An independent review of the current state of infrastructure needs, capability, and funding in the Greater Houston Region by the Houston Branch of the American Society of Civil Engineers.
EXECUTIVE SUMMARY

The Houston Branch of the American Society of Civil Engineers has developed the first ever comprehensive Houston Area Infrastructure Report Card. Our goal is to highlight the importance of local infrastructure and identify areas of improvement. The focus of our study includes the Counties of Harris, Galveston, Brazoria, Fort Bend, Waller, Montgomery, Liberty, and Chambers as well as the Municipalities, Districts, Associations, Councils, and Partnerships within this geographical area. This local report card provides an unbiased assessment of the subject infrastructure topics and should be used as a tool to help members of the community and local leaders put the grades from the national report into perspective, facilitate dialogue, and foster solutions for the citizens of the greater Houston region.

ASCE Houston has identified eight key categories for consideration in this initial report card. They include Bridges, Drinking Water, Flood Control and Drainage, Rail, Roads and Highways, Solid Waste, Transit, and Wastewater. Local report card committee members met with stakeholders throughout the region to determine metrics by which individual agencies identify their needs, both present and future, and the manner in which they gauge success in meeting those needs and fulfilling their mission. This information was collected and then evaluated according to the following criteria:

- Capacity - Evaluate the infrastructure’s capacity to meet current and future demands based on master plans, funding plans, and capital improvement programs.
- Condition - Assess the infrastructure’s existing physical condition considering near future projects which would improve the conditions if either funded or in design.
- Funding - Identify the current level of funding and predicted current and future investment in the system relative to the estimated need.
- Future Need - Evaluate the cost to improve infrastructure to meet expected needs compared to projected funding levels.
• Operation and Maintenance - Evaluate the ability to operate and maintain the infrastructure properly to preserve the system, considering infrastructure failures contributing to non-compliance with regulatory requirements.

• Public Safety - Evaluate to what extent the public’s safety is jeopardized by the condition of the infrastructure, what the consequences of failure may be, and likelihood of a major failure.

• Resilience - Consider the capability to prevent or protect against significant multi-hazard threats and incidents and the ability to expeditiously recover and reconstitute critical services with minimum damage to public safety and health, the economy, and national security taking into account cross sector interdependencies.

Grades were then assigned across each of the above criteria and given an overall average according to the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100%</td>
<td>Exceptional</td>
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<tr>
<td>B</td>
<td>80-89%</td>
<td>Good</td>
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<tr>
<td>C</td>
<td>70-79%</td>
<td>Average</td>
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<tr>
<td>D</td>
<td>60-69%</td>
<td>Poor</td>
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<tr>
<td>F</td>
<td>59% or lower</td>
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Infrastructure has a direct impact on the personal and economic health of our region. This report card is a useful and powerful tool intended to engage citizens and elected officials to do what they can to change the trend and improve the grade where infrastructure is not performing satisfactorily in order to address regional infrastructure and assure the future prosperity of the greater Houston region.
Although all eight counties in this region were polled for information on this category, the repository of information related to all area bridges is maintained by the Texas Department of Transportation (TxDOT). TxDOT inspects all bridges both on state roadways and off the state highway system on a biannual basis and maintains/shares the data. There are a total of 5,636 bridges in the Houston District, which ranks second in the State of Texas with the most number of bridges. Houston encompasses a total of 11% of bridges in the State of Texas.

**Capacity**  
N/A

It is rare that a bridge limits the capacity of a roadway. Therefore, the overall issue of capacity is relegated to the roadway assessment.

**Condition**  
D

In the Houston region, three indicators for conditions of bridges were studied. One indicator was the sufficiency rating which takes into account several issues including geometry. The second indicator was the percent of bridges that are structurally deficient, functionally obsolete, or substandard. Lastly, the third indicator was the average age.

**Funding**  
D+

Funding changes were reviewed whether funding was increased, decreased, or maintained.

**Future Need**  
D+

The ability of the region to meet future needs directly corresponds to funding trends today. This was a difficult area to evaluate due to the fact that funding for new bridges is often included in the complete construction cost of a roadway project.

**Operation and Maintenance**  
D

The percentage of bridges posted with load restrictions and closures was used as the primary indicator of the effectiveness of operation and maintenance.

**Public Safety**  
D

Public safety was measured by three indicators. The first was the number of structurally deficient bridges with high volumes. Second was the overall sufficiency rating for all bridges in the region. Lastly were the critical evacuation routes containing functionally obsolete or structurally deficient bridges.

**Resilience**  
B

Resilience was measured by two indicators. The first indicator included the existence of plans and procedures in place to respond to incidents and damage to bridges. The second was the existence of plans and procedures to respond to natural disasters.

**Overall Grade**  
C-
According to the 2009 ASCE National Report card, “The nation’s drinking water systems face staggering public investment needs over the next 20 years. Although America spends billions on infrastructure each year, drinking water systems face an annual shortfall of at least $11 billion in funding needed to replace aging facilities that are near the end of their useful life and to comply with existing and future federal water regulations. The shortfall does not account for any growth in the demand for drinking water over the next 20 years.” Based upon a review of available data collected in the Houston metropolitan area, the region is facing a similar situation. Survey data collected from the City of Houston, City of Pearland, City of Humble, City of Pasadena, the North Fort Bend County Water Authority, and the North Harris County Regional Water Authority provided a sample size of approximately half of the population of the region, with the City of Houston as the largest stakeholder in the sample.

**Capacity**

B-

This area normally has ample rainfall, and water supplies have been well planned. The City of Houston, as the largest surface water rights holder in the area, has enough water rights permitted to meet projected demand in the area beyond year 2060. The current drinking water capacity in the area can be characterized as good. There are no major areas without access to public water systems. The majority of water systems in the area, especially in the City of Houston, have looping throughout the system to provide more than one distribution main feed to the area. The City of Houston has also implemented design criteria requirements concerning capacity and looping. The facilities in the area are also designed for peak flow requirements to provide needed capacity to residents.

**Condition**

C

Condition of current drinking water facilities, transmission, and distribution as a whole would be classified as average. The majority of facilities in water authorities throughout the area are very new because the development of the water authorities has only occurred in the past couple of decades. The City of Houston water mains, while aging, are overall in fair condition with ongoing capital improvements projects continuing.

**Funding**

F

Funding is one of the largest issues for the drinking water infrastructure in the Houston metropolitan area. The amount of funding provided to public agencies sampled is in most part adequate to keep their water systems operational but it is far short of the ideal amount needed to preserve the value of the drinking water infrastructure. This means that infrastructure has not been maintained or replaced at its life span-based schedule and the systems are gradually deteriorating. As an example, the City of Houston, the area’s largest public utility provider,
funds its infrastructure through revenue collected from its rate payers. However, their rates in the past were so low that infrastructure has not been maintained or replaced as it should have. As a result, the water system is deteriorating and a backlog in repairs has piled up. A recent rate increase was able to bring the funding to a level that would keep up with the system need but it is still not enough to reduce the backlog. This was evidenced by the vast water main breaks during the 2011 record drought. Almost all of the main breaks occurred during the drought were on aged water lines. Approximately 75% of the breaks were associated with asbestos concrete lines that were placed in service 30 to 40 years ago.

Future Need F
As the population of the area increases, the need for drinking water infrastructure will increase as well. As drinking water infrastructure reaches the end of its service life, costs will have to be incurred to replace aging water mains and facilities. In order to provide these improvements, local funding will not be enough to sustain the drinking water infrastructure. The area will be challenged to develop a funding mechanism to pay for the improvements.

Operation and Maintenance D-
According to survey results, approximately 46% of the maintenance activities performed by the entities in the area are preventative maintenance, which means more than half of the maintenance is reactive in nature. Increase in reactive maintenance of drinking water facilities will continue in the area as the infrastructure ages and as the area expands.

Public Safety C
Water quality is a major safety concern for public drinking water systems. Boil water notices for main breaks and other maintenance issues create major concern for the public and decrease confidence in the system. Drinking water quality must be maintained at all costs, as poor water quality can result in severe public health issues.

Resilience C
Current water systems within the region would be considered to have an average resilience. Much of the system, especially within the City of Houston, has looping and planned prevention of stagnant water in design of mains. Should a natural disaster occur, the current systems have made provisions after Hurricane Ike to back up water facilities with generators to maintain water supply to residents. Security from a terrorist attack has been considered with fencing and alarm systems in place at water facilities.

Overall Grade D
Flood control and drainage facilities are designed to reduce the risk to life and property resulting from floods or significant street ponding and are extremely important to the Houston Metropolitan area. The Houston area and its surrounding communities, including Harris, Montgomery, Fort Bend, Brazoria, Liberty, Chambers, and Galveston Counties, reside in the coastal plain, which is identified by very flat topography and numerous bayous, creeks, and river systems each with different local issues. The region receives approximately 48” of precipitation annually. However, this rainfall is subject to the subtropical climate which produces high intensity rainfall patterns. Since much of the soil in the region includes a high clay content, the combination of soils with intense rainfall events tends to produce high runoff from the land.

There are numerous communities (counties, cities, villages and other entities) within the Houston metropolitan area with independent flood control or drainage responsibilities. Each of the entities have adopted their own criteria and funding source to deal with flood control and drainage issues for their communities. Some of these entities generate revenue through a drainage fee, impact fee, or other fee or tax structure, which help those entities address some of the flood control or drainage funding needs within that community. The City of Houston recently adopted a drainage fee structure, which will be a great help in addressing their drainage and flooding issues.

Also, the Harris County Flood Control District (HCFCD) and Fort Bend County Drainage District (FBCDD) have adopted ad valorem taxes to deal with drainage issues on a countywide level. However, many of the other entities in the Greater Houston area do not have these fees as a source of revenue and therefore usually only have limited funds to use in addressing their flood control and drainage issues.

The need to improve, upgrade, and rebuild our flood control and drainage infrastructure is growing along with the years of limited improvements and maintenance and the growing population within some areas of the region. Areas of vulnerability in Houston’s infrastructure were exposed in some of the more recent historical storms including Tropical Storm Allison in 2001 (estimated $6.7 billion in damages), Hurricane Rita in 2005 (estimated $12 billion in damages; however, as the main force of Hurricane Rita hit to the east of Houston, the actual impact to the Greater Houston economy was significantly less than this total figure), and Hurricane Ike in 2008 (estimated $27 billion in damages).

A review of the local population studies prepared by the Houston-Galveston Area Council (H-GAC) showed that the population in 2035 is expected to reach 8.8 million people, an increase of 3.0 million from the current estimate of approximately 5.8 million people. Flood control and drainage facilities can affect not only the safety and flooding potential of homes...
and businesses but can also affect the safe mobility of residents in the area. Improvements are needed not only to provide a more uniform and consistent drainage criteria for the current flood control and drainage conditions, but to also provide for increased capacity for future increases in population.

### Capacity

The capacity of flood control and drainage facilities varies by location and by entity. Major flood control channel capacities vary from a 50% Annual Exceedance Probability (AEP) up to a 1% AEP. On average, many of the open channels in the Greater Houston area would be inundated by a storm with a 10% AEP. However, new developments are required to build on-site detention and to accommodate the 1% AEP capacity.

The capacity of closed conduit drainage facilities (storm sewer systems) vary within the drainage areas between less than a 50% AEP to a 1% AEP in limited areas. On average, the capacity of closed conduit drainage facilities is estimated to be approximately a 50% AEP or less. New developments are required to build their new closed conduit drainage systems to convey a minimum of 50% AEP. The storms in excess of the capacity of the closed conduit system have to be conveyed overland, which adds complexity to grading and street design.

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1 Per current Federal Emergency Management Agency (FEMA) and United States Army Corps Of Engineers (USACOE) policy, the Annual Exceedance Probability language is to be used in place of previous definitions:

- **50% AEP** – Formerly referred to at the 2-year flood, the 50% Annual Exceedance Probability Flood has a 50% chance of being equalled or exceeded in any single year.
- **20% AEP** – Formerly referred to at the 5-year flood, the 20% Annual Exceedance Probability Flood has a 20% chance of being equalled or exceeded in any single year.
- **10% AEP** – Formerly referred to at the 10-year flood, the 10% Annual Exceedance Probability Flood has a 10% chance of being equalled or exceeded in any single year.
- **4% AEP** – Formerly referred to at the 25-year flood, the 4% Annual Exceedance Probability Flood has a 4% chance of being equalled or exceeded in any single year.
- **2% AEP** – Formerly referred to at the 50-year flood, the 2% Annual Exceedance Probability Flood has a 2% chance of being equalled or exceeded in any single year.
- **1% AEP** – Formerly referred to at the 100-year flood, the 1% Annual Exceedance Probability Flood has a 1% chance of being equalled or exceeded in any single year.

### Condition

Many of the local entities have different means by which they determine the condition of their open channel systems. One local entity, the HCFCD, has developed an Asset Management Channel Assessment Program to systematically identify, prioritize, and execute maintenance repairs of the District’s infrastructure. Other entities have different means by which they assess the condition of their flood control systems.

The condition of the closed conduit storm sewer systems is much more difficult to determine as the systems are underground and not easily accessed. Many of the underground storm drainage systems are out of sight and therefore out of mind. Additionally, silt and debris can accumulate in the underground drainage system, thereby reducing the capacity of the system without easy identification of the areas of restriction. Similar to HCFCD, the City of Houston has a regular condition assessment system for their closed conduit drainage systems.

### Funding

Funding is an important issue to address flood control and drainage facilities within the Greater Houston area. Two examples of significant funding programs in the Houston area include the recently approved ReBuild Houston program for the City of Houston and the HCFCD Capital Improvement Program (CIP).

The ReBuild Houston program is aimed at providing $125 million annually toward improvements of local street and drainage systems. The City has identified that over $5 billion is needed to improve these systems. Assuming that the current rate of $125 million in annual funding would be combined with additional grants and federal funding to an estimated $200 million, it would take approximately 25 years to address the identified current needs.

The HCFCD CIP targets a project development process approaching $200 million annually. This includes concept development, planning, property
acquisition, permitting, design, and construction. Based on the $20 billion in current needs (estimated at $12 billion for channels and $8 billion for detention identified by HCFCD), and the assumption that the current $200 million in annual funding would be combined with additional grants and federal funds to an estimated $400 million, it would take approximately 50 years to provide the approximate 4% AEP level of service.

Many other local entities have different funding programs which are more and less aggressive than the ReBuild Houston or HCFCD CIP programs.

**Future Need**

Most local entities have in place capital improvement programs aimed at addressing existing conditions, and some entities have programs for future needs. Many of the local entities have developed regional or master drainage plans to use in developing their CIPs for working with redevelopment or future development issues. Most of the local flood control and drainage entities require that new developments plan to provide for the 1% AEP level of service in order to mitigate their impacts to existing drainage systems. However, there is a need to acquire right-of-way and to improve channels and regional detention in conjunction with new developments and occasionally in advance of new developments to secure appropriate channel alignments and detention pond locations. Therefore, there should be additional funds set aside for future needs.

**Operation and Maintenance**

Operations of the open channel flood control systems and of the closed-conduit drainage facilities vary by entity. Some entities are aggressive toward the maintenance and operation of their drainage elements while others are not as aggressive with their drainage elements until the next flood reveals unforeseen problems or until local jurisdictions receive complaints from the public. With the current shortage of funds within most entities, the operation and maintenance of the drainage system may be reduced. It is important to adequately maintain the current drainage systems or they will become overgrown, clog, or otherwise deteriorate. With new technologies including new software, GIS, LiDAR, Google Earth images, and other readily available data, it should become easier to evaluate the current drainage systems.

**Public Safety**

Safety is the major concern for any public facility. However, some drainage facilities are overlooked because the drainage system is not always visible nor is it used every day. The public is impacted by not only the drainage system that drains their house or business but also by all of the drainage systems that they may encounter on the way to and from work, school, and other destinations. Drainage issues may also delay the response time of emergency vehicles during tropical storms and hurricanes or other extreme flood events. If the drainage system is not adequate for the residents to have time to evacuate during a flooding event, loss of life may occur. Therefore, public safety is a vital consideration related to the effectiveness of the drainage systems.

**Resilience**

The resilience of a flood control or drainage system is based on its ability to adjust to or recover from a flooding event. Many flood control and drainage systems have little to no factor of safety in the capacity in excess of the design storm. In addition, it is difficult to adequately predict the impact of events beyond the design storm, for example during tropical storms or hurricanes. Many of the local flood control and drainage elements are considered to have good resilience since these systems are infrequently used; however, some of the largest damages in the local area are associated with flooding of structures, businesses, streets, roads, and other utilities. When a flood does occur, it can have major impacts to the local area and can be the root cause of damage to other utilities and entities. The resilience of the current flood control and drainage systems must be maintained and improved by increasing the operation and maintenance and annual or bi-annual inspections.

**Overall Grade**

C-
The Houston Metropolitan Area rail network carries approximately 2,200 trains each week on over 800 miles of mainline track. These trains are primarily operated on track owned and maintained by two major inter-regional railroads, the Union Pacific Railroad (UPRR) and the BNSF Railway (BNSF). In addition, the Port Terminal Railroad Association (PTRA), a partnership of UPRR, BNSF and Kansas City Southern (KCS), serves the Port of Houston and heavy industrial shippers. KCS operates trains in the Houston Region via trackage rights over both the UPRR and BNSF. More than 900 customers are served by rail in the region, and goods shipped by rail both to and from the region comprise a vital portion of the region’s economic activity and growth.

Projected population growth in the region will increase the demand on this system as economic activity also increases, necessitating long-term capacity improvements to the network.

While the rail network itself is owned and operated by private entities, the network and operations have significant interface with public infrastructure, which creates potential safety hazards, delays in travel, and air quality issues due to increased vehicle emissions.

Improvements aimed at reducing the conflicts between rail and vehicular traffic will potentially benefit both the general public through enhanced safety, reduced delay, and improved air quality, and will also benefit the railroads in terms of safety and increased operational efficiency.

Capacity

While rail network congestion has improved significantly since the major problems experienced in the late 1990s, the overall network does have numerous issues which limit its capacity. These issues include limited ability to absorb increased traffic, restricted right-of-way, lack of connectivity, and constrictions at yards and terminals. A total of 33 potential improvements to rail capacity have been identified with an overall cost of $1.4 billion. Because of the private ownership of the rail network, investment by the railroads in capacity improvements will be based on the cost-benefit value to the railroads in the form of net revenue increases achieved by reducing delays and the ability to handle increased traffic.

Condition

Condition of current rail facilities as a whole would be classified as very good. The ability of the railroads to service customers depends heavily on the maintenance of infrastructure, and the UPRR and BNSF have generally provided well maintained facilities in the region. Both railroads have also implemented significant recent improvements to track on their most heavily used routes.

Funding

Currently, all funding for improvements to railroad-owned and operated facilities comes from the railroads.
themselves. The Texas Legislature created the Texas Rail Relocation and Improvement Fund (House Bill 1546) in 2005; however, to date no funding has been allocated to this fund or projects identified for the region.

Funding for improvements to non-railroad infrastructure that will benefit both the general public and the railroads such as grade separations of streets and highways and relocation of rail routes from heavily developed areas will be limited in the short-term due to the extreme shortage of available funding for transportation infrastructure projects in general throughout Texas. While the private railroads may participate in such funding to the extent that they will benefit from safety and efficiency improvements, the bulk of the cost of such improvements will need to be borne by public sources and use of creative avenues of financing including public-private partnerships.

This grade reflects the lack of public funding for public benefit projects rather than improvements to railroad infrastructure.

**Future Need C**

Freight movement in the Houston region via all modes of transportation is projected to double from 2007 to 2025, and the railroad network will carry a significant portion of this freight, making capacity improvements to the network essential. As mentioned above, capacity improvements totaling $1.4 billion in present day costs have already been identified.

In addition, such growth in the region will greatly increase potential conflicts with vehicular traffic at existing grade crossings, thereby increasing the need to provide grade separations. Recommended grade separations and grade crossing closures for the region have been studied and identified with a total present-day cost of $813 million.

**Operation and Maintenance A-**

Operations and maintenance of railroads in the region are the sole responsibility of the owner railroads. No public funding is provided for this purpose.

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**Public Safety C**

Grade crossings of railroads by public roads and pedestrian facilities present a significant public safety issue. Between 2000 and 2007, the Federal Railroad Administration has reported more than 300 train/vehicle incidents in Harris County, including more than 90 injuries and 7 fatalities. While both UPRR and BNSF invest in promoting public awareness of grade-crossing safety, the only method of making such crossings completely safe for both vehicles and trains is grade separation or crossing closure. The Houston Region Freight Study identified 55 potential grade separations and 63 potential closures. Implementation of these separations and closures is estimated to cost $813 million; however, the public benefit would potentially surpass the cost. While railroad participation in costs may be possible where a direct private benefit is demonstrated, the bulk of the cost for these improvements would be borne by the public.

**Resilience A-**

The railroads in the region would be considered to have a high level of resilience. Both UPRR and BNSF have highly developed plans for dealing with natural disasters and resulting interruptions in service both before a predictable disaster occurs and for restoring service afterward. The network within the region provides significant flexibility for the maintenance of operations in the event of localized disruptions.

**Overall Grade C+**

It is extremely important to note that the above grade is significantly impacted by factors mostly outside the control of the ownership of the private railroads, most importantly by the lack of available funding for public benefit improvements. It is also important to note that while the railroad operators are a vital part of public commerce, in the Houston region they are entirely operated as private businesses.
To avoid further degradation of roads and highways in the region, the Texas Legislature must rectify current funding issues. First is the redistribution of funds from the outdated and archaic gas tax to fund other state programs. In addition, the gas tax has not been increased in many years to account for increased construction costs. Lastly, vehicles are becoming more efficient and therefore pay less gas tax. Increased fuel efficiencies, among other reasons, have significantly reduced the amount of federal, state, and local funding for transportation improvements. The Congress and the state legislature have not been able to develop long-term solutions to this funding crisis.

Review of the 2035 Regional Transportation Plan (RTP) Update prepared by the Houston-Galveston Area Council (H-GAC) for roadway, transit, and bike facilities shows that the population is estimated to increase from 5.8 million people to 8.8 million people by 2035. In 2006, H-GAC completed an extensive financial review of local and state agencies with significant expenditures on the transportation system. Due to economic recession, interim extensions of federal transportation funding legislation, and sharply decreased motor fuels tax revenues due to the increase in fuel efficiency rates, TxDOT significantly reduced its future transportation spending for the years 2011-2035 from $30 billion to $6.7 billion.

This report encompasses the H-GAC study region as a whole. While several areas are in need of attention as discussed below, some local entities within the study region are taking the necessary steps to proactively address growing transportation needs, both with new construction and ongoing maintenance programs. These local projects may not address regional issues individually, but they do play a vital part in improving transportation in targeted areas for local residents and provide additional options for commuter traffic.

**Capacity**

Many area roadways cannot handle the current level of traffic, causing congestion and delays. In addition, the expected growth patterns show the demand for vehicle travel will double during the 2035 RTP time horizon and the movement of goods over the network of highways and rail corridors may triple in volume. In order to handle the increased growth, additional facilities will need to be added to the current system.

**Condition**

Current condition of highways and road pavement can be measured by TxDOT's Pavement Management Information System (PMIS) and City of Houston Pavement Condition Rating (PCR). Although there are some poor conditions in some rural areas, our region has constructed a good system. The trend has however shown a decrease in lane miles in good condition from 80.14% in 2007 to 75.09% in 2011. The modest trend downward in condition was intentional for TxDOT as state leaders have accepted...
lower conditions on some roadways in an attempt to save more money over improving capacity.

Funding  D-
In 2007, the Houston region experienced a significant decrease in project lettings due to financial constraints with no time table that shows this trend ending. However, the area’s growth in population, employment, vehicle miles traveled, vehicle hours traveled, added volume of goods, added truck traffic, etc., all show an increase. Federal funding is often not utilized as an additional funding source by local governments due to burdensome regulatory requirements and interagency coordination that increase the cost and extend the schedule of jointly funded projects. The City of Houston had a great achievement when the citizens, even in these uncertain economic times, voted for the street and drainage fee as a new funding source to help with area needs. In the fall of 2012, voters in the Houston region will have an opportunity to decide if Metro will continue to share a quarter of its one-cent sales tax with 16 local municipalities for road projects. Unfortunately, a large source of the traffic gridlock is not being addressed and several needed regional projects remain unfunded.

Future Need  F
The impact on our region’s ability to grow, attract new business, and maintain existing industry through the movement of goods has a direct correlation to the condition of its roads. It does not appear bright due to the collapse of funding for future projects, although tolling has continued to help as a revenue source. There have also been small spurts of funding from the federal government such as the American Recovery and Reinvestment Act of 2009; however, current legislation is not changing the major funding source for roads and highways – the outdated fuel tax. As roadway capacities are reached during peak periods and right-of-way acquisition costs become economically unfeasible, alternative modes to move people and goods will become increasingly crucial. Local, state, and federal funds alone will not supply adequate capital for these facilities so new financing means will be needed to construct and maintain them. Infrastructure improvements will be also necessary to address increasing truck traffic in and out of ports.

Operation and Maintenance  B
The region operates and maintains its roadway infrastructure well, especially given the size and scope of work involved. The City of Houston has provided data that shows service requests related to infrastructure are completed under the goal response time in 93% to 96% of instances. Houston TranStar continues to be an asset to the region through the cooperative leadership of multiple agencies in providing transportation and emergency management.

Public Safety  C
Laws and ordinances have been enacted within the region to restrict commercial truck traffic to certain lanes during the day. Truck related crashes have been reduced by 68% as a result. Response time has reduced from improvements in technology. While motor vehicle crashes have declined over the past several years from 119,450 in 2003 to 98,206 in 2008, on average over 275 serious incidents still occur daily involving injury, death, or extensive property damage.

Resilience  C
Some of the challenges of the community are related to the size of the area at more than 8,000 square miles. Transit services in smaller communities have not historically connected to the central core area of Houston, thereby leaving riders dependent on roadways. Connectivity will be crucial as the region grows in population and employment. Cross-sector interdependencies in the region and communication between agencies are good as members of different agencies serve on boards, work together on projects, and work toward solutions to current challenges. Although still difficult, the ability to move mass amounts of the population from harm’s way rapidly has shown improvement as evidenced during Hurricane Ike following the lessons learned from Hurricane Rita. This ability would also be crucial with other natural disasters or threat of terrorist attack.

Overall Grade  D+
Collection and disposal are the two main objectives of solid waste management. Collection includes removal of discarded materials from inhabited places in a timely manner to prevent the spread of disease, minimize the likelihood of fires, and reduce aesthetic issues arising from putrefying organic matter. Disposal is simply the effort of disposing of the discarded materials in a manner that is environmentally responsible.

This study considers solid waste generated from residential and commercial sources. The EPA estimates that 60% of the waste stream comes from residential sources, and the remainder is from commercial sources.

**Capacity**

Based on available information on solid waste management collection and disposal in the greater Houston area, there is sufficient landfill volume capacity for current disposal of solid waste. However, there is a gap in reaching unserved areas with adequate solid waste collection services.

**Condition**

For the purposes of this evaluation, condition focuses on the effectiveness of current solid waste management practices. There is currently a lack of capability to monitor and enforce penalties for littering which is considered to be the reason why the City of Houston pays $1 million annually for collection of discarded tires on streets and in ditches. Moreover, these discarded tires contribute to the clogging of the drainage conveying systems and are but a single example of the litter problem.

The maximum collection frequency of garbage should not to be more than the least of the following: the normal time for the accumulation of the amount that can be placed in containers of reasonable size, the time it takes for fresh garbage to putrefy and emit foul odors under average storage conditions, or the length of the fly-breeding cycle, which, during the hot summer months is less than seven days. The City of Houston has once a week collection frequency; some other areas, including outlying municipal utility districts, have a twice a week collection frequency.

**Funding**

There is no known ordinance in the greater Houston area to enforce separation for recycling (papers, plastics, glass, aluminum cans, etc.) at the source (i.e., homes or commercial institutions such as restaurants, etc.). The vast majority of residents’ lack of knowledge and accountability regarding separation for recycling makes municipalities such as the City of Houston unnecessarily pay millions of dollars for disposal at landfill sites. A significant reduction in the tonnage of solid waste could be realized if residents are educated and ordinances are in place to enforce recycling of paper, plastic, glass, and aluminum cans. The money saved could be used to increase frequency
implement separation for recycling, which will continue to unnecessarily consume valuable landfill space.

**Operation and Maintenance  C**
The magnitude of municipal solid waste generation and hence the challenge in effective collection and disposal efforts is directly related to population, especially in concentrated areas of the region. The greater Houston area generates more than 20% more solid waste per capita than the national average.

**Public Safety  A-**
The public is impacted by the regular collection and disposal of solid waste which prevents the spread of disease. Also, proper collection and disposal minimizes the likelihood of fires during transit activities. This category may be considered to be very good.

**Resilience  B-**
Resilience is the probability that incidents will interrupt regular solid waste services. Due to redundancy in collection equipment, a well developed network to convey solid waste from pickup to disposal, and ample landfill space for the foreseeable future, this category may be considered to be good.

**Overall Grade  C**

Future Need  
The greater Houston region has planned landfill expansions that will ensure adequate capacity for the projected solid waste generated. However, there is an apparent deficiency in the efforts for public education/awareness and proper ordinances to
According to the American Public Transportation Association, “Transit use increased 25% between 1995 and 2005, faster than any other mode of transportation. However, nearly half of American households do not have access to bus or rail transit, and only 25% have what they consider to be a good alternative.” Based upon a review of available data compiled, similar interpretations can be derived for the Houston metropolitan area. Review of the Final Draft Regional Transit Framework (RTF) Study prepared by the Houston-Galveston Area Council (H-GAC) for roadway, transit, and bike facilities showed that the population by 2035 is estimated at 8.8 million people from the current estimate of 5.8 million people. This will change the way people travel within and through the region. One of the surveys conducted by the study indicated that 7 out of 10 people stated improvements are needed to provide more direct transit routes, to provide more frequent and faster services, and to implement safety-related improvements. Areas and agencies included in the RTF are the Brazos Transit District, Colorado Valley Transit, Connect Transit, Fort Bend Transit, Gulf Coast Rail District, Harris County Transit, H-GAC, Island Transit, and Metropolitan Transit Authority of Harris County (METRO).

**Capacity**

In general, current systems are not at full capacity according to available data. Certain identified components such as particular bus routes, park and ride facilities, and periods of light rail vehicle ridership do reach full capacity during peak travel periods and special events. However, a major factor contributing to lower capacity utilization is a lack of complete connectivity between all systems, which has a direct bearing on the functionality of the system. As time progresses and population within the area increases, a variety of additional facilities will need to be added to the current system. These facilities could include additional bike paths, sidewalks, and/or bus routes to connect passengers to light rail facilities, in addition to rail facilities to connect rural and suburban areas.

**Condition**

Condition of current transit facilities as a whole would be classified as good. The evaluation is based on reports obtained that discuss agencies’ ongoing efforts to continually upgrade to newer, more efficient bus facilities, newer and safer bike lanes, the addition or replacement of sidewalks, and the addition of new light rail lines. Most facilities throughout the region would be considered relatively new since the Houston metropolitan area has been working diligently to improve and increase mass transit facilities over the past thirty years when compared to other large cities throughout the country.

**Funding**

Funding is one of the largest issues for growth of any public facility. With the unstable and volatile state of the economy and current political atmosphere, it is
difficult to determine what means of funding will be available for future demands. Life cycle costs such as operations and maintenance of transit facilities are significant and must be assured before future capital expansion of the transit system may be considered. Four different scenarios were developed in the RTF to meet future transit demands, and each scenario required various levels of funding. Funding was considered from local, state, and federal levels. How much and how fast transit facilities will be expanded or added to the system will depend upon future monetary sources. In order to provide these facilities, local, state, and federal funds alone will not provide adequate capital. Creative avenues of financing will need to be sought in order to construct and maintain future facilities. These avenues may be associated with private funding and partnering mechanisms.

**Future Need**

As stated in the Capacity discussion above, there will be a major need for additional transit infrastructure in the future to ensure systemwide connectivity. As roadway facilities reach or meet maximum capacities during peak periods and right-of-way acquisition for new roads becomes economically infeasible, alternative modes of moving people will become a must based on data collected. Future facilities may include continual expansion of light rail, the addition of commuter rail facilities, extension of HOV systems into suburban areas, evaluation of bus capacity as determined by the dynamics of ridership on a route, construction of new or replacement sidewalks, and addition and extension of bikeways.

**Operation and Maintenance  C-**

Based on the studies reviewed, current transit facility ridership ranges from 50 to 70 percent are generally not adequate to cover operation and maintenance costs. Therefore, additional supplements are needed. Measures will be incorporated into future planning to handle these requirements. This appears to be difficult to quantify due to the unknown rate at which ridership will develop, at what rate current facilities will degrade, and timing of future facilities.

**Public Safety  C**

Safety is one of the major concerns for any public facility. Should the public deem a facility unsafe or unreliable, it would be a challenge to maintain ridership and could take a long period of time to regain the public’s confidence level once it is diminished. One area noted within the studies was how to provide safe connectivity between transit systems. People must be able to safely walk or ride a bike to board a bus or train, be able to safely transfer from a bus to a train, and be able to board safely from their work place to a bus or train. Since transit systems must operate 24 hours a day, seven days a week, safety is a priority and must be provided at all times. With strained public agency funding, law enforcement staffing does not meet current demands. Police and security personnel are greatly needed. Area law enforcement agencies are continually developing new and innovative means of utilizing forces.

**Resilience  D-**

Current systems within the region would be considered to have a low resilience based on a lack of integrated systematic planning, security mitigations, and adequate funding. When this region is compared to others around the country, it is a fairly new system with integration of connecting systems still being developed. Should a natural disaster occur, the current systems would not be a viable alternative to rapidly move mass amounts of the population from harm’s way. Security from a terrorist attack would also be a factor.

**Overall Grade  C-**
Cities were selected for survey from those over 20,000 in population according to the 2000 census. The population was chosen to address cities whose wastewater infrastructure should be large enough for the collection system to possibly have hydrogen sulfide corrosion and the treatment plants and pump stations old enough to have required some equipment repair or replacement. Letters were sent to the mayor or city manager of eight cities in the study area. Public works officials of five cities were interviewed.

The City of Houston has 40 wastewater treatment plants and over 300 sewage pumping stations and the following criteria were developed so the city could provide numbers on which the grade would be based. The other cities have one or two wastewater treatment plants and several pumping stations.

**Capacity**

The Texas Commission on Environmental Quality (TCEQ) establishes criteria for wastewater treatment facilities operated throughout the state of Texas. Area treatment plants were evaluated on the basis of having TCEQ permit capacity for flow that is at least 1.33 times the current flow (or greater than 75% of the TCEQ permit capacity when plant enlargement is in design or under construction). Also, the plants were assessed for percentage of plants having TCEQ permitted peak 2-hour flows that are at least 1.33 times the past 12 months peak 2-hour flow (or greater than 75% of the TCEQ permitted peak 2-hour flow with an infiltration/inflow survey or construction program underway). 98% of the wastewater treatment plants evaluated meet or exceed these criteria.

**Condition**

Both treatment plants and the collection systems that convey waste to them contribute to the condition of wastewater facilities. Four criteria contributed to this grade: the percentage of plants with all blowers operable or being repaired, the percentage of plants with all clarifiers operable, the percentage of pump stations with all pumps operable or being repaired, and the number of sanitary sewer overflows and number of overflows per year. It is important to note that issues with water quality in the region are not the result of wastewater overflows but are influenced by other factors such as bacteria and chemicals conveyed by runoff in wet weather.

The City of Houston has one of the largest sewer rehabilitation programs in the nation, mostly to prevent and repair hydrogen sulfide corrosion and keep the sewer system in good condition. In other parts of the region, wastewater infrastructure is relatively new and hydrogen sulfide corrosion is not a major issue.

**Funding**

Municipalities in the greater Houston area are ensuring that funding for wastewater facilities meets the estimated current need. The implementation of utility
districts to construct and fund infrastructure in newly constructed and developing areas is also a factor.

Future Need  B
The expected future funding level generally provides enough for the estimated future need. As development occurs in the area, wastewater infrastructure is usually constructed with growth and is typically financed through independent utility districts or contributions from developers. There is also excess capacity in many areas of the existing system which will help allow for increased population densities in redeveloping areas, but some of this capacity is reserved specifically for planned future developments and may not be available for unplanned growth.

Operation and Maintenance  A-
Indicators for operation and maintenance included the percentage of treatment plants having more than one monthly permit violation in 2010 and the percentage of lift stations that do not submerge the influent line in dry weather/wet weather. In this study E. coli violations were not considered as any such violations occurred during a time of adapting to a new regulation.

Public Safety  A+
The worst situation that can occur with wastewater facilities is a bypass of all untreated sewerage into the receiving waterways. However, facilities in this region are designed to contain sewage within the sewer system when the plant is offline or undergoing repairs and are located so that flood events do not inundate the system. Recent evaluations of area wastewater treatment plants have confirmed that this arrangement is effective.

Resilience  A+
Two indicators for resilience were studied: the percentage of plants not subject to flooding so operation and maintenance personnel can access and supply the plant and the percentage of pumping plants with standby generators. 99% of the wastewater treatment plants evaluated meet or exceed these criteria.

Overall Grade  A
Without the dedication of the committee members who volunteered their time to gather information, assign grades, and assemble the results into a coherent and consistent format, this report card would not have been possible. Furthermore, area agencies were very responsive in providing the information necessary to develop this assessment and their buy-in was critical to advancement of this effort. Finally, special appreciation is in order to the Houston-Galveston Area Council, whose clearinghouse of public information and direction on its use gave the committees a big picture with which to start and served as a guiding light moving forward.

Names/Positions shown in **bold** denote committee chairs.

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City of Baytown, BNSF Railway, Brazoria County Engineering Department, Brazos Transit District, Connect Transit, Federal Emergency Management Agency, Fort Bend County Drainage District, Fort Bend County Engineering Department, Fort Bend Transit, Galveston County, Gulf Coast Rail District, Harris County Flood Control District, Harris County Public Infrastructure Department, Harris County Transit, Houston-Galveston Area Council, City of Houston Public Works and Engineering, Houston TranStar, City of Humble, Island Transit, City of League City, Metropolitan Transit Authority, Montgomery County Engineering Department, Montgomery County Transportation Program, North Fort Bend Water Authority, North Harris County Regional Water Authority, City of Pasadena, City of Pearland, Southern Brazoria County Transit, City of Sugar Land, Texas Commission on Environmental Quality, Texas Department of Transportation, Union Pacific Railroad, United States Environmental Protection Agency.
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Key Infrastructure Facts

- There are 5,636 bridges in the Houston District, second only to the Dallas District which has approximately 300 more.
- The TxDOT Houston District has approximately 11% of the bridges in Texas.

CAPACITY

- The overall issue of capacity is relegated to the roadway assessment.

CONDITION

- Only 67.5% of the bridges in the TxDOT Houston District are rated at Good or Better. This is the lowest percentage in the state. The statewide average is 80.3%. The TxDOT statewide goal is 80%.
- The average age of the bridges in the district is 25.7 years old.
- Histograms of bridge ages within the TxDOT Houston District show an accelerated replacement level (i.e. bridges being replaced faster than they were built).

FUNDING

- Funding levels have decreased significantly in the last few years due to the overall economy and internal funding distribution changes.

FUTURE NEED

- The decrease in funding and funding sources, in addition to public opinion of available funding sources, has had a detrimental effect on overall TxDOT budgets.

OPERATION AND MAINTNANCE

- Overall in the district, 4.7% of bridges are either load posted or closed. The TxDOT Houston District has the second highest total number of these bridges in the state.
- There are six bridges on the TxDOT Houston District road system that are structurally deficient and carry more than 10,000 cars per day. Two of those bridges carry approximately 100,000 cars per day.

PUBLIC SAFETY

- The overall Sufficiency rating for the bridges in the TxDOT Houston District is 841 out of 1000.
- There are numerous functionally obsolete or structurally deficient bridges on hurricane evacuation routes.

RESILIENCE

- The TxDOT Houston District has good plans and procedures to respond to natural disasters and accidents involving bridges.
CAPACITY
• The City of Houston has enough water rights permitted to meet projected demand in the area beyond year 2060.
• The majority of water systems in the area, especially in the City of Houston, have looping throughout the system to provide more than one distribution main feed to the area.
• The facilities in the area are designed for peak flow requirements to provide needed capacity to residents.

CONDITION
• The majority of facilities in water authorities throughout the area are very new because the development of the water authorities has only occurred in the past couple of decades.
• The City of Houston water mains, while aging, are overall in fair condition with ongoing capital improvements projects continuing.

FUNDING
• Infrastructure has not been maintained or replaced at their life span based schedule and the systems are gradually deteriorating.
• Almost all of the vast water main breaks during the 2011 record drought occurred on aged water lines. Approximately 75% of the breaks were associated with asbestos concrete lines that were placed in service 30 to 40 years ago.

FUTURE NEED
• Local funding will not be enough to sustain the drinking water infrastructure. The area will be challenged to develop a funding mechanism to fund the improvements.

OPERATION AND MAINTNANCE
• 46% of the maintenance activities performed by the entities in the area are preventative maintenance, which means more than half of the maintenance is reactive in nature.

PUBLIC SAFETY
• Boil water notices for main breaks and other maintenance issues create major concern for the public and decrease confidence in the system.

RESILIENCE
• Much of the system has looping and planned prevention of stagnant water in design of mains.
• Water facilities are backed up with generators to maintain water supply to residents in the case of a natural disaster.
• Security from a terrorist attack has been considered with fencing and alarm systems in place at water facilities.
2012 Report Card for Houston Area Infrastructure
Houston Branch - Texas Section - American Society of Civil Engineers

CAPACITY

- On average, most of the open channels in the Greater Houston area would be inundated by a storm with a 10% Annual Exceedance Probability (AEP).
- On average, the capacity of closed conduit drainage facilities is estimated to be approximately a 50% AEP or less. However, there are many locations in the Houston region where the drainage systems do not meet the 50% AEP design.

CONDITION

- The Harris County Flood Control District has developed an Asset Management Channel Assessment Program to systematically identify, prioritize and execute maintenance repairs of the District’s infrastructure.
- The City of Houston has a regular condition assessment system of their closed conduit drainage systems.

FUNDING

- A key component of effective flood management is funding. Most funding sources originate from local, state, or federal government, although there are other sources. The ReBuild Houston Drainage Fee Ordinance is one example of a funding mechanism in place.
- Without financial support, many communities will be unable to plan and construct adequate flood mitigation projects and will be unable to participate in federal programs due to the requirements for local matching funds.
- FEMA has implemented an aggressive Map Modernization Program across the nation, with the goal of updating maps used by local communities to manage floodplains. The program requires state or local participation in the mapping projects in order to receive federal participation and funding.

FUTURE NEED

- The population of the City of Houston is expected to increase by 70% in the next 30 to 40 years. Development in floodplains can be expected to increase as homebuilders and commercial developers continue to build near streams, rivers, lakes, and coasts.
- The City of Houston’s Storm Drainage Facilities Improvements Programs projects approximately $225.9 million in projects for FY2012-2016.
  - The Localized Drainage Improvements Program consists of small drainage improvement projects of typically less than $500,000
  - On-call engineering and construction contracts include approximately $13.2 million
  - The Comprehensive Drainage Plan (CDP) has identified more than $2 billion of inadequate systems in the City to be upgraded

OPERATION AND MAINTENANCE

- The cleaning of sediment, clearing of debris, and repair of damaged infrastructure are some of the most labor intensive and cost prohibitive tasks associated with flood control and drainage facilities. Proper planning and adherence to repair and replacement schedules can greatly lengthen the life of the infrastructure; however, this requires increased maintenance and staff funding.
PUBLIC SAFETY

- Prolonged high floods can delay traffic in areas lacking elevated roadways. Floods can interfere with drainage and economic use of lands such as agricultural production. Structural damage can occur.
- 50% of all flood deaths are related to people driving into high water. Therefore, investment into improving flood control and drainage infrastructure will save lives.
- The Texas Floodplain Management Association (TFMA) is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program (NFIP), flood preparedness, warning, and disaster recovery. Amazing efforts of this organization led to the creation of the “Turn Around Don’t Drown” program, an informative campaign designed to educate citizens of potential dangers from driving during extreme storm events.

RESILIENCE

- Improvement in Operation and Maintenance will improve infrastructure resilience.
Key Infrastructure Facts

- 800 miles of main lane track.
- 2,200 trains per week.
- 1,200 at-grade crossings.
- Based on expected growth patterns freight movement will double during the plan’s time horizon.
- Major rail operators include Union Pacific Railroad (UPRR), BNSF Railway (BNSF), and Port Terminal Railroad Association (PTRA).

CAPACITY

- Limited room for growth.
- Restricted right-of-way in many locations.
- Lack of connection/limited connection capacity between yards.
- Yards have finite capacity.

CONDITION

- Railroads maintain all track and structures within railroad right-of-way.

FUNDING

- $813 million in grade-separation/crossing closures identified.
- $1.4 billion in rail capacity improvements identified.
- Public improvements currently unfunded.

FUTURE NEED

- Freight movement to double in less than 25 years.
- Similar increase in vehicle traffic will increase safety issues at grade-crossings.

OPERATION AND MAINTENANCE

- Railroads responsible for maintenance of all rail facilities.

PUBLIC SAFETY

- 90 injuries, 7 fatalities in same period.
- 55 grade-separations and 63 crossing closures identified.

RESILIENCE

- UPRR and BNSF maintain extensive emergency planning.
Key Infrastructure Facts
- 8 Counties; 8,000 square miles.
- Houston urbanized area - 422 miles of interstate and other highways.
- 2010 population - 5.8 Million; 2035 Population - 8.8 Million.
- Region is experiencing a 1.7% population increase per year.
- Based on expected growth patterns, demand for vehicle travel will double during the plan’s time horizon.
- Movement of goods may triple in volume over the network of highways and rail corridors.
- Dispersed suburban housing - larger road network currently vs. transit.

CAPACITY
- Vehicle Miles Traveled (VMT): 160 million miles (2010); VMT 275 million miles (2035).
- Vehicle Hours Traveled (VHT): 4.2 million hours (2010); 9.8 million hours (2035 Update RTP); 13 million hours (2035 No Build); 7.35 million hours (2035 RTP).
- Truck freight transportation accounts for 9% of the total 8 county VMT (2005).
- Review of TranStar Maps during peak periods indicates capacity limitations.

CONDITION
- Road pavement conditions are trending downward.
- Regional freight affected by roads - Truck, Rail, Marine, Air.
  - Truck freight transportation accounts for 9% of the total eight county VMT (2005)
  - Five freight rail yards
  - Port of Houston ranked 2nd in United States in total tonnage

FUNDING
- Total estimated expenditures in the 2035 RTP update are $85.6 Billion, 45% for roads.
- Future decrease in fuel tax receipts due to number of vehicles with greater fuel efficiencies.
  - Unfunded Regional Priorities: IH 45 North Freeway Corridor, US 59 (Harris County), SH288 Corridor, US 59 (Fort Bend County), Hempstead Tollway, Proposed SH 35 Corridor (Harris/Brazoria Counties)

FUTURE NEED
- Projected growth will result in 3 million new residents with a 60% increase in employment.
- To accommodate truck traffic into and out of ports, certain infrastructure improvements are critical in the Transportation Improvement Plan.
- Local government funds are used for road and system improvements and related projects. Finding new sources of revenue is critical.

OPERATION AND MAINTENANCE
- City of Houston Streets and Drainage Division (SDD) and Traffic and Transportation Division (TTD) Service Requests are within target duration.
PUBLIC SAFETY

- Health hazards of exposure to ground level ozone or smog from on-road motor vehicles; EPA has designated the 8 county region as nonattainment for ground-level ozone.
- Increased security measures are needed to keep riders safe.

RESILIENCE

- New Ideas for funding are needed.
Solid Waste Facilities Fact Sheet
2012 Report Card for Houston Area Infrastructure
Houston Branch - Texas Section - American Society of Civil Engineers

Key Infrastructure Facts

- This study considers only Solid Waste generated from residential and commercial sources. The EPA estimates that 60% of the waste stream comes from residential sources, and the remainder is from commercial sources.
- Magnitude of municipal solid waste generation and disposal efforts is directly related to population.
- The City of Houston Solid Waste Management Department serves approximately 423,000 households, of which 368,000 homes are directly serviced by the department and the remaining 13% of the households are serviced through the City of Houston Sponsorship Program.
- The City of Houston Solid Waste Management Department uses automated collection the a specially fitted refuse truck that uses a side arm to grab and lift a special container, dump the garbage into the truck, and return the container to the curb. Residents participating in the program receive a 96-gallon cart specially designed for automated collection. Other solid waste collection activities utilize the traditional three person approach (including the truck driver and two helpers) to collect garbage from the curbside.

CAPACITY

- There is sufficient landfill volume capacity for current disposal of solid waste due to the Blue Ridge landfill expansion.
- There is a gap in reaching unserved areas with adequate solid waste collection services.

CONDITION

- There is currently a lack of capability to monitor and enforce penalties for littering which contributes to the clogging of the drainage conveying systems.
- The City of Houston has once a week collection frequency; some other areas, including outlying municipal utility districts, have a twice a week collection frequency.

FUNDING

- The City of Houston Solid Waste Management Department has a $65.5MM annual budget.
- The City of Houston pays $1 million annually for litter collection.
- Municipalities such as the City of Houston unnecessarily pay millions of dollars for disposal at landfill sites due to lack of ordnances and public education regarding recycling of paper, plastic, glass, and aluminum cans.
- Natural disasters add unanticipated strain to city and county solid waste management budgets.

FUTURE NEED

- Planned landfill expansions ensure adequate capacity for the projected solid waste generated.
- There is an apparent deficiency in the efforts for public education/awareness and proper ordinances to implement separation for recycling, which will continue to unnecessarily consume valuable landfill space.

OPERATION AND MAINTENANCE

- The greater Houston area generates more than 20% more solid waste per capita than the national average.
PUBLIC SAFETY

- The public is impacted by the regular collection and disposal of solid waste which prevents the spread of disease. Also, proper collection and disposal minimizes the likelihood of fires during transit activities.

RESILIENCE

- Redundancy in collection equipment, a well developed network to convey solid waste from pickup to disposal, and ample landfill space for the foreseeable future ensures good resilience of solid waste facilities.
Key Infrastructure Facts

- Study Area includes 8 Counties.
- 2010 population - 5.8 Million; 2035 Population - 8.8 Million.
- Region is experiencing a 1.7% population increase per year.
- Based on expected growth patterns, demand for transit facilities will double from 2010 to 2035.
- Movement of goods may triple in volume over the network of highways and rail corridors, creating high demands for alternative means of people movement.
- Dispersed suburban housing creates larger road networks that increase demand for people movement facilities to and from the inner city.

CAPACITY

- Shared number of trips on public transportation systems in the region is 3%; the national average is 4.7%.
- Transit is forecast to significantly increase from the current 485,000 daily boardings to 725,000 daily boardings by 2035.
- Truck freight was 9% of Vehicle Miles Traveled (VMT) in 2005, reducing personal vehicle capacity and creating the need for mass transit systems.

CONDITION

- Transition from High Occupancy Vehicle (HOV) Lanes to High Occupancy Toll (HOT) lanes reduces personal vehicle usage and attracts the public toward mass transit systems.
- Light Rail is being improved with four new rail lines (two currently under construction and two others in the planning stages) which broadens the service area and attracts ridership.

FUNDING

- Total estimated expenditures in the 2035 Regional Transportation Plan (RTP) update are $85.6 billion; 45% for roads with the remainder of funds directed to mass transit facilities.
- Transit forecasts a significant increase attributed to:
  - New Modes - commuter rail
  - Connectivity (employment centers)
  - Coordination
- Metropolitan Transit Authority of Harris County (METRO) had a referendum for $640 million in bonds to fund the first 10 years. METRO’s current revenue sources will pay for these bonds and they will not increase the one cent sales tax to pay for plan.

FUTURE NEED

- 3 million new residents are projected from 2010 to 2035.
- There will be an increased work force within the inner city.
- The need for connectivity to super districts will be increased.
- Local government funds are needed for road and system improvements and related projects.
OPERATION AND MAINTNANCE

- Livable centers are being encouraged, although they are far from being connected to mass transit systems. Connections between modes of travel (rail to bus to car) and destination are not there. To change the mindset of a drive everywhere, freeway culture, the infrastructure for regional transit must be available. A system must be developed to generate consistent ridership.

- Socioeconomic data reviewed to determine super-districts and Traffic Analysis Zones (TAZ).

PUBLIC SAFETY

- Health hazards of exposure to ground level ozone or smog from on-road motor vehicles.
- Security measures to keep riders safe.

RESILIENCE

- New ideas for funding are needed.
Wastewater Facilities Fact Sheet

2012 Report Card for Houston Area Infrastructure
Houston Branch - Texas Section - American Society of Civil Engineers

CAPACITY

- 98% of the wastewater treatment plants evaluated meet or exceed the following criteria:
  - Texas Commission on Environmental Quality (TCEQ) permit capacity for flow that is at least 1.33 times the current flow (or greater than 75% of the TCEQ permit capacity when plant enlargement is in design or under construction)
  - TCEQ permitted peak 2-hour flows that are at least 1.33 times the past 12 months peak 2-hour flow (or greater than 75% of the TCEQ permitted peak 2-hour flow with an infiltration/inflow survey or construction program underway)

CONDITION

- 98% of the wastewater treatment plants evaluated meet or exceed the following criteria:
  - Treatment plants with all blowers operable or being repaired
  - Treatment plants with all clarifiers operable
  - Pump stations with all pumps operable or being repaired
  - The number of sanitary sewer overflows and number of overflows per year

  Wastewater overflows are not the primary contributors to water quality issues in the region.

  The City of Houston has one of the largest sewer rehabilitation programs in the nation, mostly to prevent and repair hydrogen sulfide corrosion and keep the sewer system in good condition. In other parts of the region, wastewater infrastructure is relatively new and hydrogen sulfide corrosion is not a major issue.

FUNDING

- Municipalities in the greater Houston area are ensuring that funding for wastewater facilities meets the estimated current need.

- The implementation of utility districts to construct and fund infrastructure in newly constructed and developing areas is also a factor.

FUTURE NEED

- The expected future funding level generally provides enough for the estimated future need.

- As development occurs in the area, wastewater infrastructure is usually constructed with the growth and is typically financed through independent utility districts or contributions from developers.

- There is excess capacity in many areas of the existing system which will help allow for increased population densities in redeveloping areas, but some of this capacity is reserved specifically for planned future developments and may not be available for unplanned growth.

OPERATION AND MAINTENANCE

- 60% of the wastewater treatment plants evaluated meet or exceed the following criteria:
  - Treatment plants having more than one monthly permit violation in 2010
  - The percentage of lift stations that do not submerge the influent line in dry weather/wet weather
• E. coli violations were not considered as any such violations occurred during a time of adapting to a new regulation

PUBLIC SAFETY
• By design, regional wastewater treatment facilities ensure public safety by preventing instances where untreated sewerage is bypassed into receiving waterways.

RESILIENCE
• 99% of the wastewater treatment plants evaluated meet or exceed the following criteria:
  o Treatment plants not subject to flooding so operation and maintenance personnel can access and supply the plant
  o Treatment plants with standby generators