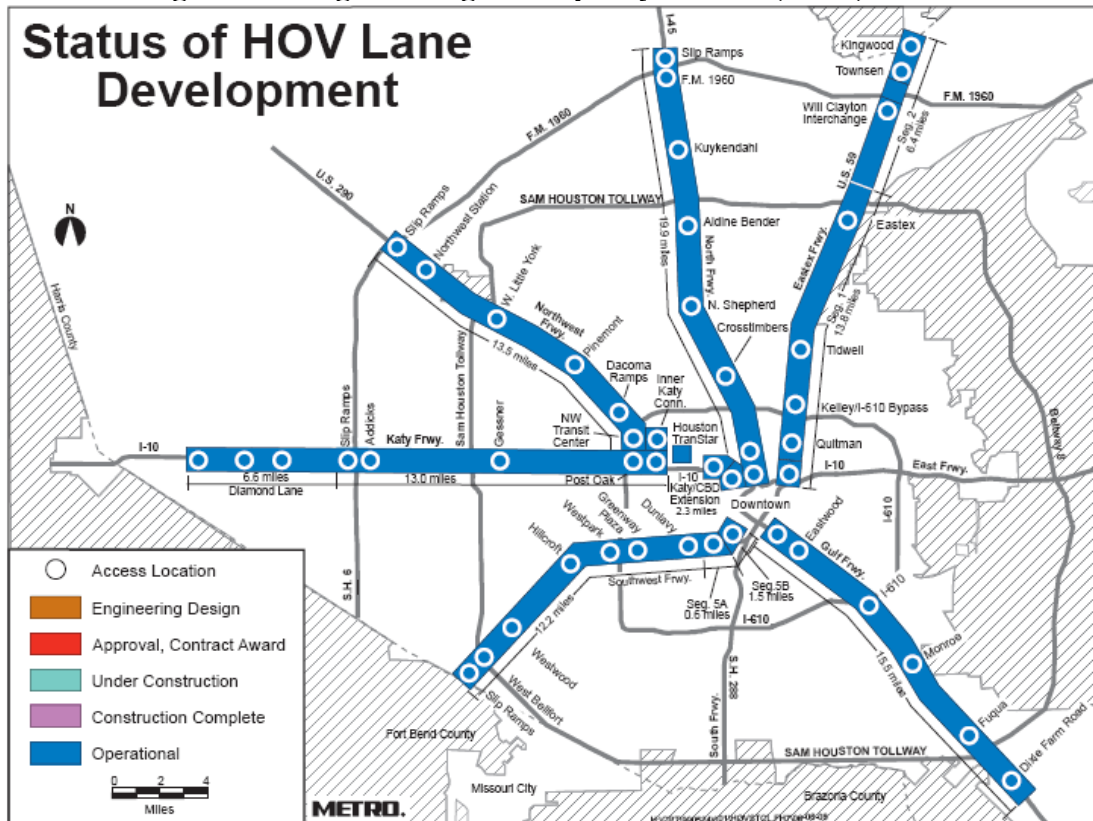
alternative modes of transportation. METRO services will utilize these facilities after conversion. Conversion will occur by 2015 and will include two (2) directional operations. A relatively small shift in the proportion of peak-period trips can lead to substantial reductions in congestion. Generally, the benefits of peak period pricing include:

- Offers incentives for more efficient use of existing capacity,
- Indicative of potential need for future mobility enhancement,
- Locally generated and dedicated revenue for system expansion, operation and maintenance, and
- Cost and travel time savings, including reductions in delay and increases in vehicle speeds.

The 2035 RTP includes plans to implement peak period pricing within the managed High Occupancy Toll (HOT) lanes of the major freeway corridors in the region. This strategy is especially important in congested corridors with limited potential for the building of additional lanes. Through 2035, the region is expected to see increases in high occupancy vehicle, high occupancy toll, and regular toll lane miles. Notably, by 2035 the region will see an overall decrease in HOV lanes offset by increases in HOT lanes. The conversion of HOV lanes to HOT lanes will increase the efficiency of the network, and will allow area stakeholders to more effectively deploy existing transportation resources.

Figure 11 highlights the current status of HOV lane development. METRO is planning to convert to HOT lanes in five HOV corridors by 2008: the Northwest HOV lane (US 290), the North HOV lane (I-45 North), the Eastex HOV lane (US 59 North), the Gulf HOV lane (I-45 south) and the Southwest HOV lane (US 59 South). Conversion will occur by 2015 and will include two-directional operations. The converted facilities will subsequently be utilized by METRO services. The Katy HOV lane will be converted to managed lanes in 2008 or 2009 by the Harris County Toll Road Authority.

Figure 11. Regional High Occupancy Vehicle (HOV) Lanes



## Operations Management

Operational management strategies for resolving congestion will include the development of new or expanded infrastructure and small-scale infrastructure efficiency improvements. 2035 RTP proposed actions seek to manage demand so that delays and queuing are lessened primarily through the development of Smart Streets and intelligent transportation deployment. The tables below provide an overview of some of the proposed actions.

The RTP includes operational strategies that will reduce existing traffic congestion and slow the rate of growth of congestion in areas that are currently not significantly congested. Implementation of a congestion management process (CMP) is one means of achieving this objective by monitoring the implementation of transportation system management (TSM) and transportation demand management (TDM) improvements in advance of added capacity.

Table 5. ♦OPERATIONS MANAGEMENT		
Smart Streets	ITS/CMP	Security
% lane miles change	% ↑ Deployment	% ↑ Contraflow Lanes
N/A	69%	17%

N/A or New facility

Table 6. ITS Deployment Elements

Freeway Management	Reported	Total	Percent
Miles under electronic surveillance	460	577	80%
Ramps controlled by ramp meter	105	656	16%
Number of Dynamic Message Signs (DMS)	130	N/A	N/A
Miles covered by Highway Advisory Radio	68	577	12%
Incident Management	Reported	Total	Percent
Freeway miles under free cell phone call to a dedicated number	562	577	97%
Freeway miles covered by surveillance cameras (CCTV)	335	577	58%
Freeway miles covered by service patrols	140	577	24%
Arterial Management	Reported	Total	Percent
Signalized intersections covered by electronic surveillance	1934	3875	50%
Signalized intersections under centralized or closed loop control	766	3875	20%
Electronic Toll Collection	Reported	Total	Percent
Toll lanes with Electronic Toll Collection capabilities	203	250	81%
Transit Management	Reported	Total	Percent
Fixed route buses equipped with Automatic Vehicle Location	1220	1239	98%
Electronic Fare Payment	Reported	Total	Percent
Fixed route buses:			
equipped with Magnetic Stripe Readers	1239	1239	100%
equipped with Smart Card Readers	1239	1239	100%



## Smart Streets

The Smart Streets concept was developed and introduced in the 2025 RTP as an additional tool to increase mobility and improve transit access and safety by providing operational improvements along strategic regional thoroughfares. Smart Street enhancements in the 2035 RTP focus on a range of operational management techniques to reduce delay such as:

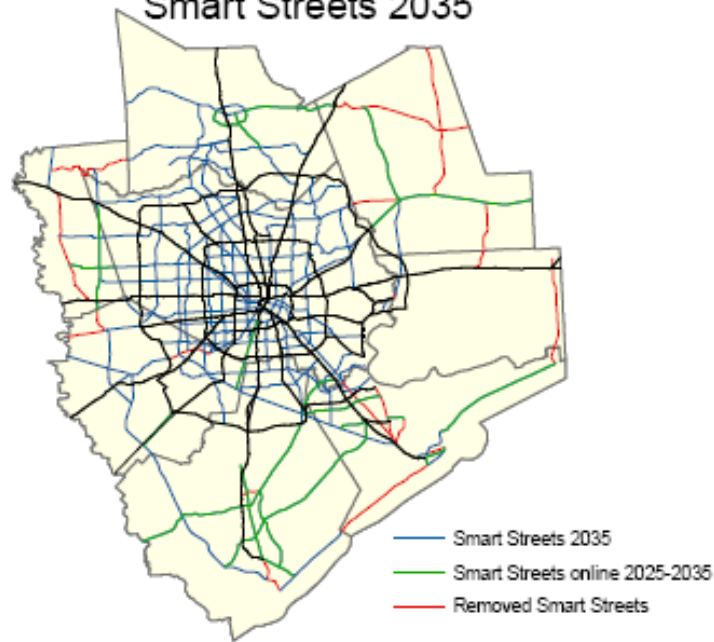
- traffic light synchronization,
- deployment of roundabouts,
- medians,
- constructing or extending (as needed) turn bays,
- consolidation of duplicate driveways, and, as appropriate,
- partial grade separation of some traffic lanes at major intersections.

Smart Streets will accommodate multiple travel modes and will enhance the aesthetic and economic benefits of the communities traversed by integrating transportation and land use planning. The design of smart streets can enhance local access through transit-oriented development and pedestrian amenities, and also improve traffic flows in the corridor. This “Context Sensitive Design” approach is critical because H-GAC recognizes that land use decisions can have a significant impact on congestion. The image below provides a visualization of a corridor containing an application of the Smart Street concept. A detail explanation of Smart Street tools and how Smart Streets can be incorporated into the regional transportation network is located in the Smart Streets White Paper Appendix.



Figure 12

### Smart Streets 2035



Analyses conducted in the 2025 RTP identified numerous corridors that could potentially benefit from a Smart Street treatment. The 2035 RTP continued the examination of Smart Streets by conducting a study on the viability of several added capacity projects contained in the 2025 RTP specifically focusing on existing configuration and available right-of-way (ROW). Based on these analyses, approximately 1,388 Smart Street lane miles are expected to be operational between 2025 and 2035. Figure 12 provides an overview of the anticipated Smart Street network. The estimated cost for implementing Smart Streets in the eight-county region is approximately \$5 billion. Expected future benefits of Smart Streets include:

- Reduced cut-through traffic in neighborhoods,
- Opportunities for economic development along select arterials,
- Improvements to transportation and land use access through the use of back access roads to major traffic generators,
- Increased travel options due to improved arterials and connectivity,
- Enhanced regional evacuation routes; and
- Improvements to transit and reliability of transit trip times resulting from the proposed Smart Street alignment with METRO's Signature Express bus line plans.

## Intelligent Transportation Systems (ITS)

The Houston-Galveston region has one of the most advanced intelligent transportation systems in the nation. The region's premier intelligent transportation management and operations system is anchored by the Houston TranStar Traffic Management Center. Houston TranStar is one of the most comprehensive advanced traffic management centers in the country, and is responsible for coordinating the planning, design, operations and maintenance of transportation and emergency management in the greater Houston region. Additional traffic management elements in the region include: incident detection and response, courtesy patrol and motorist assistant, changeable message signs, and coordinated traffic signal timing. Table 7 provides an overview of past congestion and cost savings observed between 1997 and 2004 due to the application of ITS technology.

By 2035, the implementation of ITS technology is expected to increase dramatically throughout the region with expectations that ITS deployment on the freeway network alone will expand by

69%. Additionally, there are currently \$312 million of ITS projects programmed in the 2008-2011 TIP and 111 ITS projects included in the 2035 RTP.

<b>Year</b>	<b>Congestion Savings (vehicle-hours)</b>	<b>Traveler Cost Savings (\$)</b>
<b>1997</b>	2,719,300	\$46,266,000
<b>1998</b>	4,075,800	\$69,219,000
<b>1999</b>	5,439,000	\$95,509,000
<b>2000</b>	5,866,000	\$110,914,000
<b>2001</b>	6,945,800	\$133,155,000
<b>2002</b>	8,559,200	\$166,310,000
<b>2003</b>	8,338,800	\$167,261,000
<b>2004</b>	12,715,600	\$264,651,000
<b>Total</b>	54,659,500	\$1,053,285,000

*Source: Houston TranStar Annual Report - 2004, TTI*

The establishment of standardized ITS architecture with a transportation and communications layer at the regional level will ensure that travelers and goods are presented with a consistent user interface. Advanced ITS technologies in the TMA over this planning horizon will include:

- Increase freeway surveillance with an expanded surveillance system,
- Centralized control of traffic signals beyond the City of Houston city limits,
- Automated HOV operations,
- Multi-modal and transit traveler information systems using real-time data,
- A regionally integrated Smart Card system for electronic payment of tolls, transit fares and parking, and
- A HAZMAT identification system.

## Safety

A viable safety evaluation and improvement program is an integral component of the 2035 RTP. The identification of high crash locations, an evaluation of a range of countermeasures to remediate hazardous locations, and the programming of funds to the most effective uses are of primary importance. Estimates show that the likelihood of a vehicle being involved in a fatal or injury crash in our region is 36% higher than the State of Texas average, and 149% higher than the U.S average. If this level of crashes remains constant, the cumulative crash related costs to our region could escalate as high as \$150 billion over this Plan horizon. H-GAC has implemented a formal Safety Program, and to date has taken the following actions:

- Documented and geo-coded four years of crash data using a GIS-based crash information system.
- Produced over 40 safety reports on the safety conditions in cities and counties, corridors, and other small areas throughout the TMA.
- Identified high crash locations and other areas showing a disproportionate number of crashes relative to travel volume.
- Sponsored numerous safety engineering studies of hazardous locations. To date, safety engineering studies have been conducted in the cities of Houston, Pasadena, Galveston, and Sugar Land; and access management studies were conducted on FM 518, FM 1960, and SH 6.
- Created a Regional Safety Council to provide policy-level recommendations for member communities and the State on actions that can be taken to improve safety. The Regional Safety Council hosted the first annual Regional Safety Conference in October 2006 and issued the Regional Safety Council Report: State of Safety in the Region in February 2007.

There are 144 safety projects currently in the plan totaling over \$346 million dollars. H-GAC has proposed the following actions for implementation to improve safety in our region:

- Mitigate Major Crash Hot Spots,
- Improve Freight Safety and Mitigate Major Railroad-Highway Grade Crossings,
- Reduce the Number of Alcohol-Related Motor Vehicle Crashes,
- Reduce Aggressive Driving in our Region, particularly by Teenagers and,
- Improve Safety Information Systems.

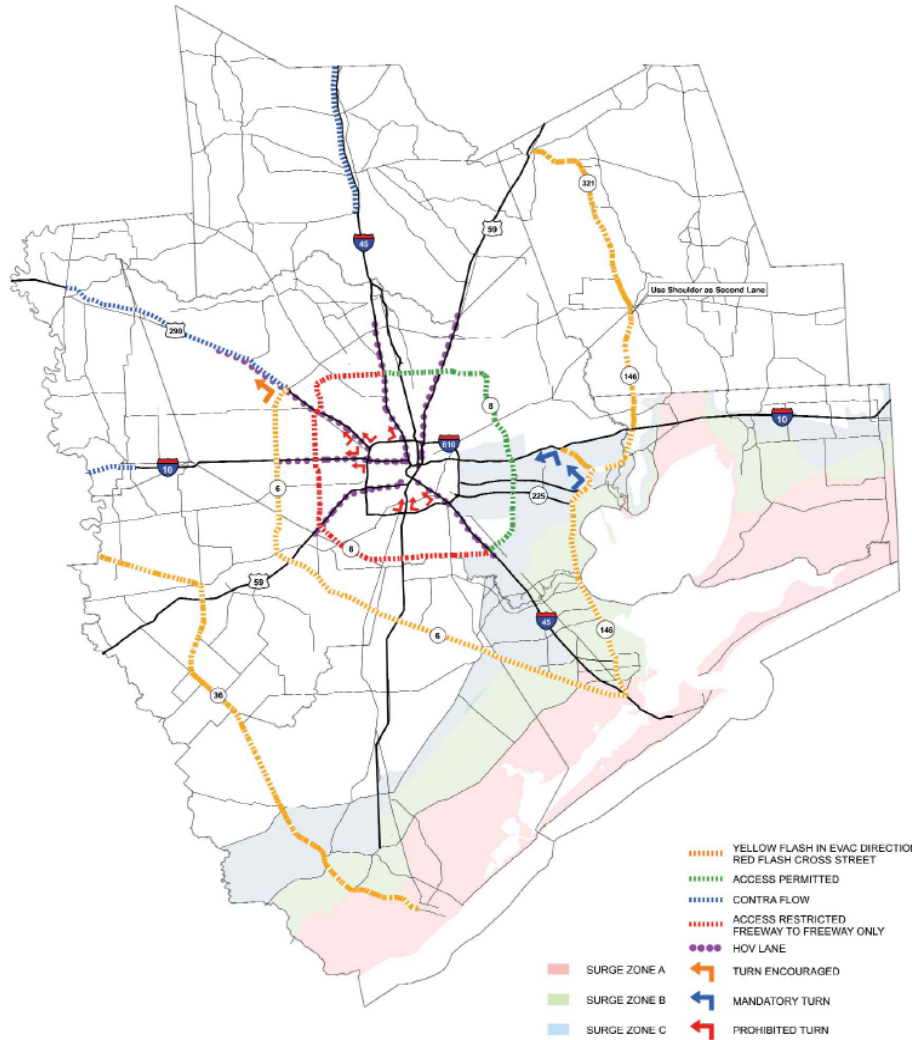
## **Security-Evacuation**

In April 2006, a list of recommendations regarding evacuation capacity was approved by the H-GAC Board of Directors. The recommendations covered four major topics: command and control, traffic management, special needs, and public outreach; and four minor topics: credentialing, wind refuges, radio communications, and school coordination. As a starting point upon which to build an evacuation plan, H-GAC is currently modeling a hurricane evacuation event to determine the best available routes, times, and impacts of changes to known bottlenecks. Currently contra-flow plans have been developed to relieve traffic congestion at choke points on major routes along IH-10, IH-45, US 290, and US 59 North. Although a regional evacuation plan is in its infancy, the following additional elements have been confirmed to be in place should another catastrophic event occur in the region:

- Pre-positioned tow trucks,
- Designated fuel stops,
- State directed fuel resources,
- Buses at pre-designated locations such as the Reliant Park and George R. Brown Center and,
- Pre-arranged destinations and lodging.

The Houston-Galveston area has an estimated fifty-one lanes, including nine contra-flow lanes that can be used to efficiently evacuate the region. The estimated daily capacity is 417,800 vehicles without contra-flow, and 505,550 vehicles with the added contra-flow lanes. This capacity level means that in order to evacuate the approximately one million residents living or working in the storm surge zones for a Category 3 or higher storm event, it would take approximately thirty-six hours under perfect conditions. The figure below highlights some of the key components of the evacuation traffic management plan.

**Figure 13. Evacuation Routes**  
Traffic Management Plan Map



### ***◆ Livable Centers: Connecting Transportation and Land Use***

While we can increase system capacity, manage demand, and improve the efficiency of the existing system, the strategy with potentially the most effect upon improving mobility and quality of life is the strategy of connecting transportation and land use. Land use choices have direct impacts on the ability of the region’s transportation system and agencies to deliver a variety of travel choices. The 2035 RTP has shown that sustained major investments in roadway capacity will only moderate, and will not eliminate the level of future traffic congestion. However, more significant mobility gains are possible through better coordinated land use and transportation planning. An outgrowth of the *Envision Houston Region* process, showed that by redirecting some future growth along

transit corridors and into “emerging cities”, a 10% reduction in daily vehicle miles traveled could be achieved. These results reinforce the public’s intuitive notions about coordinated transportation and land use planning.

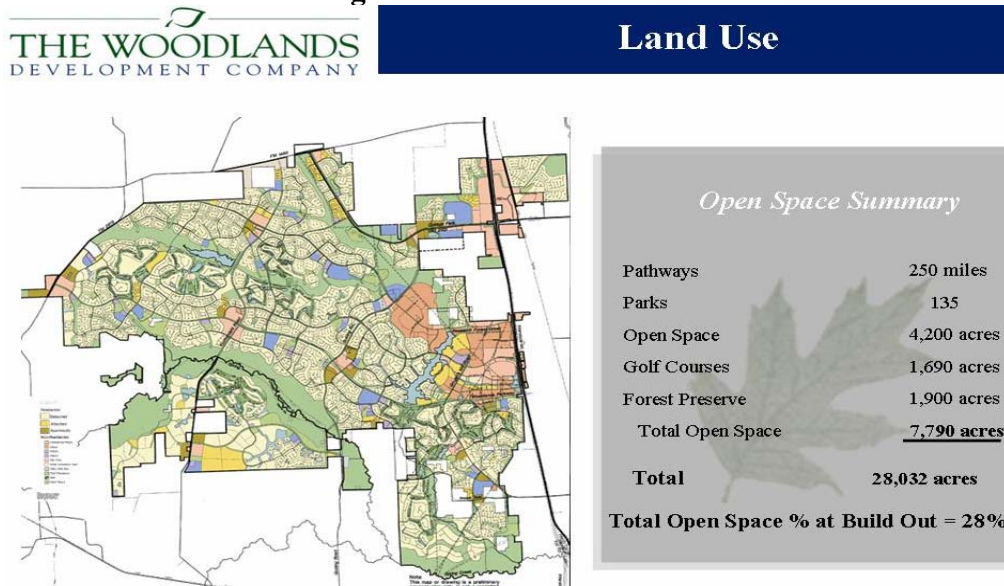
H-GAC has identified a three-pronged land use and transportation coordination strategy that calls for the creation of bicycle and pedestrian friendly **Centers**; establishment of better **Connections** between the centers, and designs based on the **Context** of the surrounding land uses. This **3C's** strategy, in addition to enhancing mobility choices, is expected to produce economic, environmental and “quality of place” benefits for the region in the following ways:

**Centers** are places with a concentration of jobs, shopping, entertainment, and/or housing. The clustering of these kinds of land uses and activities creates opportunities for walking, bicycling and transit trips, thus reducing the need for car travel. Depending on the concentration of activities and the pedestrian environment, internal car trips within a center could be reduced by as much as 55%. Key elements to be considered in the creation of town Centers include:

- Create incentives for reinvesting in existing downtowns and other pedestrian friendly neighborhoods,
- Encourage concentrated mixed-use developments that cluster live, work, and play opportunities, particularly near transit stops,
- Encourage mixed use Town and Village Center designs in new developments and,
- Provide more infrastructure to support convenient pedestrian and bicycle travel in centers.



Figure 14. Livable Centers



An example of such a “Livable Center” currently within our region is the Woodlands Town Center. The Woodlands Town Center contains approximately 28% open space, as well as over 40,000 jobs and 35,000 housing units within 28,000 acres. Future centers within the region are expected as the quality of life benefits offered by such “Livable Centers” is becoming increasingly apparent.

**Connections** within and between the region’s centers strengthens the overall land use/transportation linkage. When a community or region is well connected to other communities a wider variety of products and services will be available to its residents. Wherever activities are concentrated, frequent transit service, walking and bicycling trips are more feasible; and commuter transit service could also serve a series of concentrated activity centers more effectively than it could broadly dispersed patterns. The 2035 RTP includes strategies to link the development of roadway improvements like Smart Streets with METRO Solutions investments such as the Signature Bus Routes and Guided Rapid Transit (GRT) corridors.

**Context Sensitive Design** is a collaborative approach that considers the surrounding environment of a transportation project. Context sensitive design ensures flexibility and the ability to tailor projects to meet the specific cultural and environmental needs of a community. In addition, context sensitive design emphasizes the active involvement of



stakeholders throughout the planning process.

In order to integrate the 3C's concepts into regional transportation planning, H-GAC has identified the following five strategies:

1. Coordinate transit and roadway planning to connect existing and planned centers with the region's multi-modal transportation network,
2. Promote roadway designs appropriate for the context of the surrounding community to ensure safe, convenient travel choices for all user modes,
3. Coordinate transportation improvements and private sector development efforts to promote projects that combine sustainable mobility and economic benefits,
4. Help fund local planning studies to assist in the development of centers and,
5. Provide funding support for infrastructure projects that enhance connections within and between centers.

**Livable Centers.** H-GAC has taken several steps towards implementing the 3C's program. A Livable Centers project category has been created in the TIP and sponsors have proposed both planning and implementation projects totaling \$25 million for regional and sub-regional access and mobility improvements. In simple terms, mobility is the ability to make trips measured by the amount of travel attributed to various modes; and access is the ability to reach desired destinations with reasonable effort or cost.

H-GAC has utilized GIS to assess land use patterns in project corridors to help promote context sensitive designs. Extensive analyses have also been conducted in an attempt to quantify the potential benefits of centers and compact development patterns. Staff has produced publications, given presentations and conducted workshops to familiarize local officials and other stakeholders with these proposed land use and transportation alternatives. In future RTPs, a greater level of coordination between local land use plans and transportation projects is planned.

**Transit and Land Use.** In addition to expanding the regional transit system, transit ridership and efficiency can be improved by coordinating transit and land use. Development along transit lines that increases density and integrates transit with the development can make transit more accessible and decrease the need for single-occupancy vehicle trips. Recommended strategies include:

- Promote community design that provides convenient access to transit systems:

- Improve transit connections, particularly between local transit and regional transit systems.
- Encourage development of convenient and safe sidewalks, street crossings, bicycle, and pedestrian facilities to serve local and regional transit facilities.
- Promote pedestrian and bicycle connections between regional transit facilities and nearby neighborhoods.
- Collaborate with partners to accommodate growth by developing Public Private Partnerships. Consider incentives for economic development and joint development opportunities adjacent to major transportation system corridors.
- Promote transit-oriented development investments around regional transit facilities:
  - Encourage conveniently located pedestrian-oriented businesses and services near regional transit facilities.
  - Encourage building design and placement, street improvements, parking standards, and other measures that encourage pedestrian access and use of local and regional transit.
  - Promote higher density initiatives along dedicated right-of-way transit corridors.
- Enhance access opportunities for the transportation disadvantaged
  - Increase mobility for transportation disadvantaged citizens by providing a minimum level of access to social, work, welfare, and resource activities, including the creation of a customer-oriented, regionally coordinate public transit system.

## Regional Freight

Houston's freight transportation network consists of four different modes: truck, rail, marine and air. The concentration of petrochemical industries to freight infrastructure has a predominant influence on the location of the region's transportation infrastructure. Below is a summary of the region's freight transportation network. A detail profile of the regions freight transportation network is located in the Regional Freight Appendix.

**I-69/Trans-Texas Corridor.** I-69 is a planned 1,600 mile national highway connecting Mexico, the United States, and Canada. Eight states are involved in the project. In Texas, I-69 will be developed under the Trans-Texas Corridor concept. The Trans-Texas Corridor (TTC) is a proposed multi-use, statewide network of transportation routes in Texas that will incorporate existing and new highways, railways and utility rights-of-way. Specific routes for the TTC have not been determined. As envisioned, each route will include:

- Separate lanes for passenger vehicles and large trucks,
- Freight railways,
- High-speed commuter railways,
- Infrastructure for utilities including water lines, oil and gas pipelines, and transmission lines for electricity, broadband, and other telecommunications services.

Conceptual Trans-Texas Corridor



Source: TxDOT, Texas Turnpike Authority Division, 2004

Plans call for the TTC to be completed in phases over the next 50 years, with TxDOT overseeing construction and ongoing maintenance, with private vendors responsible for much of the daily operations. In the Houston region, the I-69/TTC will affect the following counties: Fort Bend, Brazoria, Waller, Harris, Liberty, and Chambers. The official route(s) for the highway has not been determined.

TxDOT is in the environmental review phase of the project. The next step is to hold public hearings on the findings in the draft environmental documents during the summer of 2007. The final environmental documents are scheduled for completion by the spring of 2008. For up to date project information, go to the project website at <http://www.keeptexasmoving.org>.

**Commercial Trucking.** The Houston urbanized area has 422 miles of Interstate and other highways, plus 755 miles of other principal arterials. Using this network, commodities are transported throughout the region and to other parts of the country. The top five commercial truck freight commodities (in tons) for the region in 2004 were: petroleum and coal, chemicals and allied materials, nonmetallic minerals, cargo related to secondary movements; as well as clay, concrete and glass. Truck freight transportation accounted for 9% of the total eight county VMT in 2005.

To improve commercial truck traffic safety; laws and ordinances have been enacted within the region to restrict commercial truck traffic to certain lanes during the day. The Texas Transportation Institute evaluated the impacts of truck lane restrictions and found that: the restriction was a positive experience; commercial truck related crashes were reduced by 68%; a 95% compliance rate was observed with limited impacts to overall freeway operations. Additional findings also showed that by implementing such a policy on a regional basis may not be operationally feasible, and restricting commercial vehicles to one lane may conflict with other vehicles entering and exiting the freeway.

**Rail Freight.** The Houston-Galveston region has five freight rail yards, and is a major rail hub for the nation. The rail network in Houston is dominated by Union Pacific (UP) and Burlington Northern Santa Fe; with UP rail lines transporting the majority of the tonnage on the system. The Settegast and Englewood rail yards in Houston are major yards for the southern part of Texas serving the petrochemical industry along the Texas Gulf Coast.

The majority of rail freight, approximately 75%, is transported within the south central states. Chemicals represent almost 64% of all rail commodities originating in the Gulf Coast port districts, and is the largest rail commodity originating in the Houston area. The most heavily traded rail commodities for the Houston region in 2004 were: chemicals and allied products; coal; nonmetallic minerals; farm products; and petroleum and coal products.

Exporting commodities out of the region in an efficient manner with minimal negative impact to commuter traffic is important not only to the railroad companies, but to the general public as well. In an effort to improve traffic flow affected by freight rail, the Harris County Freight Rail Crossing Study (July, 2004) identified needed at-grade railroad crossing improvements in Harris County to decrease the daily minutes of vehicle delay. The H-GAC Safety program has also identified the following at-grade railroad crossings as “hot spots”, or areas showing a moderate to high incidence of freight related crashes:

- FM 1960 east of SH 249
- Hillcroft Street near Main Street (US 90A)
- Bellfort near Mykawa Road
- Almeda-Genoa near Mykawa Road
- Antoine Drive near Tidwell
- Park Terrace near Galveston Road

The Texas Department of Transportation recently completed the Houston Freight Rail Study in 2007. The study addressed deficiencies in the Houston region’s freight network and included roads, ports, and railroads. The study identified improvements that may provide relief to residents and the traveling public adversely affected by delays, interruptions, and noise attributed to the movement of freight within the region. The study also identified alternatives that may improve regional freight rail capacity by enhancing the efficiency and operations of the railroads. The study identified \$3.3 billion of improvements for the 8-county region, which are categorized as:

- Grade Separations,
- Grade Crossing Closures,
- Improvements to existing railroad infrastructure, and
- New railroad corridors

More information about the study and the newly-formed Gulf Coast Freight Rail District can be found at <http://www.houstonrailplan.com>.

**Marine Freight.** Marine freight in the Houston region is served by the Port of Houston, the privately owned Port of Texas City, and two smaller ports at Freeport and Galveston. Crude oil and chemical products are frequently processed at or in close proximity to the marine ports. In 2004, the Port of Houston ranked eight among U.S. containership ports, handling over 933,000 ton equivalent units; and ranked second in the nation in terms of total tonnage.

Water transportation is the lowest cost freight transportation option. The Gulf Intracoastal Waterway (GIWW), a 1,300 mile man-made canal runs along the Gulf Coast of Mexico. GIWW links all of the Gulf Coast ports and enables these ports to access the inland waterway system of the United States. Limitations of the waterway's 1949 design do not support the scale of barge transportation today. West Galveston Bay, where the GIWW passes beneath the dual Interstate Highway 45 bridges and the Galveston Island Railroad Bridge is concerning for the Houston region. The opening for barge traffic through these structures is only 120 feet wide for a distance of about 800 feet. TxDOT is currently building replacement highway bridges which will have a 300 feet opening for navigation interests. These replacement bridges have an estimated completion date of 2008. The Coast Guard and local legislators are working on replacing the railroad bridge under the authority of the Truman-Hobbs Act, but only partial construction funding has been secured at this time.

To accommodate truck traffic into and out of the ports, certain infrastructure improvements are critical. Specifically, the Port of Houston recommends improvements to the following gateways to their facility: SH146, SH225, Port Drive, Barbours Cut Blvd, Spencer Road, and Red Bluff. Many of the Port of Houston priority projects are in the H-GAC Transportation Improvement Program (TIP) for funding years 2008 – 2011. For Port Freeport, improvements to SH36 are critical to its ability to handle projected growth.

**Air Freight.** The Houston-Galveston region has three major airports: George Bush Intercontinental Airport/Houston (IAH), William P. Hobby Airport (HOU), and Ellington Field (EFD). IAH handles the vast majority of air cargo entering and exiting the Houston region, approximately 336,000 tons in 2003. IAH ranks 30<sup>th</sup> among the nation's cargo-

service airports in terms of landed weight.

**Policy Recommendations and Next Steps.** In May 2003, H-GAC hosted a Freight Stakes Workshop that highlighted a variety of issues, concerns and themes related to freight mobility in the Houston-Galveston region. The workshop generated the following potential action items:

- Continue and enhance efforts to engage freight operators and stakeholders in the metropolitan planning process, with a focus on specific issues and/or projects. Identify “champions” in the industry willing and able to foster industry involvement.
- Ensure the planning process considers intermodal and multimodal options and opportunities for addressing regional freight movement needs. Such options are critical to maintaining freight mobility in a congested transportation system.
- Expand and continue region-wide freight movement data collection and analysis for all modes, including intermodal movements. Focus on key freight movement corridors and subareas of the region.
- Examine and analyze options for more efficient truck use of any under-utilized toll facilities, including peak hour diversion strategies.
- Look for quick-fix type projects with relatively high benefits.
- Work with municipalities and counties to develop freight supportive land use guidance as a way to proactively integrate freight access and mobility considerations into development planning and design, thereby mitigating needs for costly future retrofitting of the transportation system.
- Use the public involvement program to help educate the public and policy makers on the importance of freight and its relationship to everyday life.

At the MPO level, the implementation of provisions in the Freight Transportation Gateways Program (SAFTEA-LU, Section 1205) should be explored. A “Freight Transportation Gateway” is a nationally or regionally significant transportation port of entry or hub for domestic and global trade, military mobilization, and includes freight intermodal and Strategic Highway Network connections that provide access to and from these gateways. Under this program, states and localities are encouraged to adopt innovative financing strategies for freight improvements, including new user fees and private sector investment. A comprehensive list of financing options is located in the Freight Appendix along with a detailed discussion of freight in the Houston-Galveston Transportation Management Area.

## Environmental Justice

H-GAC has taken steps to ensure that the 2035 RTP meets all federal goals of Environmental Justice, as described in the guidelines of *Executive Order 12898: Federal Action to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations*; in addition to, internal agency goals of maximizing public participation by providing opportunities and forums beyond minimum requirements by pro-actively reaching out to more citizens prior to formal decision making. A public involvement plan has been developed that provides a structured set of procedures designed to engage the full and fair participation of all potentially affected communities in the transportation decision-making process. H-GAC reviews projects to verify that the effects of the RTP are not disproportionately borne by minority or low-income populations, including but not limited to health, environmental, social and economic effects. Consideration will also be given to the equitable distribution of possible benefits resulting from the RTP, including emissions reductions, congestion relief, and increased mobility for EJ communities.

The environmental justice analyses undertaken in the 2035 RTP consists of two major components: a technical analysis and a public involvement and public outreach effort in conjunction with local agencies. The technical analyses seek to identify EJ communities and analyze the costs and benefits of RTP transportation projects to EJ communities through a mode share and accessibility analysis. Public involvement and outreach activities included meetings, presentations, mailings, notices, attitudinal surveys, and prompt responses to incoming telephone calls and e-mail messages. The purpose of which, is to ensure an open planning process that supports early and continued public involvement, timely notice and response, as well as full public access to information regarding key decisions. The primary objective of H-GAC environmental justice outreach activities is to improve public transit services in underserved communities. Information gained from these activities was included in the Public Transportation Coordination Plan which is a component of the RTP.

**Technical Analysis: Identifying EJ Communities.** The 8-county H-GAC region is projected to increase in population by more than 3.5 million people by the year 2035. This correlates to adding a city the size of Los Angeles on top of the current H-GAC region population. As Table 8 indicates, a large percentage of this projected growth will be accounted for by growth in minority populations. As the H-GAC region becomes



increasingly diverse, Environmental Justice issues will continue to be at the forefront of transportation planning.

**Table 8: Projected Demographic Changes 2000 - 2035**

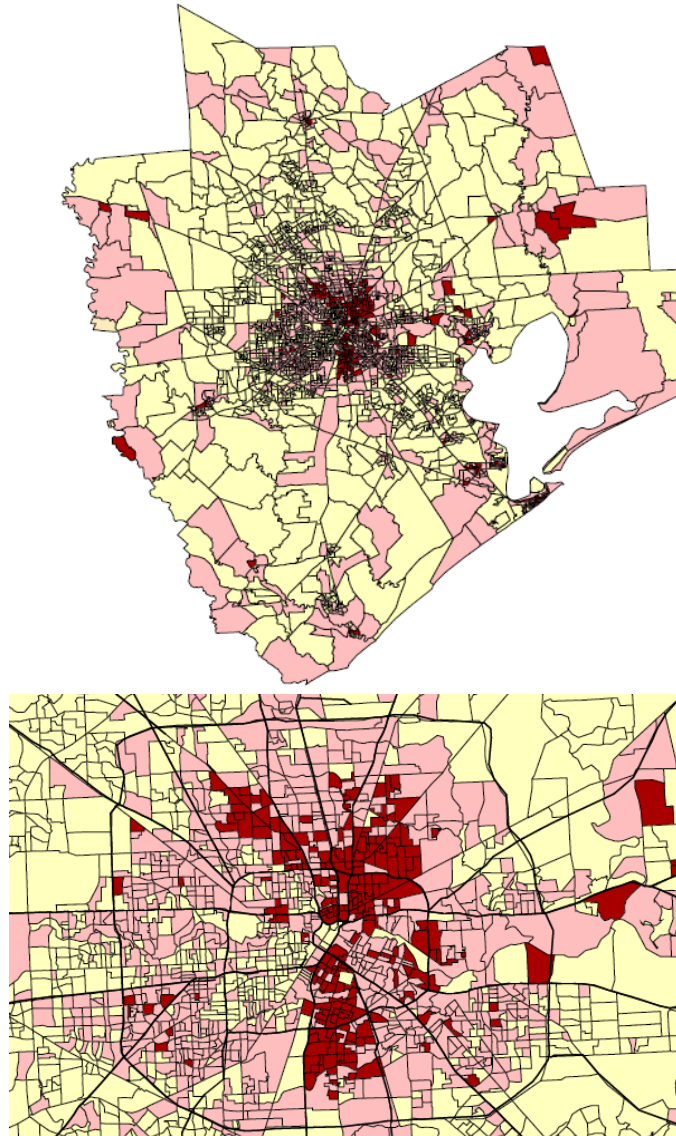
<b>H-GAC Region</b>	<b>2000</b>	<b>2035</b>	<b>% change</b>
Population	4,669,571	8,835,000	89.20%
Households	1,639,401	3,302,013	101.40%
% Minority	52.10%	68.97%	16.87%
% Non-minority	47.80%	31.02%	-16.87%
% Zero-Auto Households	8.28%	14.10%	5.82%

In order to assess the equity of the costs and benefits conferred by the RTP, H-GAC identified the locations of EJ and non-EJ communities. EJ and non-EJ communities were identified at the census block group level by aggregating data on the percentage of low-income, minority, and elderly residents within each block group. Approximately 7% of the H-GAC region population has been identified as being in a census block group of significant environmental justice concern according to the 2000 Census. This percentage represents 293 block groups and over 339,000 residents. As can be seen in Figure 15, significant EJ communities are located in all 8-counties of the H-GAC region with the majority being located within Harris County and the central City of Houston.

**Transportation Mode Share Analysis.** The demographic profile of EJ communities in the H-GAC region includes a transportation mode share analysis. This analysis focuses on how the regional transportation system is being used. As seen in Table 9, this analysis found that significant differences in transportation mode usage exist between EJ and non-EJ communities. It also reiterated that areas of unmet transit need exist throughout the 8-County region, including within Harris County.

**Figure 15. Environmental Justice Communities of Concern  
in the Region and Central Houston**

Environmental Justice Level of Concern  
Low Moderate Significant



**Table 9: H-GAC Region Transportation Mode Share by Level of EJ Significance**

Work Trip Mode Share	Non-EJ Total H-GAC Region	EJ Moderate Total H-GAC Region	EJ Significant Total H-GAC Region
Drive Alone	82%	71%	63%
Carpool	11%	18%	20%
Public Transit	2%	4%	9%
Walk/Bicycle	1%	3%	4%

**Accessibility Analysis:** In order to measure the distribution of benefits between EJ and non-EJ communities, an accessibility analysis for work and non-work based trips for EJ versus non-EJ communities was conducted. The purpose of this analysis was to determine equity in accessibility to the transportation system. The analysis was conducted by calculating the average travel time to specific activity centers within the region from EJ versus non-EJ areas for both auto and bus.

Transit travel time data was only available for two of the selected communities: Gulfton and the Third Ward, both located within the METRO service area. The large disparity between auto and travel times for these two locations suggests that an improvement in local service would be of great benefit to these communities. The complete discussion of environmental justice analyses and other EJ activities can be viewed in the Environmental Justice Appendix.

**Public Involvement, Participation, and Outreach.** Many opportunities exist for local citizens to participate in the regional transportation planning process. Between July 24 and August 18, 2006, eighteen public meetings were held throughout the 13-county Gulf Coast region in support of regional public transportation coordination activities. H-GAC in partnership with transit stakeholders and private consulting firms hosted a series of public meetings to ascertain the extent of need for regional transit and the coordination of existing transit services.

**Liberty County RPTC meeting, August 14<sup>th</sup>, 2006**



Additional public comment was received through an outreach effort funded by The United Way Texas Gulf Coast (UWTGC) and conducted by the Texas Citizens Fund (TCF). TCF used H-GAC environmental justice data to strategically locate focus groups in Fort Bend, Harris, Montgomery, and Waller counties; targeting areas within these counties with large percentages of minority populations, zero auto and low income households. The additional outreach activities provided invaluable insight on existing, needed, and planned public transportation services. Total public meeting attendance reached 350 attendees. Attendees typically included the general public, advocacy group representatives, elected officials, social service agencies, transportation providers; and city, county, and state officials.

Public sentiment towards public transportation was also gathered through the use of four attitudinal surveys (Consumer, Economic Development, Social Service Agency, and Public Transportation Inventory) that were distributed across the 13-county Gulf Coast region. Each survey focused on a different group of intended respondents. A total of 1,569 completed surveys were returned to the consultant for tabulation. More information is also available online at [www.ridethegulfcoast.com](http://www.ridethegulfcoast.com)

## Environmental Analysis

Prairies, Wetlands, Bottomland Forests, Upland Forests, and Riparian Corridors ecosystems provide natural beauty to the Houston region. Each of these resources serves particular functions, and also faces threats to its survival. These environmental resources are a major part of our region's quality of life, providing vital functions such as flood protection, air quality, water quality, wildlife habitat, ecotourism, and recreation opportunities. These resources contribute to our region's identity and sense of place, making the region truly unique. Protection of these natural resources that contribute to our region's quality of life is an important priority when planning for our region's future growth and transportation requirements, a desire that was strongly echoed at the Envision Houston Region workshops and forums.

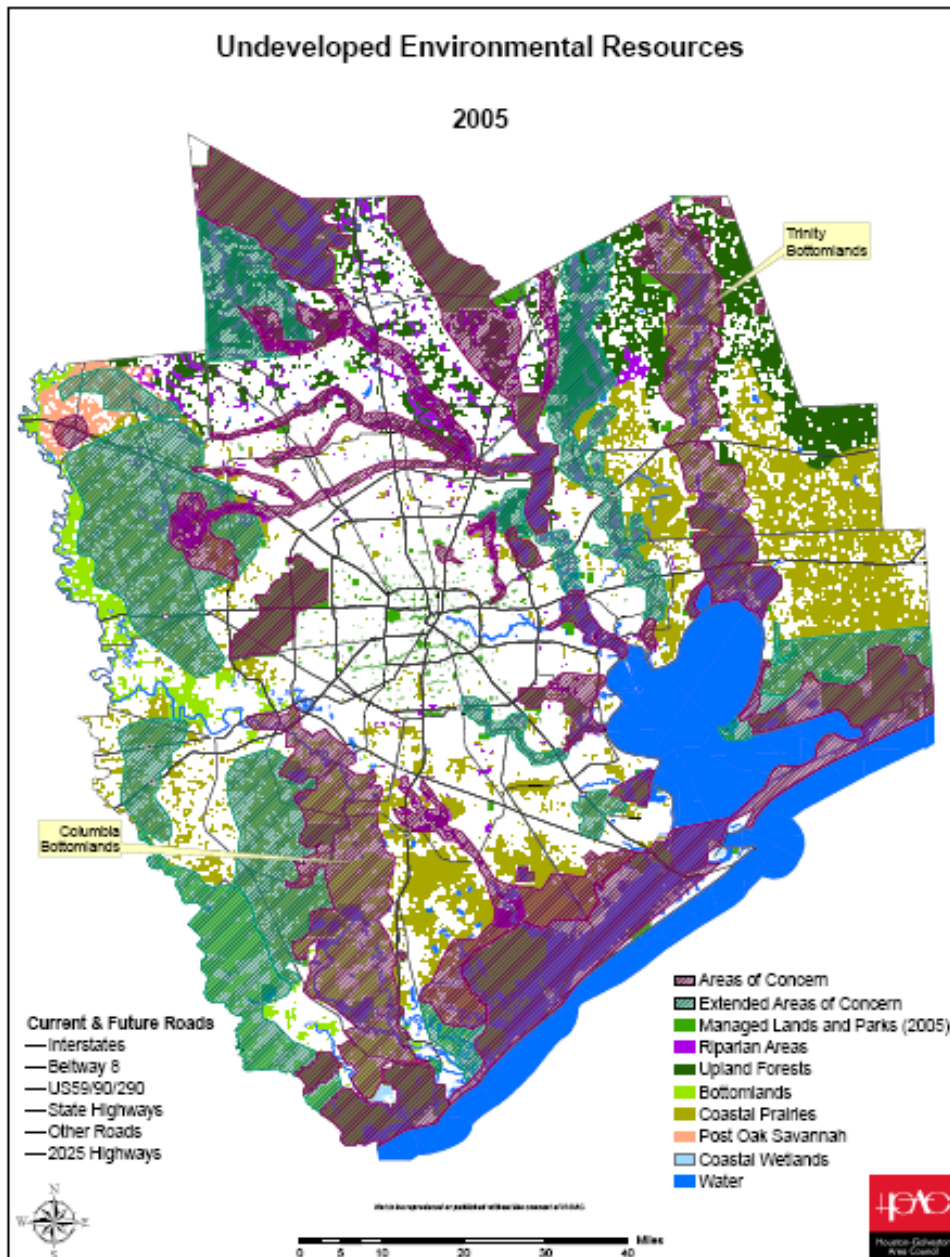
As growth and development are part of our region's future, it is not feasible that every environmental parcel will be able to be conserved. However, it is feasible that the region identifies and works to conserve those areas that have the most significant ecology. Figure 16 identifies areas of concern that are distinct environmental resources within the H-GAC region for special consideration in the transportation planning process. These resources were identified by a committee of environmental professionals from federal and state resource agencies, as well as other organizations with similar expertise.

In identifying these areas of environmental concern, major focus was given to contiguous and intact ecosystems of the resources described above, such as prairie, wetlands, and forests. Priority was also given to areas containing resources that protect our region from flooding and hurricane storm surges, such as the coastal wetlands. As the areas identified are geographically broad, they contain some areas that currently contain development. As such, the identification is not intended to be used for project-level screening. The goal of the identification is to increase awareness of the locations of the region's important environmental resources, the benefits that these resources offer, and the threats facing them. The results are also intended to be used for long-range planning purposes and screening to identify areas in which future transportation projects or development may potentially impact these sensitive resources. In addition, the identified environmental resources are areas in which mitigation efforts may be focused.

**Identifying Advanced Mitigation Areas.** In some instances disturbing natural resources may be unavoidable for regionally significant projects or projects located on facilities that

are multiple-lane, limited access facilities, such as highways and tollways. Due to their scale, regionally significant projects potentially have a larger impact on the environment than a local project and therefore were closely examined.

**Figure 16.**



Currently, projects within the 2035 RTP are individually subject to environment requirements but have no mechanism for cumulatively identifying or mitigating environmental impacts. A project-by-project approach often results in mitigation that



consists of fragmented habitat. For example, segments of a project may impact the same river but at different locations. The environmental effects of the development to the river may extend throughout the watershed or ecosystem.

Sustainable long-range planning emphasizes the coordination of transportation investments with environmental conservation and environmental mitigation. This process has several advantages over the current process, primarily because it provides for anticipated mitigation within a 10-15 year time period, saves taxpayer dollars, and may allow for larger, more contiguous mitigation parcels. Therefore, recommendations will be made to sponsors to investigate the possibility of mitigation or realignment in the long-range planning stages.

**Figure 17. Bike Routes and Greenbelt Planning**

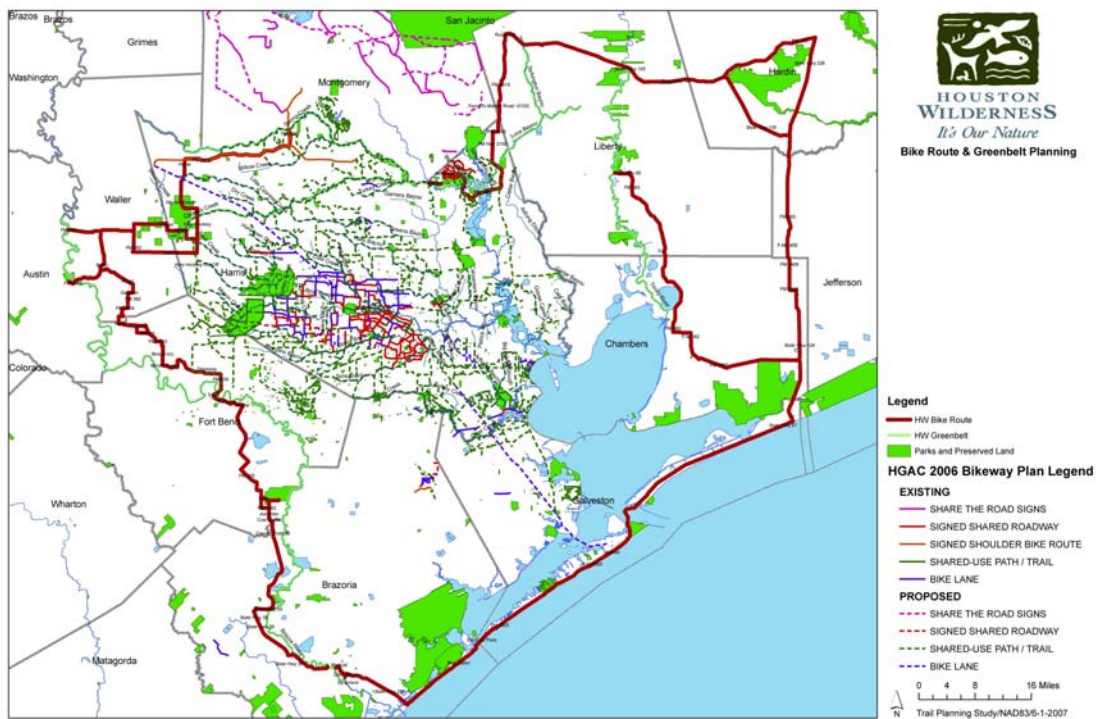
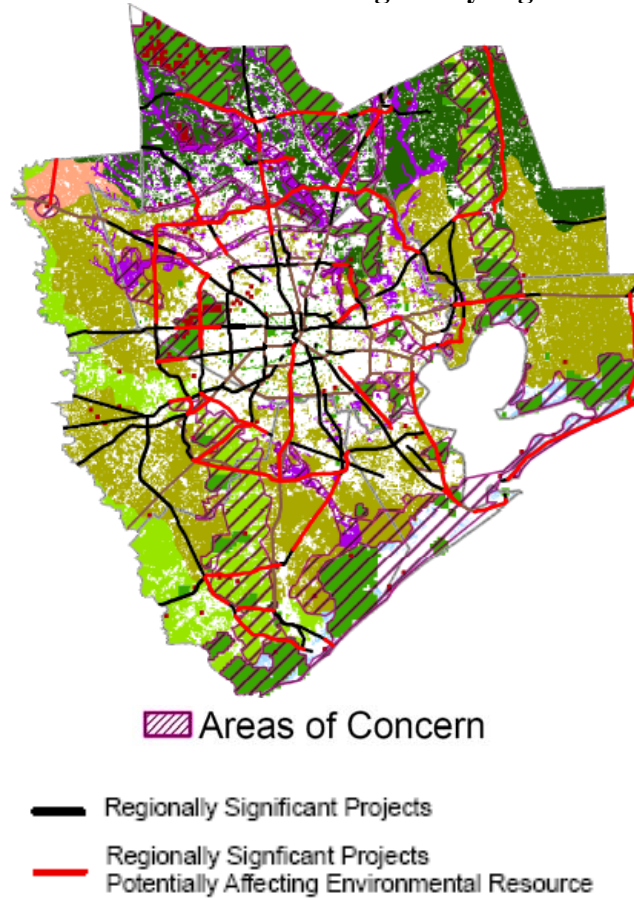


Figure 17 shows a regionally significant greenway concept surrounding the Houston region, linking important existing preserves and conservation areas with major parks, bayous and rivers in a continuous loop. This greenway would provide contiguous wildlife habitat, steer development away from floodways, preserve ecological habitats and provide other important environmental benefits. A pedestrian and bike trail is planned in the conceptual greenbelt to further Houston Wilderness goals of environmental

education, recreation and ecotourism. H-GAC will continue to work with environmental agencies and awareness groups to preserve green space for ecosystem and habitat preservation and regional recreational opportunities.

Figure 18 shows regionally significant transportation projects included in the 2035 RTP that intersect an area identified as being of environmental concern.

**Figure 18. Areas of Concern with Regionally Significant Projects**



The maps below highlight regionally significant transportation projects that intersect a specific environmental variable, such as wetlands, wildlife habitat, endangered or threatened species, managed lands, and floodplains. The highlighted projects may be candidates for mitigation and/or realignment due to their possible effects on environmental resources.



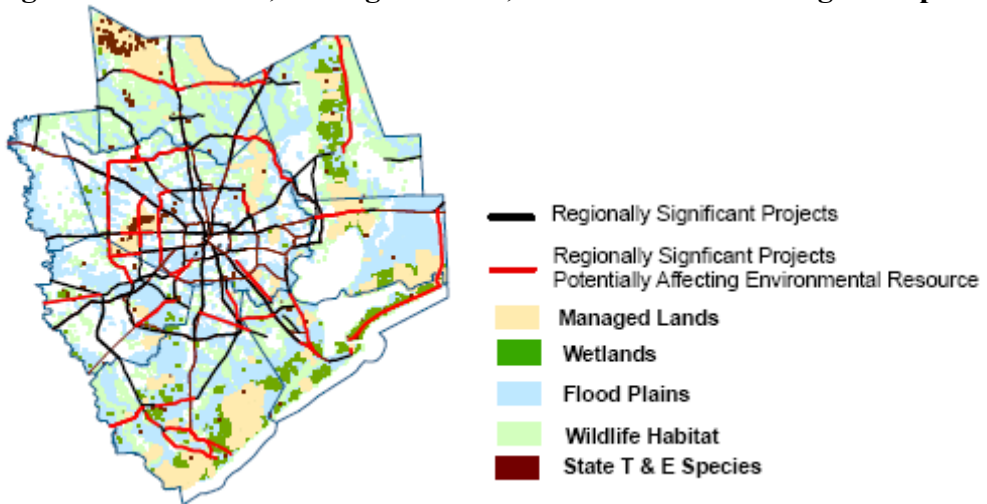
**Figure 19. Floodplain**



**Figure 20. Wildlife Habitat**



**Figure 21. Wetlands, Managed Lands, Threatened or Endangered Species**



- Regionally Significant Projects
- Regionally Significant Projects Potentially Affecting Environmental Resource
- Managed Lands
- Wetlands
- Flood Plains
- Wildlife Habitat
- State T & E Species

## Transportation and Climate Change

Climate change is defined as an increase in atmospheric concentrations of greenhouse gases. Greenhouse gases (GHG) are gases that trap heat within the earth's atmosphere such as carbon dioxide and methane. As heat builds up in the atmosphere it contributes to a rise in global temperatures, resulting in various climatic disturbances.<sup>1</sup> Although the total future impacts of climate change remain unknown, possible future impacts include an increase in sea level and extreme weather conditions, such as droughts and flooding. These changes in climate conditions also have potential impacts on transportation systems.

Potential impacts of climate change upon our region's transportation system include changes in the safety, operations, and maintenance of the region's transportation infrastructure and systems. The H-GAC region is particularly vulnerable to hurricanes/tropical storms and flooding, which may be intensified by sea level rise and/or land subsidence.

H-GAC, in coordination with the Department of Transportation and other entities are working to identify the potential impacts of climate change and variability on our region's transportation system and ultimately to develop strategies and policy options to adapt to any future changes. Due in December 2007, the U.S. Department of Transportation study "The Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study" will be particularly beneficial in assisting H-GAC's transportation and climate change planning efforts.

The 2035 RTP represents the first steps in H-GAC's integration of climate change into the transportation planning process. An additional step in linking transportation and climate change to the transportation planning process will be an increased recognition of the contributions of the transportation system to GHG emissions and potential strategies to reduce, mitigate and eliminate these emissions. H-GAC currently has an extensive Clean Air Initiatives program and future efforts may create linkages to other H-GAC programs and initiatives.

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<sup>1</sup> U.S. Department of Transportation: <http://climate.volpe.dot.gov/trans.html>

## Public Involvement

Public involvement has been a part of the metropolitan planning process since its initiation in the early 1970s. As with all components of transportation planning, public outreach is a continually evolving process. In the past, public involvement was limited to allowing comments from the public after the plans were developed and almost ready for implementation. This model of limited participation in the transportation planning process has evolved over the years to the public having an increased role of involvement during the plan development process.

H-GAC has witnessed and embraced the evolution of the public involvement process as it relates to the development of the regional public transportation plan. During the development of previous plans up to the 1998 *Vision 2020 Metropolitan Transportation Plan (MTP)*, H-GAC's primary method of outreach was to host meetings and advertise in local news media. This method attracted special interest groups and a few select interested individuals. These public outreach methods were in compliance with the Federal Highway Administration's ISTEA and TEA-21 regulations.

Leadership at H-GAC recognized that the public deserved more opportunity for involvement during the plan development process and began to employ new methods for public involvement and outreach. Through coalition building efforts, partnerships were formed that enabled H-GAC to present draft versions of the *2025 RTP* to more diverse audiences. H-GAC employed the following methods to engage stakeholders in the plan development process of the *2025 RTP* and is planning a similar level of outreach engagement for the *2035 RTP*:

- Site Visits – prior to public meetings, H-GAC staff initiated dialogue with stakeholders in the vicinity of the public meeting site. The purpose of the site visit(s) was to gain first hand knowledge of transportation issues in the area. Site visits occurred in Waller County, Chambers County, Liberty County, and the East End (Harris County).
- Community Dialogues - H-GAC initiated the “community dialogues” to take the regional transportation plan to a local level. Utilizing GIS, maps were created that displayed short range and long range projects that either abutted the community or that were near the community. A key component of the community dialogues initiative was the recruitment of “local champions” to serve

as host(s) for the meetings. H-GAC hosted community dialogues in the following Harris County communities: East End, Acres Homes, Kashmere/Fifth Ward, and Third Ward.

- Local Champions – H-GAC recruited local elected officials to serve as hosts for the community dialogues. Local champions were instrumental in ensuring that their constituent base was represented at public meetings.
- Coalition Building/Partnerships- The Envision Houston Region project involved H-GAC partnering with local organizations. For the meeting in Harris County, H-GAC partnered with Blue Print Houston, a grassroots organization whose mission is to build community support for a planning process to make improvements to Houston’s quality of life and place. Blue Print Houston sent an e-vite (email invitation) for the Harris County (Houston) workshop to its member database. This resulted in the attendance of hundreds of interested citizens at the workshop.
- Technology- H-GAC sent public meeting e-vites to members of the Technical Advisory Committee (TAC) and Transportation Policy Council (TPC) and requested that the e-vites be forwarded to their constituent databases. This extended H-GAC’s reach and in turn increased public meeting attendance.

The Envision Houston Region spring forums were recorded live via webcast making the forums available to anyone with an internet connection. Webcast participants could submit questions for forum participants via email. The webcasts could be accessed via the H-GAC website after the event as well.

As H-GAC works to continually improve the public involvement process, future public outreach methods are anticipated to build upon the current foundation. Presently, H-GAC has downloadable audio files of Transportation Advisory Committee and Transportation Policy Committee meetings available on our website. Technology is anticipated to increasingly play a role in outreach efforts. Specifically, new visualization and computer simulation models will make it easier to depict transportation planning concepts.

## Financial Plan

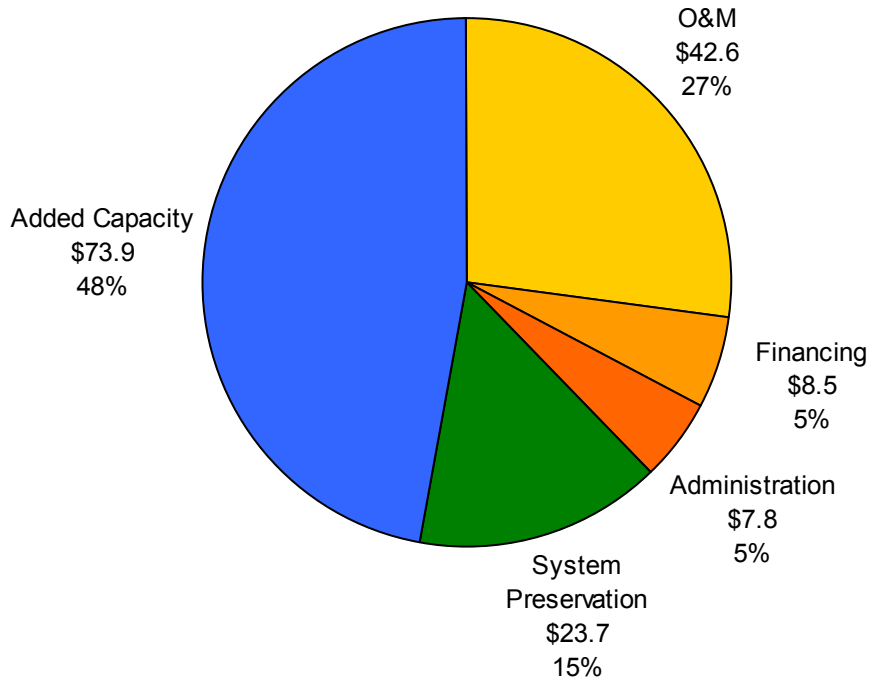
In 2006 H-GAC completed an extensive financial survey that included local governments and agencies with significant expenditures on the transportation network and services. The result is a more complete understanding of how much, by whom, and where transportation dollars are being spent. The results indicate a significant undercounting in previous plans (based on preliminary results) of the contribution by local governments on transportation investments. However, for the purposes of fiscal constraint, this undercounting is neither surprising nor alarming because a large portion of local transportation investment is done on local street networks that are not included in the RTP because they are not considered to be of regional significance. Fiscal constraint is demonstrated for the regionally significant transportation projects.

This financial summary is different from one in past Plans in that it conforms to new federal regulations requiring the expression of future costs and revenues in year-of-expenditure dollars values, that is, the effects of inflation must be included. The inflation rate used is the average increase of the Consumer Price Index from 1996-2005: 2.53%. Another innovation is the expression of major projects costs in terms of their total costs, including the costs of right-of-way, realignment of utilities, and engineering costs. Historically, these types of costs are paid for from statewide accounts, as opposed to federal or state dollars that are directly apportioned to the Houston-Galveston area.

**Expenditures.** Expenditures on the transportation network include building new and improving existing roadways and transit lines (added capacity), operating the network and maintaining it in good repair (operations & maintenance), reconstructing existing facilities when it has reached the end of its useful life (system preservation), financing costs associated with debt incurred for transportation projects (financing), and wages and salaries paid to various staff of the roadway and transit agencies (administration). Total Estimated Expenditures 2035: \$156.5 Billion (see Figure 22).

Figure 22.

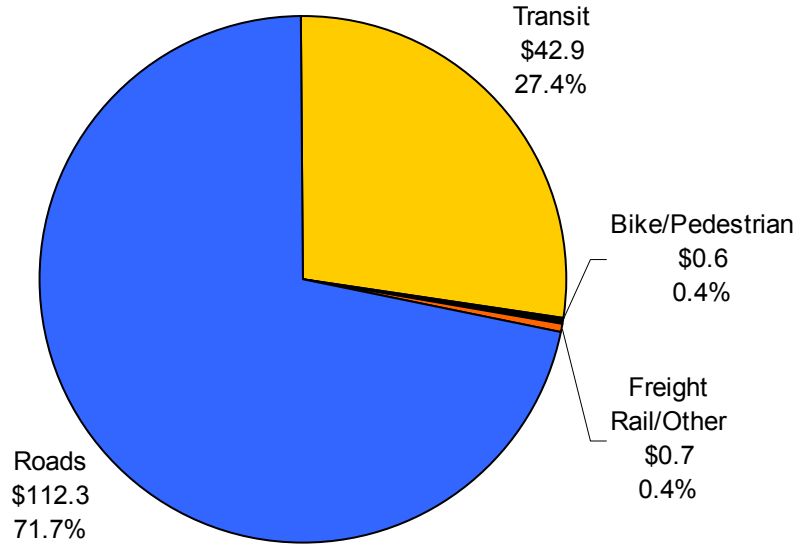
**Expenditures By Category**  
in \$ Billions



For the next several years the region is expecting to continue the trend of expanding the transportation network through added capacity projects, for example, the expansion of I-10 West and the creation of new rail and guided rapid transit lines. However, in the 2006 edition of the *Texas Metropolitan Mobility Plan* prepared by H-GAC, findings indicate that added capacity projects will decrease in spending relative to system preservation costs. Not only will there be a larger network to maintain in the future, but also system preservation efforts are currently under-funded. In the future, more revenues will be needed for system preservation to prevent further deterioration of roadway surfaces.

When examined by mode of travel (roadway, transit, or bicycle), nearly 72% of all expenditures are for roadway projects that support the automobile. In a region known for its dispersed suburbanized housing, this percentage is not unusual. However, over the last several years transit investments have increased dramatically, and this trend is expected to continue (see Figure 23).

**Figure 23.**  
**Expenditures by Mode**  
 in \$ Billions



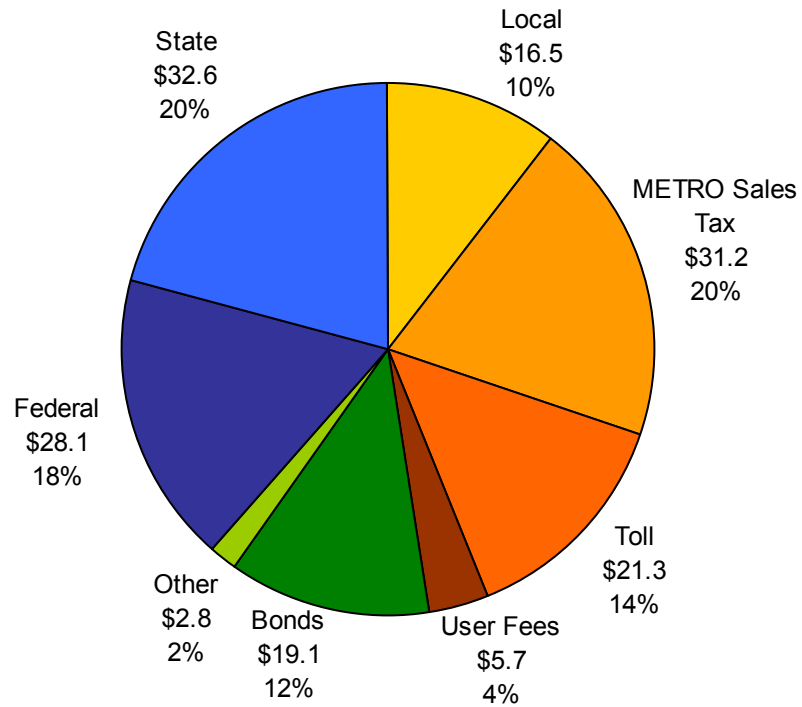
**Revenues.** The estimated total revenue available for the 2035 RTP is \$157.2 Billion (see Figure 24). These revenues come from a variety of federal, state, and local sources. Among the federal sources is the federal gas tax, programmed funds from the Federal Highway Administration and the Federal Transit Administration, congressional earmarks, as well as other funds that are allocated to the individual states. State sources include the motor fuel tax, vehicle registration fees, pass-through financing agreements (as reimbursed from federal sources), and other state allocations. Local sources include property and sales taxes collected by the cities and counties, toll revenues, bonds, and user fees from transit agencies. As a group, the local sources provide the greatest amount of revenues for the RTP.

It is particularly important to note that the region's reliance on toll receipts to fund the RTP is growing each year. New toll roads, such as the SH 99-Grand Parkway, as well as managed lanes, such as the High Occupancy Toll (HOT) Lanes currently being constructed on I-10 West, are scheduled to come on line in the next 30 years. Although the Harris, Fort Bend, Brazoria and Montgomery County Toll Road Authorities are not

obligated to spend tolling receipts on non-toll transportation projects, in the past they have reinvested all toll-generated revenues into the toll and connecting roadway road systems.

**Figure 24.**

**Revenue Sources**  
in \$ Billions



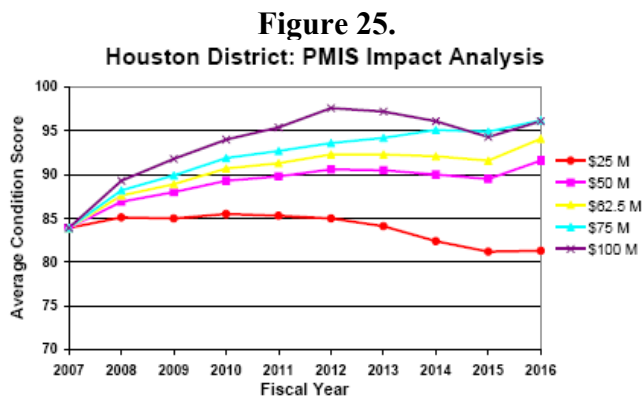


## Preservation, Maintenance and Rehabilitation

The regional road system is either the largest capital asset or among the largest capital assets under the responsibility of local area governments. With nearly all of the regional highway and roadway system being built to its outermost limits, an emphasis on maintenance and rehabilitation has become paramount. As pavements near the end of its useful life, and as pavement deficiencies develop, decisions must be made about when, where, and how to allocate funding for maintenance and preservation.

In August 2001 the Texas Transportation Commission set a goal to have 90% of Texas pavements in good or better condition by the year 2017. In keeping with this goal, H-GAC and TxDOT staff ran a PMIS analysis using several yearly pavement budgets for a ten year period assuming a baseline average pavement condition score of 82 (good condition). The basic question was, “What would be the required expenditure level for the Houston District to maintain the future network at or above a condition score of 90 (very good condition)”? The results of this analysis are depicted in Figure 25.

The five scenarios as indicated in Figure 25 correspond to expenditure levels from \$25 million to \$100 million for the time period 2007 – 2016. It can be concluded that based on the Houston District’s goal to achieve and maintain an average pavement condition score of 90 or very good pavement condition; between \$50 million to \$75 million is needed in order for this region to improve from a good condition score of approximately 83 to a very good condition score of 90, and thus meet and maintain the statewide goal. The selection of any allocation strategy however, will be formed in part through an economic analysis involving a myriad of trade-offs. The end result will be a set of maintenance projects ranked by need and scheduled by year for the long-term good of the region.



## 2035 RTP System Analysis Summary

This section summarizes the results of analyses of various measures used to describe the effectiveness of the regional transportation system as it exists today and as it is planned for the future. The discussion begins with summaries of measures of mobility and accessibility including the following:

- Level of Mobility (LOM)-serious/severe congestion levels are shown indicating the results of the projects in the 2035 RTP.
- Accessibility relative to the time required to get to the central core of the region by auto and transit (shown in travel time contours).
- User Benefits defined as the value of time saved for users of the transportation system by automobile and transit modes.
- Summaries of population and employment within specific time frames by transit access.

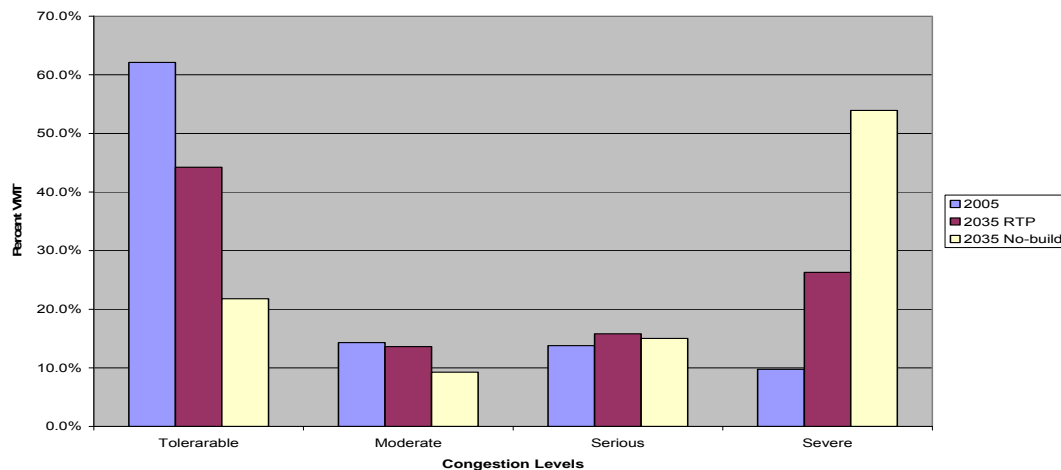
(More detailed analyses are included in Appendix B-2035 RTP System Analyses).

### Level of Mobility (LOM)

The LOM was developed to illustrate the degree of congestion on roadways within the region. The LOM is comparable to the standard engineering Level of Service (LOS) measure which is based on volume-to-capacity (V/C) ratios. The chart below shows the relative distribution of morning peak period congestion levels for the current and future

**Figure 26.**

**Level of Mobility-AM Peak**



systems as a percentage of vehicle miles traveled in each LOM category. There will be

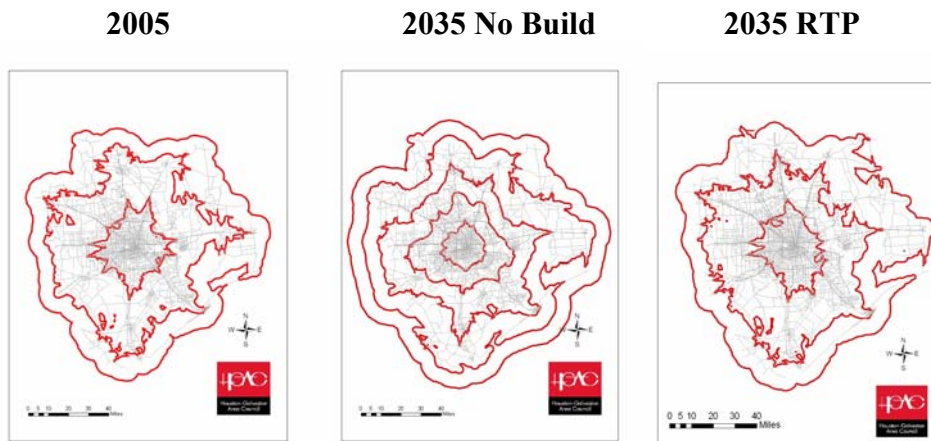
an increase in regional congestion levels if the forecasted growth occurs. The most significant changes would be at the low end of the range (tolerable congestion levels) and high end (severe) congestion levels, between the current system performance and a future scenario without the RTP projects (the no-build). The projects in the RTP would reduce the percentage of severely congested VMT in the morning peak period, from about 50% to less than 30% compared to a No-build scenario.

**Regional Accessibility**

The term accessibility is used here to describe the level of ease or convenience that travelers experience in getting to and from various parts of the region for various trip purposes. Travel times for home-based work trips are the primary focus of the following discussion. According to Census Bureau estimates, the mean (weighted average) perceived travel time to work in Harris County increased from about 26 minutes in 1990 to 28 minutes in 2000. For both years those values are about 3-4 minutes higher (slower) than the mean travel time to work for the state of Texas.

Regional accessibility can be illustrated graphically by travel time contours (Figure 27). The contour maps shown below are based on the average travel times from the region to downtown, with values combined into equal time-bands (in 30 minute increments). Those equal time-bands (or contours) are overlaid with the regional roadway network and show

**Figure 27.  
2035 RTP Travel Time Contours to CBD**



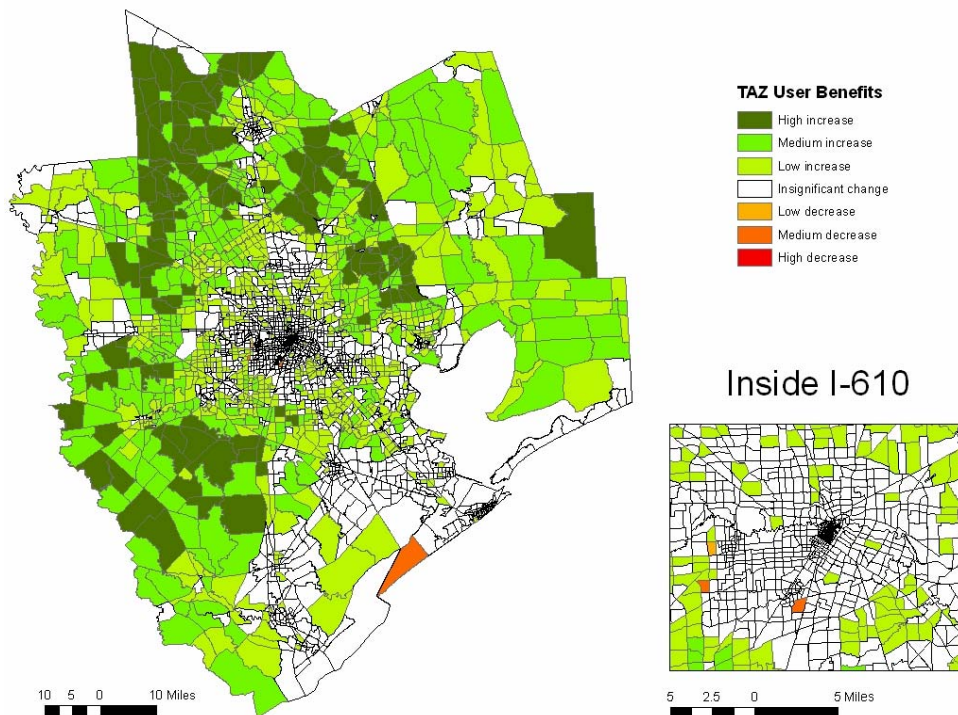
the relative travel distances from downtown, for the current and future 2035 roadway

systems. The contour map shows that the future regional accessibility to downtown (CBD) by auto, including the forecasted regional growth, will be very similar to today with the improvements included in the 2035 RTP. By contrast the relative distance that could be traveled if the RTP projects were not implemented is noticeably less (No-build).

### Summit-User Benefits

Another analytical technique uses the Summit software program which generates color coded plots that represent changes in system accessibility between alternative system improvements. The measure that is used, User Benefits, is based on a microeconomics theory relative to the value of time saved for users of the transportation system. The areas where travelers would save time are shown in green and the areas in red/orange show travel time losses. The losses in travel time are likely the result of increased regional growth in demand, without significant increases in the transportation system in those areas. Figure 28 shows the user benefits for the 2035 RTP compared to a No Build

**Figure 28.**  
**2035 User Benefits**

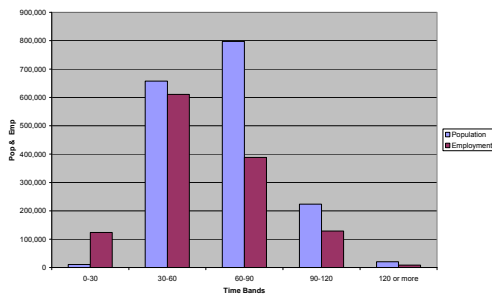


scenario for all origins. Overall the analysis shows improvements in most areas. Further review is needed for those areas indicated as losing travel time benefits.

Another way of measuring the changes in regional transit accessibility is shown by calculations of the regional population and employment within specific time bands by time of day for the current and future transportation system. The charts below highlight the share of regional population and employment accessible within 30 minute time bands by walk access to transit in 2005 and 2035.<sup>2</sup>

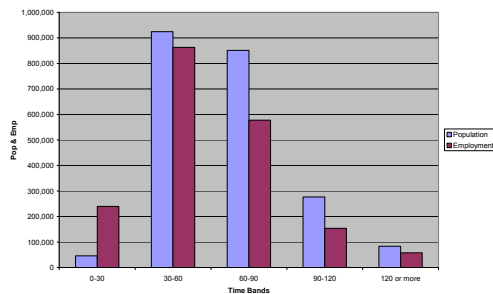
**Figure 29.**

**2005 Transit Access-Walk**



**Figure 30.**

**2035 Transit Walk Access**



The employment accessible within 30 minutes (or less) by local transit would double from 100 thousand to 200 thousand in 2035 compared to the current system. There would also be a significant increase in the employment accessible within 60 minutes by local transit access from 650 thousand to over 900 thousand. (See Appendix B for more details.)

<sup>2</sup> Trips are in reference to a centrally located analysis zone in the Central Business District for home-based work peak period trips.

## **Project Prioritization**

The RTP groups projects into three timeframes: long-range, short-range and imminent for construction. Generally, all RTP projects begin in the long-range plan. Any given project identified as long-range will require additional planning to understand the project's purpose, need, and scope. The time-frame for implementation may be eleven to twenty-five years in the future. Long-range projects, which are based on forecasted needs, are often concepts to assist comprehensive community planning and identify needed corridor preservation. These conceptual projects are subject to public comment in a variety of ways, such as feasibility and corridor studies, both of which include discussions focusing on sub-areas as well as whole corridor issues. Public meetings are held with various local community and business groups for Corridor Studies, and during the Preliminary Design stage as well as through the formal RTP public outreach program.

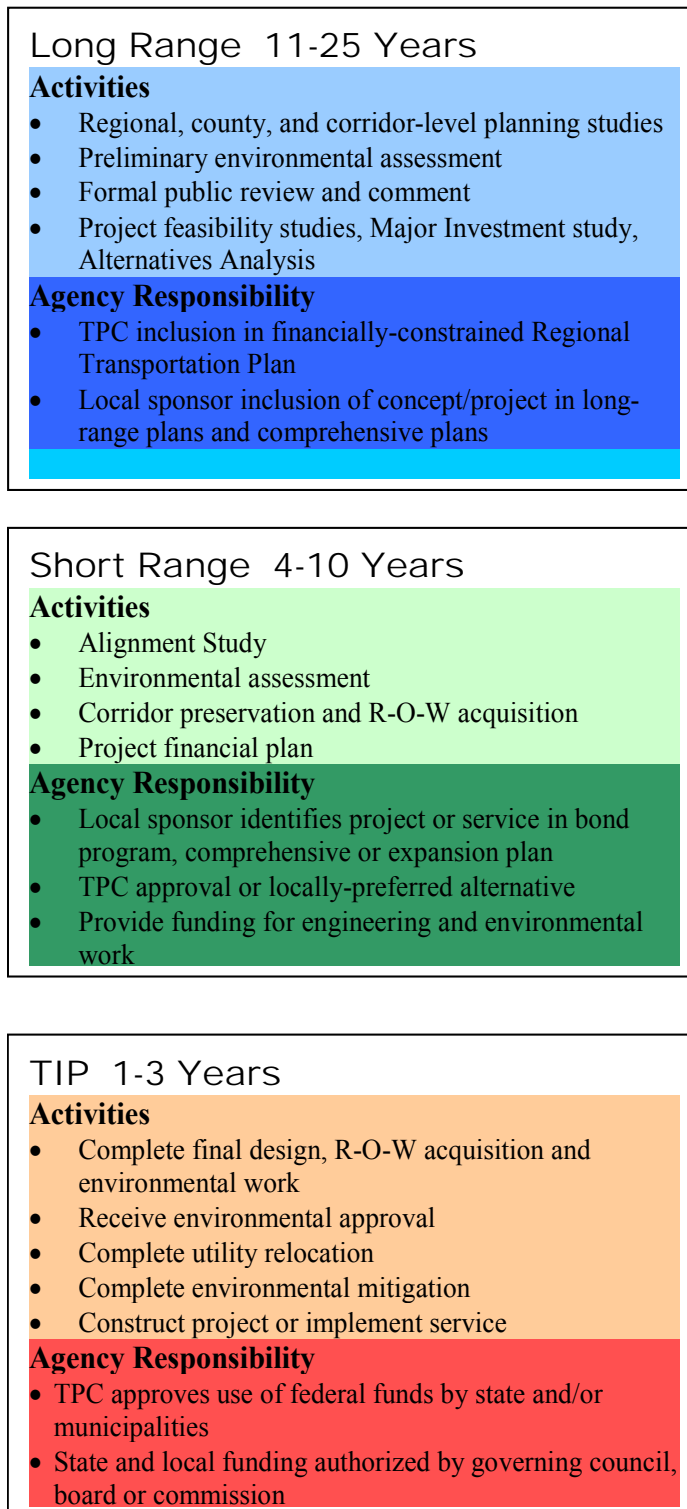
Short-Range projects are those under development for implementation within four to ten years. This timeframe is the beginning of the project implementation process. Short-Range projects go through a number of steps including environmental assessment, EIS, preliminary engineering and design, financial planning and additional public outreach. Public outreach activities include opportunities for comment during environmental assessment phases as well as through the formal RTP public outreach program. In this stage, project sponsors, upon approval of environmental work, can finalize alignment and, can begin the right-of-way acquisition process.

TIP projects are authorized to be implemented. These projects have met all the requirements for project readiness, including reliable cost estimates, financial commitments, and substantial right-of-way acquisition. TIP projects can be scheduled for implementation within the next one to three years. The projects listed in the TIP are the only 'fully funded' roadway projects within the RTP. The current TIP in development is the 2008-2011 TIP.

**Project Prioritization Process.** The 2035 RTP project prioritization process is a systematic procedure to rank projects in the long-range plan from higher to lower priority. Projects listed in the long-range plan do not require the identification of a specific funding source. The intention of this process is to determine the types of transportation improvements that are financially feasible over the next twenty years or

more. Projects ranked near the top of the listing have the expectation of providing the greatest achievement of desired regional outcomes for every dollar expended.

**Figure 31. Project Development**



The process involves several basic steps to achieve the end result of linking regional goals and objectives to specific quantitative and qualitative performance indicators. The process begins with a list of modeled projects from the most current plan and a pre-determined set of RTP planning factors. Step two, sorts all projects into one of the following eligible program categories:

**Program 1.** System Development and Preservation

**Program 2.** Pedestrian-Bicycle

Air Quality – Non Pedestrian-Bicycle

**Program 3.** Operations Management

Intersection and Bottleneck Improvements – Non ITS

Intersection and Bottleneck Improvements – ITS

**Program 4.** Transit Services

Transit Capital

Livable Centers

The remaining steps are summarized as follows:

Step 3. Determine the benefit-cost ratio of each project,

Step 4. Apply points or scores to the B/C ratio and other planning factors,

Step 5. Compute total scores and rank-order each project from high to low based on overall scores,

Step 6. Submit the list of projects to the TPC for final review and approval.

The project prioritization process also establishes the context for implementing the Long-range Vision for the future of the region. The vision as stated in the 2035 RTP, began with the outcomes prescribed by SAFETEA-LU and other critical issues in transportation identified by the Executive Committee of the Transportation Research Board (TRB). The prescribed legislation and guidance, coupled with Envision Houston Region recommendations, cumulated into these broad statements of regional values and goals:

1. Better mobility, less congestion and cost,
2. Easier access to jobs, homes and services,
3. More transit,
4. More green space and preservation of floodplain areas for aesthetic and recreational activities, and
5. Healthier Environment.



SAFETEA-LU requires consideration of eight broad areas:

1. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency, including through services provided by public and private operators;
2. Increase the safety of the transportation system for motorized and nonmotorized users;
3. Increase the security of the transportation system for motorized and nonmotorized users;
4. Increase the accessibility and mobility of people and for freight, including through services provided by public and private operators;
5. Protect and enhance the environment, promote energy conservation, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;
6. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight, including through services provided by public and private operators;
7. Promote efficient system management and operation; and
8. Emphasize the preservation of the existing transportation system, including services provided by public and private operators.

The Executive Committee of the Transportation Research Board (TRB) of the National Academies has outlined the most critical transportation issues facing the nation as:

- **Congestion**, increasingly congested facilities across all modes;
- **Emergencies**, vulnerability to terrorist strikes and natural disasters;
- **Energy and Environment**, extraordinary challenges;
- **Equity**, burdens on the disadvantaged;
- **Finance**, inadequate revenues;
- **Human and Intellectual Capital**, inadequate investment in innovation;
- **Infrastructure**, enormous, aging capital stock to maintain;
- **Institutions**, 20<sup>th</sup> century institutions mismatched to 21<sup>st</sup> century missions; and
- **Safety**, lost leadership in road safety.

The three foundational elements of the prioritization process, SAFETEA-LU, TRB critical issues, and Envision Houston Region are summarized in Table 10. Table 10

provides a compact, seamless linkage of the guiding principles for the 2035 RTP. This new emphasis represents a shift from predetermined modal decisions, toward a broader consideration of tailored multimodal solutions within the context of transportation performance expectations or indicators. As such, this emphasis is intended to result in transportation plans, programs, and decisions driven by: a general statement of community values, the desired ends of the planning process, and an assessment of programs, projects, and services with respect to overall transportation plan goals and objectives.

The benefits to be gained from this approach could be substantial. The ability to better direct resources to those programs and projects that provide the best return on transportation investments as determined by measurable indicators from a planned course of action and the associated tradeoffs is crucial for this planning horizon.

**Table 10. 2035 RTP Goals and Objectives**

<b>Goals</b>	<b>Objectives</b>	<b>Criteria</b>	<b>Indicators</b>
4	Support the economic vitality of the 13-county metropolitan area via land use and other planning strategies that support state and local managed growth and economic development.	Economic Development and Quality of Life	New Development, Town Centers, Employment and Population Growth within quarter mile of new town centers, Development in flood plain.
1	Reduce congestion.	Congestion	Reduction in VMT and VHT in town centers, delay index, congestion index.
1,3	Increase accessibility and mobility options for motorists, pedestrians, bicyclists, freight carriers, and special need segments of the population.	Mobility and Equity	Employment and Population growth within quarter mile of transit.
3	Enhance the integration, connectivity, and coordination of the transportation system and services for people and freight across all modes.	Coordination of Transportation Services	Transit PMT and PHT, Transit accessibility index
5	Provide protections to the human and natural environment and promote resource and energy conservation.	Environmental Protection and Air Quality	NOx and VOC emissions,
1,2	Improve the safety of the transportation system for all motorized and non-motorized users.	Safety	Safety Improvement Index
1,2	Increase the ability of the transportation system to support homeland security and safeguard the personal security of all motorized and non-motorized users.	Security	Hurricane Evacuation Zones

## **Development of the 2008-2011 Transportation Improvement Program**

The 2008-2011 Transportation Improvement Program (TIP) has been developed in accordance with the requirements of metropolitan planning guidance received from FHWA and FTA. Specific requirements of the TIP and a brief discussion of how H-GAC met the requirements are outlined below:

- The TIP must include a priority list of projects to be implemented during the four-year TIP period.

The 2008-2011 TIP contains a list of priority roadway and transit projects to be implemented over the next four years. To ensure that high priority, cost-effective projects were selected; all proposed projects were reviewed and adopted by the TPC.

- The TIP must include a financial plan which shows the source of funding for the projects contained therein.

H-GAC, TxDOT, METRO and other transportation agencies in the region have worked to identify the amount of funding available annually for highway and transit transportation improvements. The 2008-2011 TIP includes a separate financial plan for highway and transit elements, which documents these amounts. Each year is financially constrained to funding availability. Together, this ensures that the most cost-effective projects are given top priority and implemented at the earliest possible opportunity given the funding and construction constraints.

- Projects identified in the TIP must be consistent with the Regional Transportation Plan.

The method used to select projects for the 2008-2011 TIP is consistent with H-GAC's regional transportation planning process. The 2008-2011 TIP is endorsed by the TPC, subject to the condition that projects selected for the TIP are included in a conforming metropolitan transportation plan.

- There must be reasonable opportunity for public comment prior to approval of the TIP.

Discussions regarding TIP development are conducted at TPC and TAC meetings each month. An opportunity for public comment is included in both meetings. H-GAC also holds a thirty-day public comment period on the draft TIP prior to approval of the final document. Notices regarding the public comment period are placed on

the H-GAC Transportation web site and are advertised in the Houston Chronicle.

- The TIP must cover the entire metropolitan area, including the designated non-attainment area.

All projects in the eight-county TMA selected for federal-aid are included in the TIP. Federal formula transit funding for each urbanized area is included within the boundaries of the TMA and in the TIP.

- The TIP must show progress in implementing projects from the previous TIP periods.

The 2008-2011 TIP identifies priority roadway and transit projects scheduled for implementation between September 1, 2007 and August 31, 2011. The TIP contains the first four years of funded priority projects within our region and is considered the implementation tool for the Regional Transportation Plan. The TIP includes any transportation project in our region receiving federal funds as well any locally funded regionally significant project.

Over \$2 billion dollars in federal funding requests were submitted by our local agency sponsors, only \$230 million dollars was available for programming. Since the transportation needs in our region far exceeded the amount of funding available the transportation policy council established a competitive evaluation process to select those projects that would be ready for implementation within the TIP timeframe and would result in the highest regional benefits.

The scope of work for transportation investments considered for federal funding are uniquely different which results in a variety of benefits for our transportation system. For this reason the Transportation Policy Council approved the Coordinated Development Programs for project solicitation and selection. The objective was to organize the project improvements into four areas by goals and activities eligible for funding. The four program areas are:

**PROGRAM 1 - System Development (Ex: Added Capacity) & Operational Non – ITS (Ex: Grade Separations, Turn lanes)**

Projects are evaluated for their impact on relieving bottlenecks and filling gaps in the existing transportation network. Benefits evaluated also include the project's positive impacts on the economy, provisions for additional travel choices, and investments to address safety concerns. This criterion gives some recognition to projects that preserve and maintain our existing infrastructure and to those local

government's conducting corridor planning efforts that include the study of access management.

**PROGRAM 2 - Bicycle and Pedestrian and Air Quality Programs (Ex: Bike lanes, bike trails, pedestrian paths, Clean Vehicle, Commute Solutions)**

The evaluation criteria recognize projects for their impact on filling gaps in the existing pedestrian and bicycle network. Benefits evaluated include the project's convenience and safety for the users as well as the project's design accommodations. These projects are also evaluated on their air quality improvements. Projects competing for the Air Quality Programs were evaluated on their emissions benefits and cost effectiveness.

**PROGRAM 3 - Traffic Operations and Management Planning Factors (Ex: Signal Synchronization, Access management)**

The evaluation criteria recognize projects for regional coordination and connectivity with area stakeholders and systems. Regional benefits from these projects can include providing traveler information during emergencies and improved traffic flow along an entire corridor without the need for roadway expansion. There are other factors used in the evaluation of these projects that relate to the planning efforts of the project sponsors such as preparing back up in case of system failure, identifying leverage, and the development of a maintenance plan. This criterion has been updated to give some recognition to projects that maintain a high level of emissions over the life of the project. There will also be a cost effectiveness threshold to fund projects with a minimum air quality benefits.

**PROGRAM 4 - Transit Service, Transit Capital and Livable Centers Planning Factors**

Transit services are evaluated for their benefits in providing coordinated and connected services for the region. Services were evaluated on the potential to reach new riders and the ability of the service to continue at the conclusion of CMAQ eligibility. This criterion was updated to give recognition to projects that operate vehicles using cleaner fuels. There was also some recognition to projects ensuring the safety and security of the riders.

There are two new criteria developed for this TIP. The first is transit capital developed to address the benefits of facilities to the region and the users. The

benefits of capital transit include the safety of the facility, the coordination of services to that facility, and the use of ITS for the users. Sponsors must also have a ridership plan to document the expected increase in use.

The second criteria are for a new Livable Centers program category. Livable Centers projects are focused on a geographical area and have private investor interest. Livable center projects are evaluated on their ability to redevelop a community, provide a safe walkable environment, provide community identity through landscape design, are part of a comprehensive plan, and provide multiple mode opportunities.

## Air Quality

On-road mobile transportation is one of several broad categories contributing to the formation of ground level ozone. To meet the federal air quality standard in the region, reductions are needed from all criteria pollutant sources. The 2035 RTP recommends increased funding for the following emission's reduction programs:

- \$460 million for FY 2007-2035 Clean Cities/Clean Vehicles Program
- \$198.8 million for FY 2007-2035 Vanpool
- \$11.6 million for FY 2007-2035 Commute Solution's
- \$53.2 million for FY 2007-2035 NuRide
- \$2.8 million for FY 2007-2035 Transportation Management Organizations

**Air Quality Conformity.** The eight-county TMA continues to be non-compliant with the Clean Air Act for ground-level ozone. Ozone is a ground-level pollutant that causes lung irritation, which at high levels is dangerous to the elderly, the young, and individuals with chronic diseases, such as asthma or other heart-lung ailments. Ground-level ozone is created by a chemical reaction between volatile organic compounds (VOCs) and nitrogen oxides (NOx) and sunlight. The Houston-Galveston Area emits large amounts of VOCs and NOx, principally from on and off road mobile sources, and secondarily from area and point stationary sources such as small and large industrial sources.

Under the Clean Air Act, the Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) to determine the health threat of area pollutants. If an area has a health threat, it is designated as a non-attainment area until it becomes compliant. Through the conformity process, the 2035 RTP addresses the tracking of on-road mobile air quality improvements. To receive federal approval for the expansion of the regions roadway and transit system, the 2035 RTP must demonstrate compliance with specific reductions in air pollutants caused by on-road vehicles.

Transportation conformity is obtained by demonstrating that on-road emissions associated with all projects in the 2035 RTP do not exceed emission limits established in the Texas State Implementation Plan (SIP). Vehicle emissions resulting from the implementation of transportation projects in the 2035 RTP cannot exceed emission budgets established by the SIP. Thus, a conformity determination means that on-road vehicle emissions are within the on-road vehicle emissions budget as determined by the State Implementation Plan. The budget as it appears in the 1-hour Ozone Attainment

Demonstration SIP is measured in tons per day (tpd) and is summarized in the table below:

**Table 11. 2007 Attainment Demonstration Budget**

NOX	186.13 tpd
VOC	89.99 tpd

Transportation conformity is an analytical methodology that establishes the connection between projected on-road emissions from the RTP, and known reductions in the motor vehicle emission budget from the State Implementation Plan (SIP). Through the process of transportation conformity, the RTP uses the SIP's on-road mobile strategies, and air quality targets to demonstrate that the RTP complies with the federal air quality requirements. The Houston-Galveston region must demonstrate that the 2008 - 2011 Transportation Improvement Plan (TIP) and the 2035 RTP result in less volatile organic compounds (VOC) and nitrogen oxides (NO<sub>x</sub>) than established and approved by EPA for the base year and each horizon years. The results from the previous conformity determination adopted in June 2005, showed the Houston-Galveston Transportation management area met the requirements of the SIP with reductions in both nitrogen oxide (NO<sub>x</sub>) and volatile organic compound (VOC) emissions.

**Conformity Requirements.** The Clean Air Act Amendments of 1990 (CAAA) require transportation plans, programs, and projects in nonattainment areas, which are funded or approved by the Federal Highway Administration (FHWA) or Federal Transit Administration (FTA), to conform to the SIP. This ensures that transportation plans, programs, and projects do not produce new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards (NAAQS).

Additional requirements that apply include:

- Use of the latest planning assumptions
- Analysis based upon the latest emission estimation model available
- Interagency consultation as well as a public involvement process must be conducted during the analysis
- Timely implementation of Transportation Control Measures (TCMs)
- The RTP and the TIP must be consistent with the MVEBs established in the applicable SIP



- The RTP and the TIP must include all regionally significant projects expected in the nonattainment area

**Conformity Analysis Results.** The results of this conformity determination show that the 2035 *Regional Transportation Plan* and the 2008 - 2011 *Transportation Improvement Program* for the Houston-Galveston Transportation Management Area meet the requirements of the SIP for the Houston-Galveston Ozone Nonattainment Area, according to the Clean Air Act (42 U.S.C. 7504, 7506 (c) and (d)), as amended on November 15, 1990, and the final conformity rule (40 CFR Parts 51 and 93).

**TABLE 12: Air Quality Conformity Analysis Summary**

Analysis Year	VOC Emissions (tpd)	VOC Budget (tpd)	NOx Emissions (tpd)	NOx Budget (tpd)
2007	88.09	89.99	171.35	186.13
2009	80.70	89.99	150.86	186.13
2019	46.00	89.99	49.60	186.13
2025	42.20	89.99	39.34	186.13
2035	51.43	89.99	43.05	186.13

**Amended Air Quality Results.** TxDOT submitted project revisions to the August Conformity network (please refer to Amended Project Listing—Appendix 9.12). These revisions triggered a conformity amendment for which new air quality analysis needed to be done for the years 2019, 2025 and 2035. The air quality results are as follows:

**Table 13: Amended Conformity Analysis Summary**

Analysis Year	Miles	VOC Emissions (tons/day)	VOC Budget (tons/day)	NOx Emissions (tons/day)	NOx Budget (tons/day)
<b>2007</b>	133,887,822.8	88.09	89.99	171.35	186.13
<b>2009</b>	147,409,162.9	80.70	89.99	150.86	186.13
<b>2019</b>	186,786,559.9	46.17	89.99	49.84	186.13
<b>2025</b>	211,681,750.4	42.07	89.99	39.19	186.13
<b>2035</b>	255,998,311.1	50.43	89.99	42.29	186.13

These air quality results were calculated using the same programs and the same data as for the original 2007 conformity, as it was agreed by the Conformity Consultation Committee.

## Summary

The examination of the growth scenarios in the 2035 RTP does not constitute a consensus on the nature or location of development in the eight county region. It is intended to give policy makers additional information against which to assess the need for and scope of potential transportation investments. The 2035 RTP will help set the stage for future exploration of transportation and land use coordination by all stakeholders and local governments as they look to maximize the use of public transit, reduced commute distances, and increase cycling and walking opportunities.

This Plan is a major first step towards improving the regions accessibility and quality of life while recognizing that as the region and local economy continues to grow, that growth must be managed strategically. The 2035 RTP has identified a myriad of solutions for improving the regional transportation landscape. Over this planning horizon, utilizing a combination of strategies to include: roadway expansions, intelligent transportation technologies, alternatives to driving alone in heavily traveled corridors, the creation of live-work communities, and connecting transportation with land use reduces the reliance on vehicular trips and encourages a more efficiently functioning transportation network. The incremental and cumulative effects from the implementation of the four major strategies will build more overall system capacity at an acceptable level-of-service.

## SAFETEA-LU 2035 Requirements

SAFETEA-LU Requirement:	SAFETEA-LU Provision:	Addressed in 2035 RTP:	Location in 2035 RTP:
Added a new stand-alone factor to “increase the security of the transportation system for motorized and non-motorized users.”	Sections 5304 (d) (1)	Security concerns, specifically evacuation planning, are addressed in the 2035 RTP. Consultation and coordination activities occurred under Hurricane Evacuation Task Force.	Main RTP Document, 4 Strategies Section, Operations Management Sub-Section.
Added a new stand-alone factor to “increase the safety of the transportation system for motorized and non-motorized users.”	Sections 5303 (h) (1)	The Regional Safety Council, consisting of safety stakeholders, developed safety goals and strategies included in the 2035 RTP.	Main RTP document, 4 Strategies Section, Operations Management Sub-Section
Environmental Mitigation Activities: Plans shall include a discussion of environmental mitigation activities and this discussion shall be developed with stakeholder agencies.	Sections 5303 (i) (2) (B) and 5304 (f) (4)	The 2035 RTP includes a discussion of potential impacts, avoidance, and mitigation activities at the policy level. An Environmental Advisory Committee consisting of stakeholder agencies identified areas of environmental concern. In addition, staff in coordination with TxDOT and EPA, utilized the GIS-ST program to identify possible advanced mitigation sites.	Main RTP document, Environmental Section. See also Executive Summary.
Public Transit Element: Plans shall include a Coordinated Public Transit-Human Services Transportation Plan	Sections 5310, 5316, and 5317	A Regional Coordinated Public Transportation Plan was developed through a process including representatives of public, private, and nonprofit transportation and human service providers and the public.	Main RTP document, Transit Section. See also website: <a href="http://www.ridethegulfcoast.com">www.ridethegulfcoast.com</a>
Transportation Facilities: Operations and Management strategies in MTP.	Sections 5303 (i) (2) (D), 5303 (k) (3), 5304 (f) (7), and 5304 (i)	The 2035 RTP contains operations and management strategies for both the highway and transit network that improve the intermodal connectivity of the existing transportation systems (including use of ITS technologies).	Main RTP document, 4 Strategies Section, Operations Management sub-section.
Fiscal Constraint	Sections 5303 (i) (2) (C); (j) (1) (C), (j) (2) (B); (j) (3) (D) and 5304 (f) (5); (g) (4) (E); (g) (4) (F)	The 2035 RTP demonstrates fiscal constraint through an analysis of regional revenues and costs. This analysis confirms revenues and costs related to system operations and maintenance activities covered in transportation plans and programs.	Main RTP document, Financial Plan.
Consultation and Cooperation: Transportation Plans	5303 (g) and (i) (4) and 5304 (f) (2)	The 2035 RTP was developed in continued consultation with partners (including TxDOT and local officials) as well as the public (including Envision Houston Region effort).	Main RTP document, Public Outreach section. Also see public outreach appendix and Public Participation Plan (PPP) for more detail.
Consultation and Cooperation: Land Use Management and Other Resource Agencies	5303 (i) (4) and 5304 (f) (2) (D)	The 2035 RTP was developed in consultation with local/State land use management, natural resource and other agencies. The plan was compared with available conservation plans and inventories of natural resources through the Environmental Advisory Committee process and GIS-ST analysis.	Main RTP document, Environment Section.
Congestion Management Process	5303 (k) (3)	The 2035 RTP “Congestion Management Process” is based on the congestion management system used in the 2025 RTP.	Main RTP document, Operations management section.