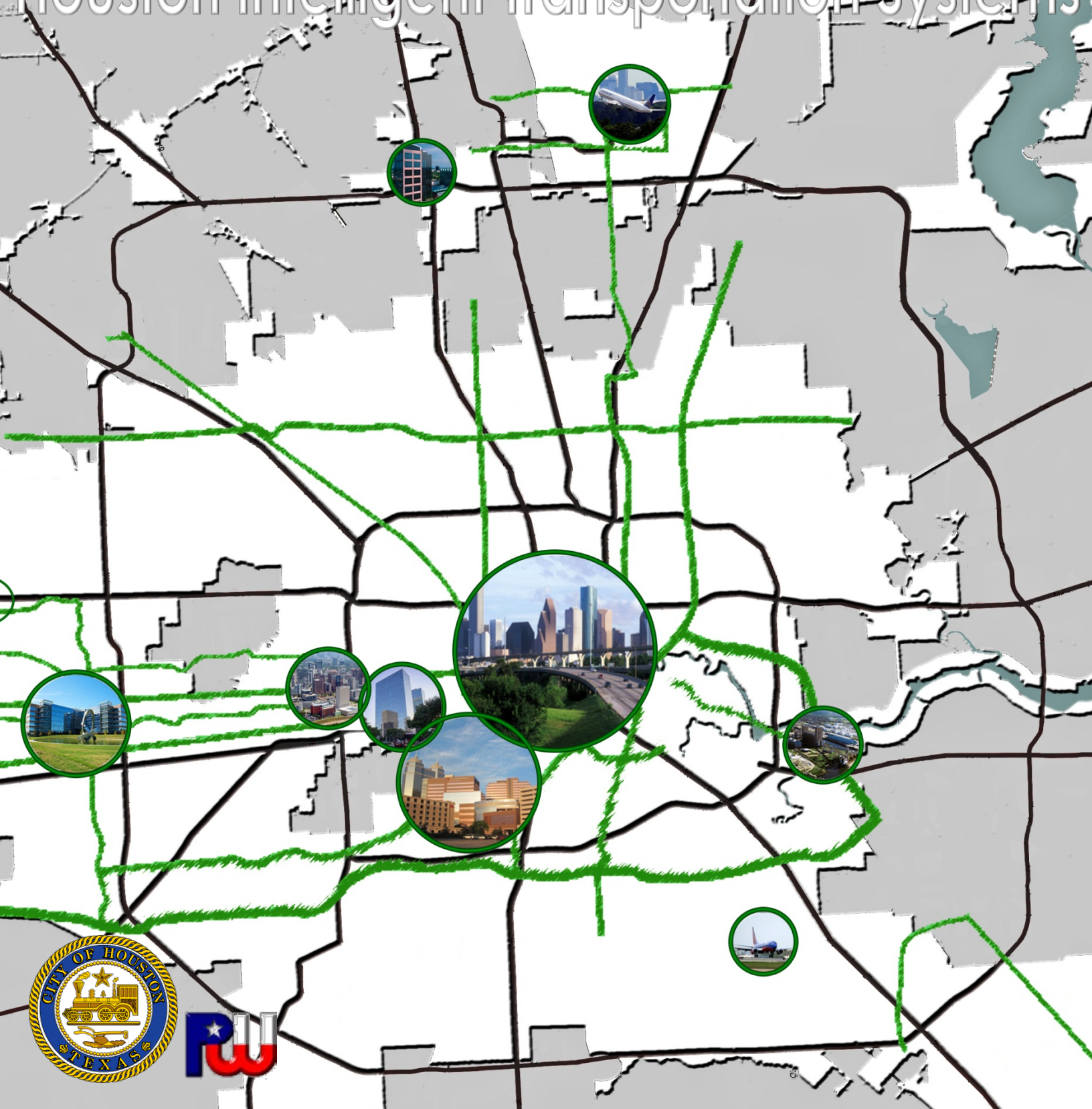
Application for TIGER 2014 Discretionary Grant

CITY OF HOUSTON | DEPARTMENT OF PUBLIC WORKS & ENGINEERING | DUNS #024240439

Grant Request: $16,594,950 | **Local Match**: $7,501,100 | **Total Project Cost**: $24,096,050

Houston Intelligent Transportation Systems



Contents

Project Description 2
System Components 3
Project Parties 7
Grant Funds and Sources/Uses of Project Funds 8
Selection Criteria 9
Primary Selection Criteria 9
State of Good Repair 9
Economic Competitiveness 10
Livable Communities & Quality of Life 11
Environmental Sustainability 12
Safety 13
Secondary Selection Criteria 13
Innovation 13
Partnership 14
Benefit Cost Analysis Summary 15
Project Readiness 23
Project Schedule 23
Legislative Approval 24
State and Local Planning 24
Technical Feasibility 24
Financial Feasibility 24
Environmental Approvals 25
Federal Wage Rate Certification 26

Refer to the HITS Project website for all project documents:

http://www.publicworks.houstontx.gov/traffic/traffic/tiger-2014.html

Located in Harris County in southeastern Texas, Houston is the nation's 4th largest city and is home to some of the most congested roads in the country. It ranks 6th in annual delay per auto commuter (52 hours/year) and 8th in congestion cost per auto commuter ($1,090 per year), according to the Texas Transportation Institute's 2012 Annual Mobility Report.

Houston is home to approximately 2.1 million residents, with the metropolitan region consisting of approximately 6 million residents. The City of Houston has over 6,000 center-lane miles of interconnected roadway system spanning over 640 square miles. A full 75% of workers over the age of 16 drive alone to work; another 13% carpool. With more than 80% of area jobs inside Harris County and numerous centrally located venues and attractions, many regional residents commute along Houston's roads for work and/ or leisure. Furthermore, the Texas State Data Center predicts the metropolitan region will add another 2-3 million residents (*moderate-fast growth scenarios*) and 1 million jobs by 2030, with Harris County remaining retaining ~80% of regional jobs. With a booming population and limited space for urban expansion, the existing roadway network needs to become 'smarter' to meet the needs of a growing city.

Project Description

Our TIGER 2014 proposal centers on the expansion of existing ITS infrastructure to monitor and manage arterial traffic in real-time. We are targeting 150 arterial corridors, in 16 zones, throughout Houston. Once complete, the Houston Intelligent Transportation System (HITS) will:

- Allow traffic management staff to detect and respond to congestion and incidents in real-time.
- Provide real-time traveler information to the public, partner agencies, and media outlets for analysis, planning, and announcements.
- Reduce travel delay and emissions. Improve capacity, accessibility, and travel time reliability.
- Enable traffic management staff to optimize signal operations by customizing timing plans for varying traffic demands.
- Allow maintenance staff to identify, assess, and respond quicker to equipment failures.

HITS will consist of 91 Dynamic Message Signs (DMS), 138 Closed-Circuit Television (CCTV) cameras, 160 traffic count stations, 650 Bluetooth Automatic Vehicle Identification (AVI) sites, 489 enhanced traffic detection locations, fiber cable/ wireless (WiMAX) communication system, and a central software system. Data will be gathered through CCTV cameras, Bluetooth AVI, and traffic detection. This information will also be directed to Houston TranStar, partner agencies, and first responders when an incident is detected. Information regarding travel times and alternative routes will be provided to the public via Houston TranStar's website (houstontranstar.org) and by DMS positioned on arterials at strategic locations. Improvements to arterial management, such as the modification of signal timing, will be implemented in response to data collected on system efficiency (traffic counts, speeds, volumes, etc).

Many components of HITS have been completed or are in progress. They include a fiber cable and wireless (WiMAX) traffic communications network, an initial deployment of cameras and count stations (25 and 16 locations respectively), Bluetooth AVI and a more advanced central software system. TIGER 2014 funding would allow the City of Houston to complete the HITS project in its entirety.

HITS will provide for one of the most advanced arterial traffic management systems in the United States today and would allow the City to actively manage traffic on a comprehensive scale. The estimated capital cost for HITS is approximately $45 million.

System Components

Central Software

A central software system provides remote access and control for the City's traffic signal network, as well as our ITS devices. This system can monitor intersection controllers in real-time, allow timing changes remotely, and implement action plans (preset timing changes) for events and incidents. Such centralized control will help coordinate signal operations within Houston and across neighboring jurisdictions. This software system has been approved and funded through Congestion Mitigation and Air Quality (CMAQ) program. Deployment will begin later this year and will include a site license for all existing and future traffic signals.

CCTV Cameras

Closed Circuit Television (CCTV) cameras provide the ability to monitor traffic flow, verify incidents, and visually verify timing plan implementation. The HITS project will install 360° pan-tilt-zoom (PTZ) cameras. These cameras have the ability to view all four approaches of an intersection, making them an efficient and effective investment. Video feed can also be made available to the media and public (fixed view, with no PTZ control), as with the freeway cameras currently available through Houston Transtar. In August 2006, Monroe County DOT evaluated their 2004/2005 deployment of CCTV cameras and found:

- Improved operator performance via increased awareness and understanding of why an incident is occurring
- Higher and more responsive quality of service available to motorists through real-time visual information
- Cross-coordination by offset and cycle observations of traffic signals

In general, operators believe CCTV improved their job performance and improved mobility and quality of service to the public *[Research and Innovative Technology Administration (RITA) website].* Deployment of CCTV cameras is in progress. The City of Houston is finalizing deployment of 25 CCTV cameras along Houston's west side *(Zone 1 – see Figure 5).*

Dynamic Message Signs

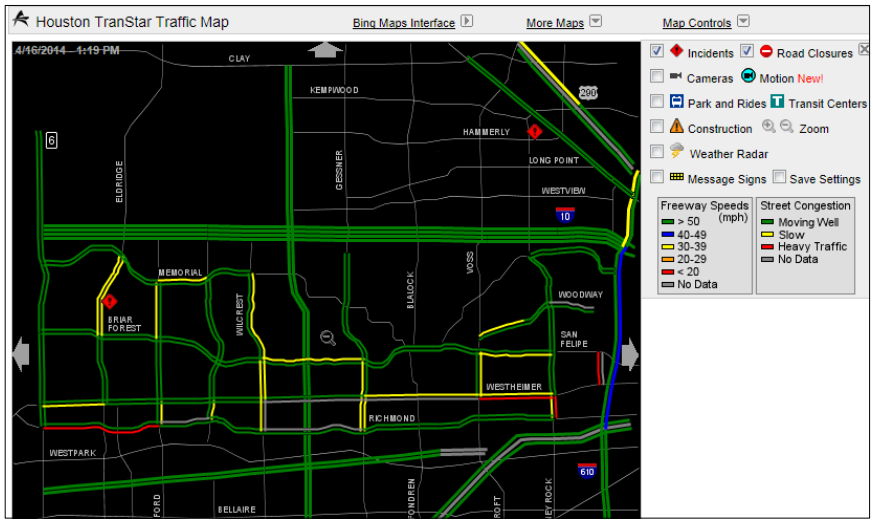
DMS are a key component to relaying travel time and incident information to drivers. They improve driver route selection, reduce travel time, mitigate the severity & duration of incidents, and improve the network's overall performance. TxDOT conducted a survey in 2004 and found that 85% of respondents changed their route based on real-time information on freeway DMS *(RITA website).* In applying similar technologies along the arterial roadway system, drivers will be able to make route choices based on the information provided on street-level DMS. HITS calls for the deployment of 91 DMS at key locations along Houston's arterial roadway network.

Enhanced Traffic Signal Detection

Good detection is key to the efficient operation of a signalized intersection. The Enhanced Traffic Signal Detection includes controller's software and firmware upgrades, as well as the addition of detectors at strategic locations, which will allow the collection and analysis of high-resolution controller events. This data logging capability provides valuable information such as speed, volume, arrivals on green, gap-out, etc. that allows the signal timing team to fine-tune signal operations regularly and for all periods of the day. When interfaced with the central software, the system also monitors the health of signal equipment, automatically generates failure alerts, and thus significantly reduces troubleshoot and response times.

Midblock Speed and Count Stations

Another key piece of a comprehensive grid is the use of midblock count and speed stations. Stations allow transportation managers to monitor fluctuations in traffic volumes throughout the day. The stations also allow the capture of seasonal fluctuations, as well as long-term changes in traffic patterns that influence planning. Additionally, real-time speed data from the stations is an essential component of incident detection. Algorithms are available to monitor sudden, unexpected drops in speed and immediately generate an alarm notifying the traffic management center. Deployment of midblock count stations is near completion, with 16 stations being finalized along Houston's west side *(Zone 1 – see Figure 5).*



Travel Time System

The City of Houston is currently operating 48 Bluetooth AVI readers along Houston's west side (*Zone 1*). Data is disseminated in real-time on Houston Transtar's website. By tracking corridor speeds and travel times, we are equipped to study demand patterns and trends. Providing this data to the public assists drivers in route selection, minimizing delay. An additional 602 locations have been approved for deployment with CMAQ funds. Additional location deployment will commence later this year.

WiMAX

The City of Houston has deployed Worldwide Interoperability for Microwave Access (WiMAX) at more than 1,650 traffic signals. WiMAX enables the City to wirelessly communicate with each signal for coordination and central control. Also, WiMAX will be used to communicate with each DMS, CCTV camera, and count station proposed on the HITS project.

WiMAX on Signal Pole

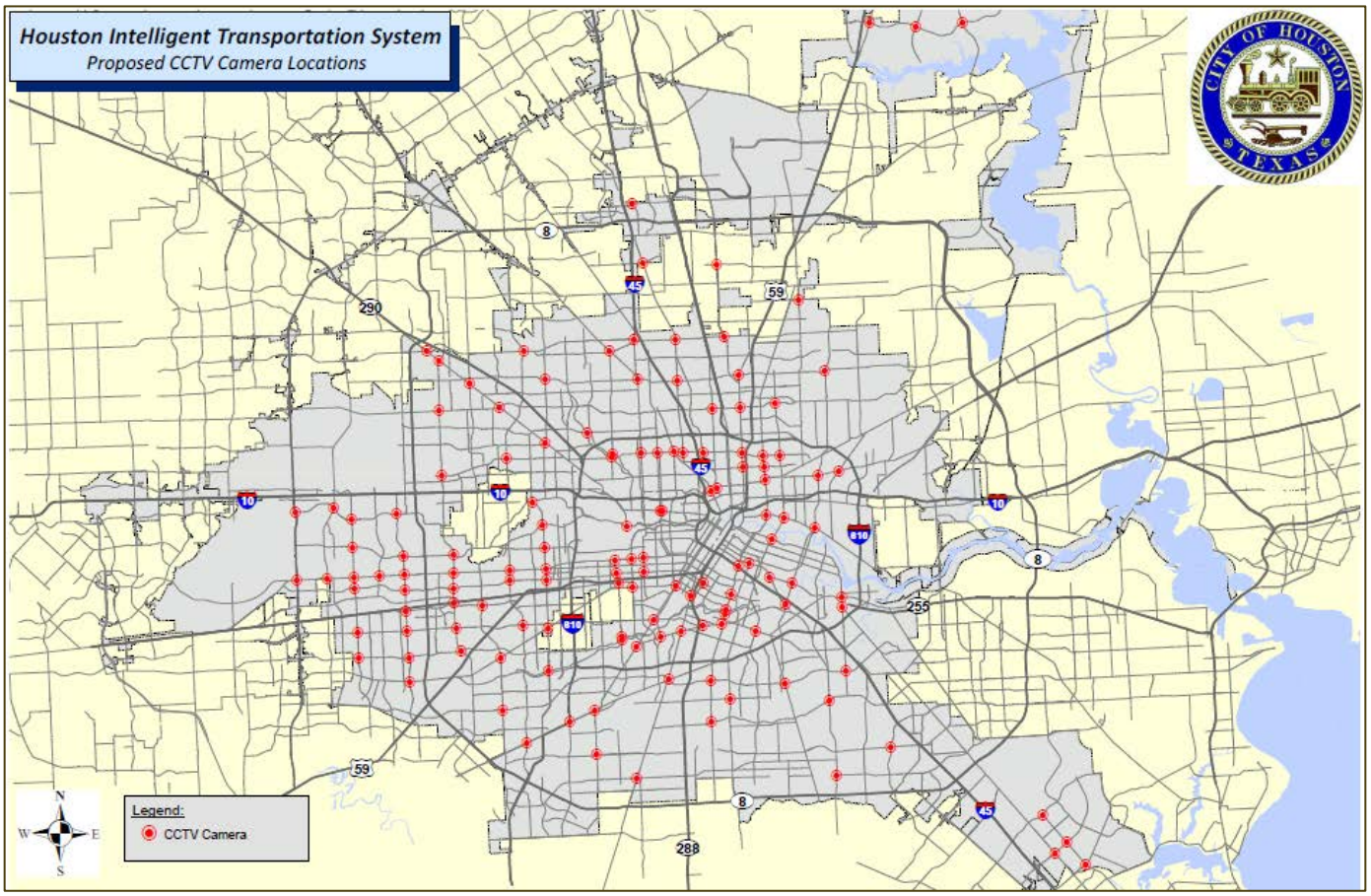


Figure 1 - CCTV Camera Locations

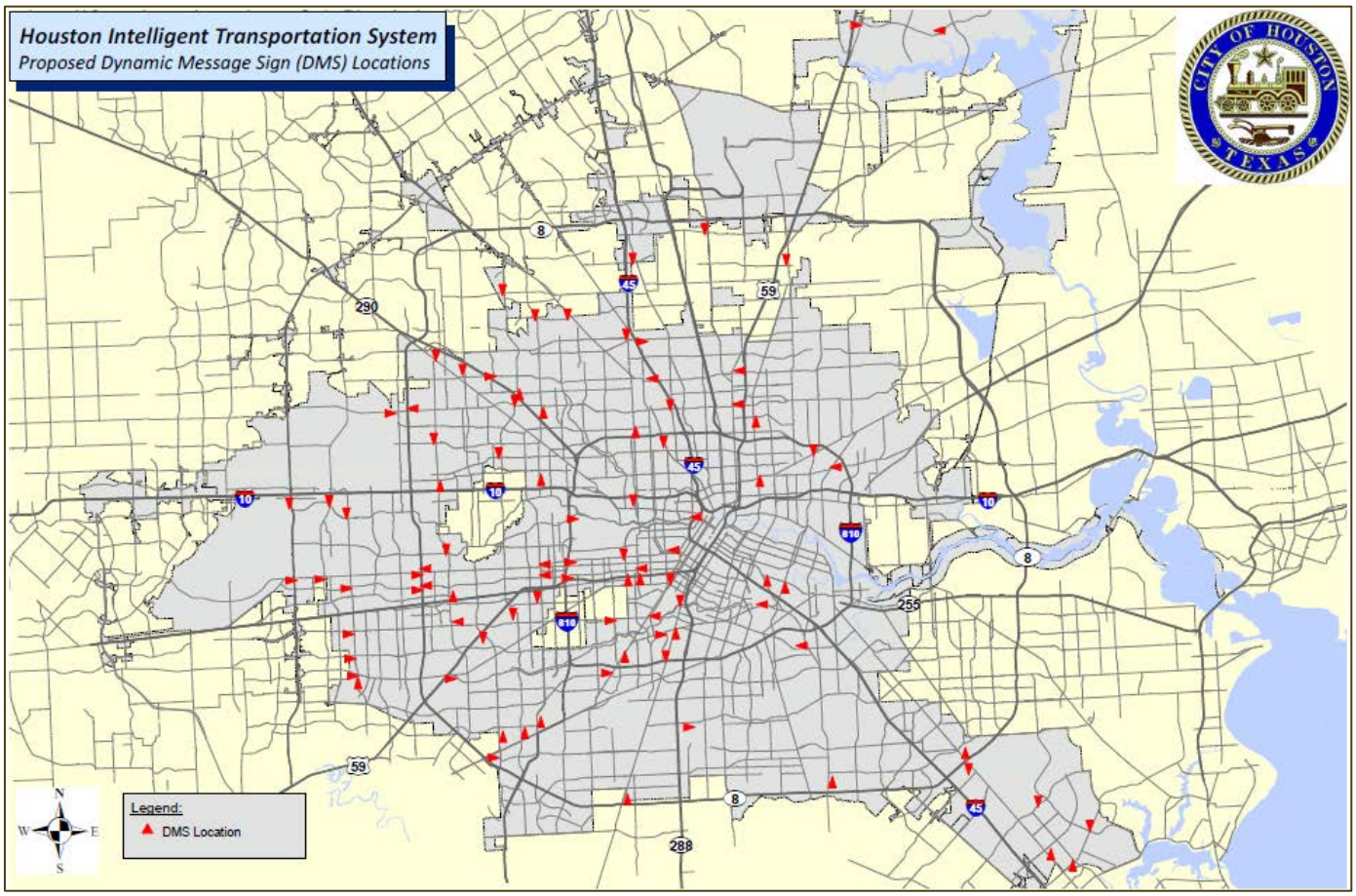


Figure 2 - Dynamic Message Sign Locations

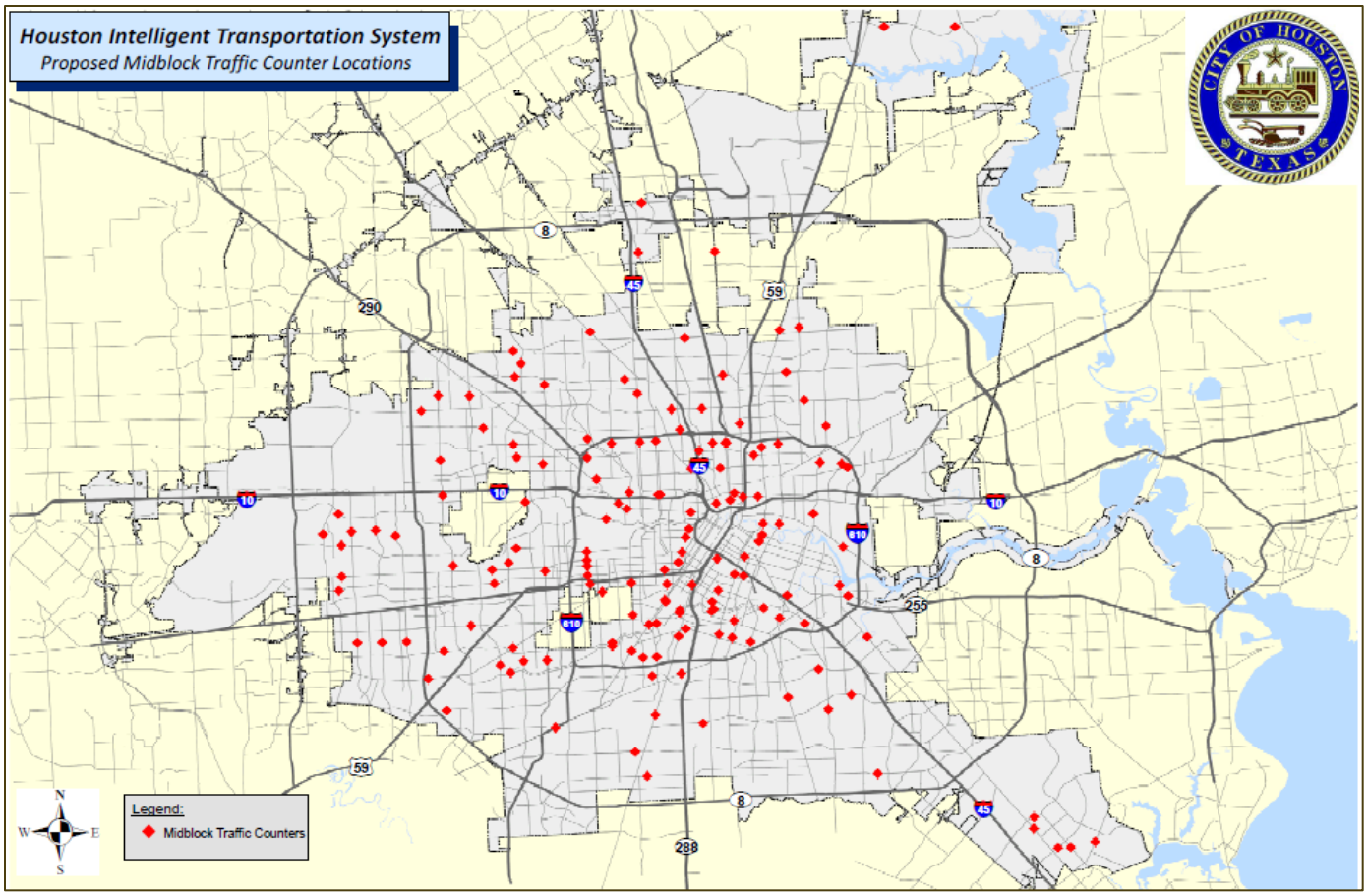


Figure 3 - Mid Block Counter Locations

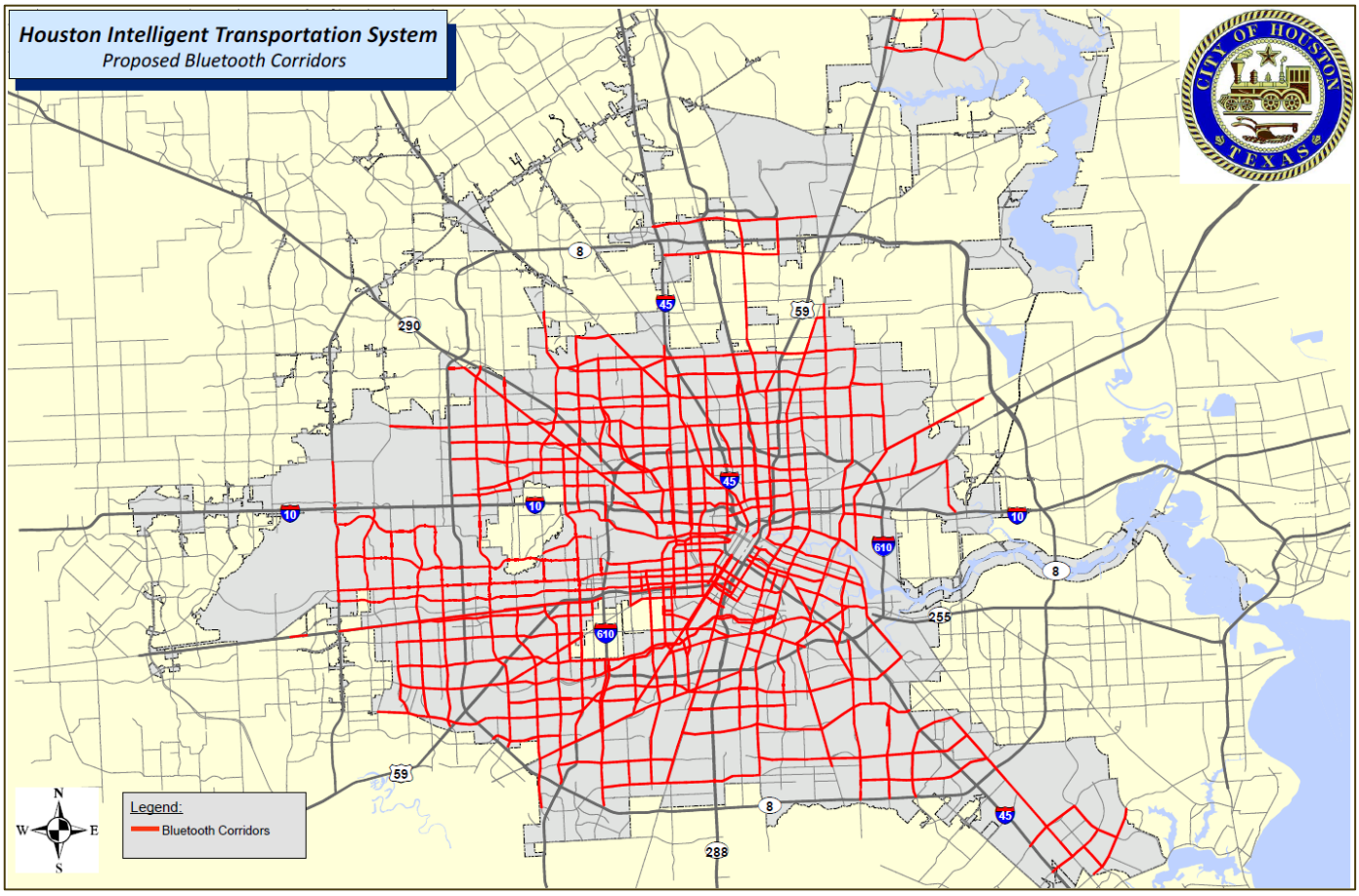


Figure 4 - Bluetooth Travel Time Corridors

Project Parties

HITS will create a 'smarter' traffic management system by providing real-time incident management, data collection, and information to motorists and partner agencies.

HITS involves local partnerships with the Houston-Galveston Area Council, Houston Police Department, Houston Fire Department (including EMS), Houston TranStar partner agencies, and other entities that provide expertise and community support for effectively managing Houston's transportation network.

Real-time camera feeds will allow console operators to coordinate with emergency response teams such as police, fire and EMS, as well as the Houston Emergency Center. In addition to incident management, CCTVs will also relay current travel conditions to the news media, as well as visitors to the Houston Transtar website.

Data collection is key in traffic analysis. Traffic counters collect traffic volumes, as well as information about the types of vehicles using a roadway. This data will be shared with Houston TranStar partner agencies, other City of Houston departments, as well as regional planning agencies, in a joint effort to provide a proactive approach for scheduling roadway repair, roadway expansion projects, and regional transportation planning.

Real-time information is essential in a 'smarter' roadway system. Real-time traffic conditions and travel time analyses can be performed via Bluetooth AVI system. DMS relay incidents and travel times to motorists, giving them the information they need to avoid congestion and improve network flow. This system will not only benefit everyday commuters, but also help mitigate the impact of event related congestion at stadiums, convention centers, entertainment venues, as well as hurricane evacuations.

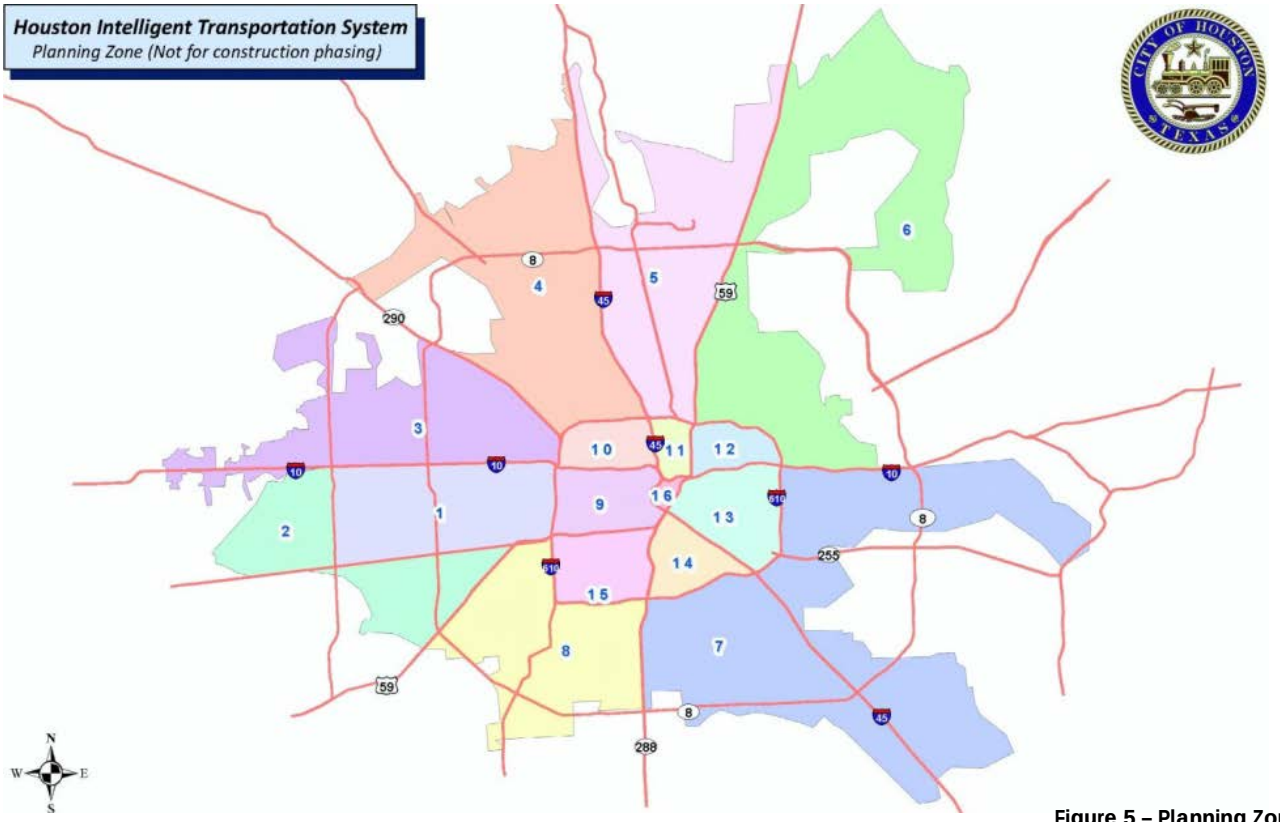


Figure 5 – Planning Zones

Grant Funds and Sources/Uses of Project Funds

The City of Houston is requesting a total of $16,594,950 assistance from the TIGER 2014 program. The total projected cost of HITS is approximately $45,040,909. *Table 1* below shows the project costs and funding sources. It also differentiates between what is installed, funded but not yet installed, and unfunded (pending TIGER 2014 approval).

Table 1 | Project Cost & Funding

Unit	Components	Estimated Cost	TIGER Grant Funds	Other Funding Source*	City of Houston Funds
	Installed Components				
48	AVI (Bluetooth Device)	$ 120,000	$ -	$ -	$ 120,000
25	CCTV Cameras	$ 500,000	$ -	$ -	$ 500,000
16	Count Stations	$ 200,000	$ -	$ -	$ 200,000
1	Communication (WiMAX)	$ 7,000,000	$ -	$ 5,000,000	$ 2,000,000
1	Communication (Fiber Optic Cable)	$ 7,219,859	$ -	$ 1,886,793	$ 5,333,066
	Sub Total	**$ 15,039,859**	**$ -**	**$ 6,886,793**	**$ 8,153,066**
	Funded Components				
602	AVI (Bluetooth Device) (2014 TIP)	$ 1,505,000	$ -	$ 1,137,000	$ 368,000
1	Communication Expansion (Fiber Optic Cable)	$ 2,000,000	$ -	$ 1,200,000	$ 800,000
1	Central Traffic Signal Software (2014 TIP)	$ 2,400,000	$ -	$ 1,920,000	$ 480,000
	Sub Total	**$ 5,905,000**	**$ -**	**$ 4,257,000**	**$ 1,648,000**
	Unfunded Components				
91	Dynamic Message Sign (DMS)	$ 9,100,000	$ 6,267,170	$ -	$ 2,832,830
113	CCTV Cameras	$ 2,260,000	$ 1,556,462	$ -	$ 703,538
144	Count Stations	$ 1,800,000	$ 1,239,660	$ -	$ 560,340
489	Enhanced Signal Detection	$ 8,557,500	$ 5,893,550	$ -	$ 2,663,950
0	Signal Controller Upgrade	$ -	$ -	$ -	$ -
0	Signal Cabinet Upgrade	$ -	$ -	$ -	$ -
235	Additional WiMax for count stations and DMS	$ 188,000	$ 129,476	$ -	$ 58,524
1	System Integration (10%)	$ 2,190,550	$ 1,508,632	$ -	$ 681,918
	Sub Total	**$ 24,096,050**	**$ 16,594,950**	**$ -**	**$ 7,501,100**
	Project Total	**$ 45,040,909**	**$ 16,594,950**	**$ 11,143,793**	**$ 17,302,166**

*Includes CMAQ and/or American Recovery and Reinvestment Act funds

Selection Criteria

The TIGER 2014 'Discretionary Grants Final Notice of Funding Availability' specifies several primary and secondary selection criteria for the program. The following section addresses the HITS project's contribution to the criteria. The subsequent Benefit / Cost Analysis section provides a conservative estimate of the Houston Intelligent Transportation Systems' quantifiable impacts over a 20-year project lifespan. While HITS addresses the goals outlined by the TIGER program, the benefits are broader than even those critical benchmarks. The ITS deployed for this project are intended to strengthen all aspects of transportation service delivery, including operations & maintenance, incident management, and analysis & planning. The information generated by this system is multi-faceted, including: traffic volumes gathered using mid-block and signal detectors; performance measures of arterial speeds, travel times, and throughput; and origin-destination data that will factor into future planning efforts. HITS will not only have an immediate impact on mobility, safety and quality of life; it will also generate long-term impacts on economic activity, sustainability, and planning efforts.

Primary Selection Criteria

The City of Houston believes that the HITS project enhances quality of life and economic competitiveness by improving the existing arterial management system's performance and operation, thereby improving mobility and safety for motorists, transit providers/ passengers, and pedestrians. The HITS project is very much aligned with FHWA's Integrated Corridor Management vision and will implement that vision on an expansive scale across Houston.

State of Good Repair

The HITS project will contribute to optimal use of the regional roadway network capacity in several ways. As availability of real-time travel information to motorists on a network-wide scale increases, drivers will have the information necessary to avoid delay, resulting in less congestion along high-use routes and overall better utilization of the entire network.

Monitoring technologies, such as travel times, count stations, and incident detection, will inform and enhance the performance measures (current utilization and utilization trends over time) used by transportation managers. Managers can identify and assess roadways that are not performing optimally, due to ineffective signal timing or roadway deficiencies (for example, when pavement deficiencies cause motorists slow down to avoid the condition). These performance measures will help city staff quantitatively track arterial performance and strategically plan and program needed system structural improvements.

CCTVs will provide visual information within the arterial system (similar to existing capabilities on the highway system) to traffic operations staff and partner agencies. This visual confirmation of atypical operations will help identify or confirm traffic signal problems remotely. Monitored intersections will save the City time and resources involved with manually sending crews to identify issues, enabling remote determination for needed resources and materials. Positioned near the Gulf of Mexico, Houston is subject to extreme weather events, including high winds and flooding from hurricanes and tropical storms. Additionally, the region's warm and humid weather, combined with climate change predictions, presents a challenge in the maintenance and operation of infrastructure. HITS will help transportation managers identify roadway segments impacted by weather and storm events.

The City of Houston's Traffic Operations Division has instituted a robust preventive maintenance program over the past five years. The result is fewer trouble calls, fewer interruptions in service, and reduced congestion and fuel consumption caused by malfunctioning equipment. HITS will give transportation managers the real-time data needed to take the preventive maintenance program several steps further. With the remote capability to identify various maintenance issues, assess subsequent impacts on mobility, dispatch maintenance crews and mobility response teams in a streamlined manner, and ultimately reduce congestion and environmental impacts of incidents or system outages. The complexity of managing an arterial system of approximately 6,000 center-lane miles with over 2,400 traffic signals grows more complicated by the day. Given Houston's population forecast, city-wide Intelligent Transportation Systems upgrades are not simply a vision of streamlined operations, they are critical to the effective management of a growing demand. With limited space and funding for expansion, the network must become 'smarter' or risk poorer service, reduced accessibility, and increased emissions over time.

Economic Competitiveness

By improving long-term efficiency and effectiveness of Houston's arterial network, the HITS system will open the roadways to provide enhanced accessibility to employment centers and local attractions. HITS was deliberately designed to cross-cut the city broadly, including economically distressed portions of the city. Operational information about arterial status can also be used by transit providers to engage the public with their services in a more efficient and effective manner.

The HITS Project includes the vicinity around the Port of Houston, thus delivering travel time and incident management benefits to freight stakeholders, improving the ability to transport goods in a more efficient, cost-effective, and environmentally responsible way. HITS will also provide critical data for input into regional planning models, including sub-regional models around the port, where system upgrades can be based on real performance measures, traffic volume data, and speed data.

The City of Houston also actively promotes flextime as a travel demand management tool to reduce peak-period demand spikes. HITS can contribute to the success of flextime programs by giving employees and employers a real view of trip times to and from work. The Flexible Workplace Initiative Program, based in Houston, provides research on various aspects of flexible work options, including employee reactions and observed productivity, as well as mobility effects of implementing flexible options. Flexible work options have not only become a method to decrease heavy, peak-period traffic, but consequently, a persuasive recruitment tool used by employers.

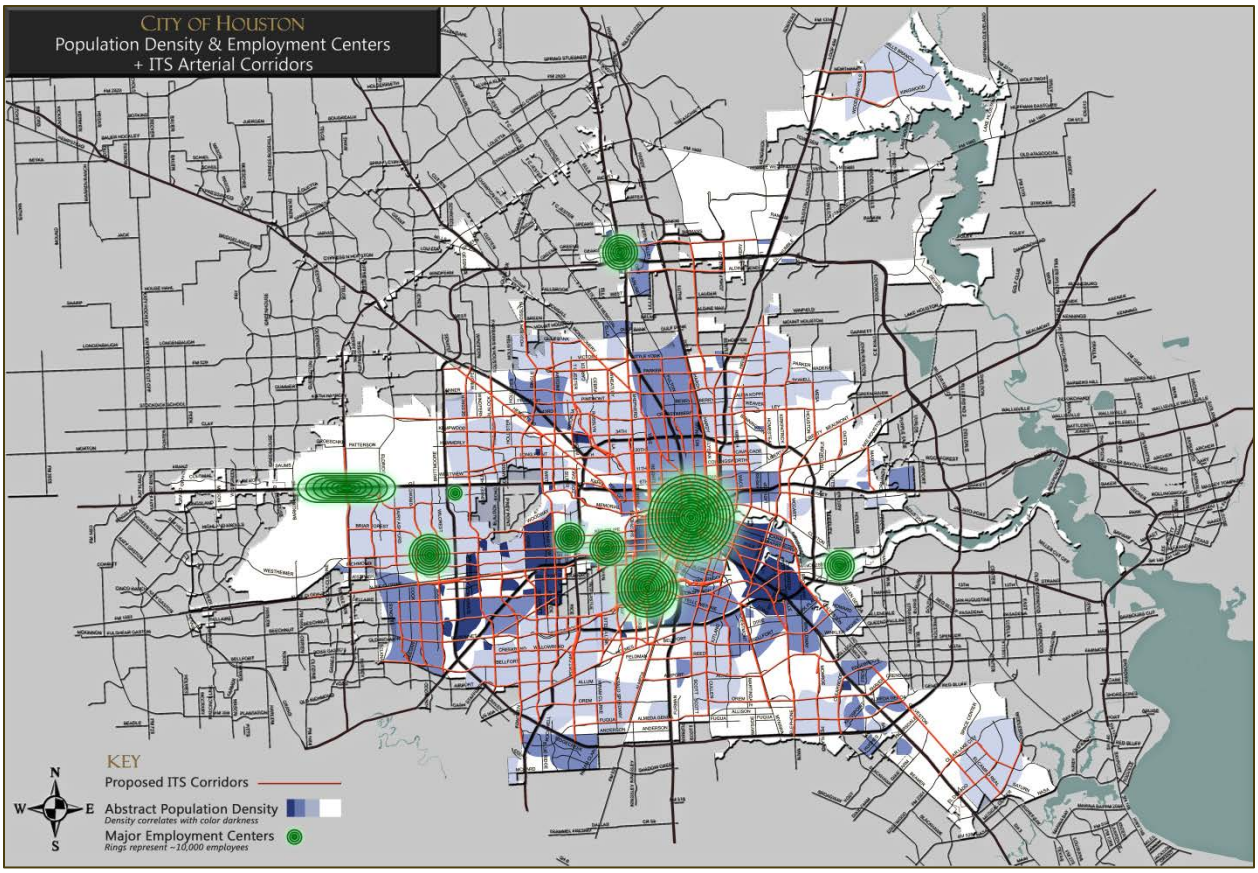


Figure 6 - Population Density & Economic Centers, with HITS Arterial Corridors

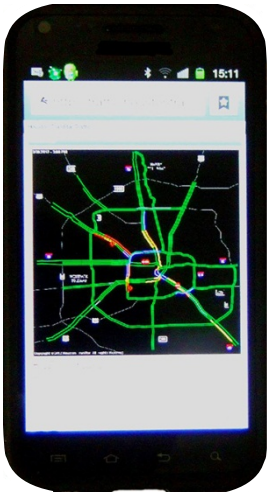
Livable Communities & Quality of Life

Monitoring arterial conditions through the deployment of HITS will make Houston a more mobility-friendly and livable community. Closed circuit televisions, enhanced signal detection, midblock detection, and wireless travel time data streaming means that service levels are addressed more often and more efficiently, contributing to the safe and efficient movement of people and goods. This 'smart' infrastructure also improves incident management, streamlining pertinent data to transportation managers and alerting first responders in real-time. Improvements to travel time, system reliability, and incident notification will positively impact driving and transit across the city's critical arterial corridors. HITS will enhance the quality of life for Houston's residents and commuters, as well as help augment ongoing redevelopment efforts in distressed portions of the city.

This system will empower travelers to identify traffic congestion along their routes in advance, as well as consider alternate trip times. Dynamic Message Signs and live traffic maps online & on mobile phones share important travel information with motorists, transportation providers, and local media. Previous studies have suggested that travel times decrease by 4% to 20% with similar traveler information systems ("*Developing Traveler Information Systems Using the National ITS Architecture" - Table 1.2-1. Summary of Traveler Information System benefits. U.S. DOT, Intelligent Transportation Systems Joint Program Office, August 1998*). HITS is also expected to improve travel time reliability by providing real-time information about additional routes and modes available during incidents or special events.

While ITS technologies are useful when deployed separately, deploying multiple ITS strategies synchronously creates a comprehensive benefit to the community. Once deployed, HITS will allow:

- Faster detection and verification of incidents that impact traffic operations (including flooding events that effect both pedestrian and vehicle traffic)
- Monitoring incident clearance
- Monitoring traffic flow during emergencies and special events
- Enhanced monitoring of signal operations and timing adjustments based on current conditions
- Visual confirmation of surface conditions during inclement weather
- Better data that informs operations and planning efforts, making the most efficient use of funds for future transportation improvements.



The HITS project will function in partnership with Houston TranStar, the Greater Houston Transportation and Emergency Management Center. Houston TranStar provides important travel information regarding Houston area freeways, including current speeds, incidents, construction, and lane closures, as well as weather and transit information. HITS will integrate the arterial 'smart' network into the established framework of Houston TranStar's website. By synching real-time travel maps for arterials and freeways into the same interface, a motorist may decide to avoid a congested freeway in favor of an arterial, or steer clear of an arterial incident by using the freeway instead. Houston TranStar conducts user surveys to assess the need for website travel information in the region. Generally, more than 80% of respondents want to see arterial travel information at a level comparable to that which is currently available for the freeway system.

Houston's Flexible Workplace Initiative Program hosts a four week mobility study annually in May called "Flex in the City." Participating local employers adopt flexible work options for some or all of their employees during the trial period, with surveys conducted before and after the study. Changes along Houston's major freeways are typically measured during the study. Implementing the HITS project will allow us to also quantify impacts to the arterial network, where much of the benefits are realized, particularly along corridors in and around major employment centers. An overwhelming number of participants experience a drop in commute-related stress levels by altering the time they arrive and leave from work. Much of the research indicates that productivity improves and that clients see better service from employees during this period, which enhances both economic competitiveness and quality of life. Traffic studies also indicate a reduction in the number of trips, increased travel speeds (by 1-3%), and reduced peak duration on the freeway system.

Environmental Sustainability

By improving vehicle flow along major arterials throughout Houston, the HITS project will reduce vehicle emissions and fuel consumption, improving fuel economy for regional motorists and transit operators. HITS will contribute to a reduction in vehicle emissions for both recurring and non-recurring (e.g., incidents, events, emergencies) conditions. Estimates of the reductions in CO_2, NOx, and VOCs could count towards quantifiable benefit/cost calculations. Over the life of the project, an average of 49 tons of VOCs, 33 tons of NOx, and 17,500 tons of CO2 is expected to be cut annually. We have estimated an average expected savings of a little less than 2 million gallons of fuel per year.

Safety We believe strongly that Intelligent Transportation Systems enhance safety on targeted roadways. A key motivator of the Traffic Operations Division staff is the motto of "mobility first, safety always". The HITS project addresses safety issues on the Houston's arterial network by combining technologies that enable city staff, including both transportation and emergency services personnel (including the City of Houston's Mobility Response Team), to quickly identify and respond to incidents with real-time data. Whether responding to a vehicle crash, a medical emergency, or a security situation, the ITS deployed by this project will enable faster response to protect the safety of citizens and visitors to Houston.

Through ITS, first responders can identify and react to incidents faster and clear the primary incident more efficiently. As primary incidents contribute to secondary crashes, clearing incidents efficiently will help reduce additional incidents. Efficient clearly of incidents also reduces incident related delay for motorists and transit passengers, as well as the added emissions and fuel consumption caused by delay. Previous studies indicate that the use of ITS can reduce response and clearance times by up to 20% and reduce secondary crashes by a similar amount *(USDOT, Intelligent Transportation Systems for Traffic Incident Management, January 2007)*. In addition to first responders and City of Houston personnel, data and video streams will be advantageous for partner transportation agencies such as Houston METRO (the regional transit operator), TxDOT (who operates the freeway system), and Harris County (who operates arterials adjacent to Houston's boundaries). More interagency data sharing will substantially contribute to better coordinated incident response.

Studies indicate a crash risk reduction (4%-10%) and a fatality reduction with enhanced EMS response - two major safety benefits of a traveler information system("*Developing Traveler Information Systems Using the National ITS Architecture" - Table 1.2-1. Summary of Traveler Information System benefits. U.S. DOT, Intelligent Transportation Systems Joint Program Office, August 1998*). Another safety benefit of ITS technologies and improved incident response will be reduced incident related driver stress. Having real-time arterial incident information at their fingertips and reflected on Dynamic Message Signs will help motorists avoid stressful delays and use alternate routes.

Secondary Selection Criteria

The HITS project addresses the secondary selection criteria very well, particularly in light of existing regional partnerships and collaborations. If this project is funded, other cities will be able to use our experience as a case study in the application of integrating off-the-shelf ITS technologies on a broad, urban scale. They can then apply the results of HITS to their own unique needs, improving the lives of their residents and strengthening partnerships with local and state agencies.

Innovation The City of Houston has deployed, on a city-wide scale, a last-mile private wireless communications network based on the WiMAX protocol. The WiMAX system has a communications backhaul network that is tied to city facilities with towers (fire stations, police stations, and other city facilities). The City of Houston's Smart City project is a prime illustration of the fast-growing global movement towards transforming urban life with enhanced communications infrastructure. The WiMAX system has allowed the City of Houston to offer advanced municipal services, such as enhanced public safety and traffic optimization solutions, as well as consistent access to status information. This network is utilized in making adjustments wirelessly to 2,459 traffic intersections and

1,500 school zone flashers throughout Houston, improving traffic safety and congestion. It also improves customer service and encourages lower utility costs by connecting the City's 500,000 water meter accounts to the system, providing customers with current use information and customized notifications. This system reduced multi-million dollar annual commercial T1 costs by replacing connections with WiMAX at multiple facilities. It also offers the ability to add devices as needed. Communications are often the most costly portion of ITS systems; the communications infrastructure that HITS will employ is in place and operational.

The City of Houston sponsored early testing and deployment of Bluetooth and Wi-Fi based arterial travel time monitoring in partnership with the Texas A&M Transportation Institute in 2009. The initial testing covered 48 intersections in west Houston. The system will be expanded to total 650 sensors, which will provide probe-based roadway segment travel times and origin-destination data. Additionally, recent developments include the ability to discern measures of individual intersection delays, an important component in corridor management and performance measures. The City also implemented a robust preventive maintenance program that adheres to FHWA standards, as well as reduced response times for requested maintenance. These new maintenance standards will be applied to the HITS components, as well.

Partnership The City of Houston is a founding member of Houston TranStar, the Greater Houston Transportation and Emergency Management Center, as well as a consortium of partner agencies, including the Texas Department of Transportation (TxDOT), Harris County, and the Metropolitan Transit Authority of Harris County (METRO). Through this consortium, the City is launching collaboration in the deployment and management of new Intelligent Transportation Systems, sharing data and learning from each other's experiences. The HITS project will leverage the combined capabilities of these partner agencies through Houston TranStar, one of the first interagency transportation and emergency management centers in the country. This project will utilize Houston TranStars established freeway travel information webpage (houstontranstar.org) to provide ITS-based arterial travel information, as well. This partnership will create a comprehensive picture of travel conditions on both networks to the public, media, and partner agencies through a single, seamless platform. The project also ties in with the arterial travel information system deployed by Harris County and TxDOT in northwest Houston.

Houston TranStar Control Room

Benefit Cost Analysis Summary

BCA Introduction

As part of project development, a Benefit Cost Analysis (BCA) for a 20 year period life span of the project was performed in order to determine the financial and economic feasibility of the project. The proposed project is an expansion of an existing prototype system that was designed to test use of new technologies in order to minimize the risks associated with deployment of large scale ITS systems. ITS Deployment Analysis System (IDAS) software was used to evaluate benefits of the HITS project by deploying DMS and CCTV components of the HITS project at proposed locations (shown in Figure 2 and Figure 4). The IDAS software provided monetized value of travel time savings and accident reductions in 1995 dollars for the complete system. The total benefits were then split into Baseline benefits and benefits for TIGER Grant portion of the project using a simple proportional method based on project components available without and with TIGER grant funding. More detail on benefits calculation methodology can be found in subsection below. The following sections summarize the costs and benefits of the baseline system and the proposed project.

Infrastructure Baseline without TIGER Grant Funds

Currently the City operates and maintains 2,459 traffic signals and 6,000 center lane miles. Out of the 2,459 signals, 48 signals have been equipped with Bluetooth/AVI sensors to collect, analyze and develop travel time information. With the currently existing and funded components, it is expected that the infrastructure Baseline will consists of 650 Bluetooth AVI sites, 25 CCTV cameras, 16 count stations, and a communication infrastructure. The baseline infrastructure will provide limited benefits as the system will not benefit from incident detection and management capabilities that reduce non-recurring congestion by clearing incidents faster and diverting traffic due to availability of incident information. The benefits will also be limited due to non-availability of roadside travel information proposed to be disseminated via DMS. In order to determine the benefits of the baseline and proposed project separately, it was assumed that the baseline infrastructure will provide benefits proportional to the total number of CCTV cameras available without TIGER Grant funds versus the total number of CCTVs that would be available with the complete project. In other words, the baseline system is assumed to provide 18.1% (25/138) of the total benefits and the proposed TIGER Grant funded project 81.9% of the total benefits. This assumption is expected to provide a liberal estimate of the Baseline net benefits, since IDAS computed benefits came from deployment of both DMS and CCTV components and the baseline will deploy only 25 CCTV and no DMS. Project benefits and costs were computed for a 20 year life span of the Baseline project starting in 2015 and continuing thru 2034. Table 2 presents a summary of the benefit-cost analysis for the Baseline system.

Table 2. Summary of Benefit Cost Analysis for Baseline System

Discount Rate	Total Cost	Total Benefits	Benefit - Cost Ratio
0%	$25,311,295	$179,043,461	7.1
3%	$24,100,199	$131,972,386	5.5
7%	$23,111,254	$93,087,843	4

* Capital Cost for Baseline System not discounted

Project Justification and Economic Benefits

The proposed project will expand the prototype system to provide travel information (roadside) and incident management capabilities along 150 arterial corridors by adding 91 Dynamic Message Signs, 113 CCTV cameras, 144 count stations, and 489 sites with enhanced signal detection. While this project has many benefits that are difficult to quantify, its primary long term quantifiable benefits come from reduction in travel time and secondary crashes due to better routing by travelers and improved incident management by agencies. Due to reduced travel times, region would experience reduced emissions and fuel consumption as a co-benefit of congestion mitigation.

In order to determine the economic benefits of the proposed project (TIGER Grant funded), IDAS computed benefits (for the complete system) were reduced proportionally to account for the components that will be available without the TIGER grant funding. The economic benefits presented in this document are conservative in nature since only two components namely DMS and CCTV were deployed in IDAS to compute the benefits of the system. Project benefits and costs were computed for a 20 year life span of the proposed project starting in 2017 and continuing thru 2036 with partial benefits available in years 2015 and 2016. Table 3 present summary of the benefit cost analysis for TIGER Grant funded project.

Table 3. Summary of Benefit Cost Analysis For TIGER Grant Funded Project

Discount Rate	Total Cost	Total Benefits	Benefit - Cost Ratio
0%	$32,107,579	$866,278,692	27.0
3%	$29,706,074	$610,745,939	20.6
7%	$27,829,094	$408,911,895	14.7

BCA Analysis Method and Assumptions

ITS Deployment Analysis System (IDAS) software was used to evaluate the benefits of HITS project using the following methodology and assumptions. Data were obtained from the Houston Galveston Area Council's (H-GAC) regional travel demand model to use as inputs into the IDAS model. The model data included both network files and travel demand files (trip tables) representing the a.m. peak periods. Three separate modes were obtained from the H-GAC model, including all auto, walk to local transit, and park and ride transit. These data were imported into the IDAS software to conduct the analysis. The a.m. peak period represented 2.5 hours from 6:00 a.m. to 8:30 a.m. The p.m. peak period is 3.5 hours from 3:00 to 6:30pm, but was not specifically modeled, instead am peak period results were extrapolated proportionally to represent the pm peak period. Off-peak benefits are not included in the BCA as it was assumed that most of HITS' benefits occur during the peak periods and that this approach would produce a more conservative estimate of average annual benefits. For the evaluation effort, HITS components (DMS and CCTVs) were deployed in IDAS according to information available from the proposed plan (shown in Figure 2 and Figure 4). IDAS provided monetized value of travel time savings and accident reductions in 1995 dollars.

A number of key parameters were used to estimate the net present value of the proposed project from IDAS analysis. Table4 presents the general parameters used in the analysis.

Table 4 BCA General Parameters

Parameter Name	Value	Unit	Notes/Source/Description
Project Life	20	Years	Expected Life of the Project
Discount rate	3%	Per annum	Per NOFA
Discount rate	7%	Per annum	Per NOFA
Discount rate for CO2 benefits	3%	Per annum	Per NOFA
Value of Time in IDAS	9.63	$/hour	1995 values by default in IDAS
2013 Value of Time	$12.98	$/hour	Per NOFA
Vehicle Occupancy	1.0	Persons	To provide conservative travel time reduction benefits
Traffic Growth in region	1.5%	Per annum	Conservative than Regional Travel Demand Model
O&M Cost	$440,000	Per annum	As estimated and budgeted based on partner agency (TxDOT) experience for freeway system
Growth in O&M Cost	3%	Per annum	
AM Peak period	2.5	Hours	Based on local data
PM Peak period	3.5	Hours	Based on local data
Inflation Rate from 1995 to 2013	1.528		http://www.bls.gov/data/inflation_calculator.htm
Emission Factors - VOC	1.034	g/mi	http://www.epa.gov/otaq/consumer/420f08024.pdf
Emission Factors - NO_x	0.693	g/mi	http://www.epa.gov/otaq/consumer/420f08024.pdf
Emission Factors – CO_2	368.4	g/mi	http://www.epa.gov/otaq/consumer/420f08024.pdf
Gasoline Consumption for Passenger cars	0.4149	gal/mi	http://www.epa.gov/otaq/consumer/420f08024.pdf
Gasoline Price (all grades)	3.374	$/gallons	http://www.eia.gov

Livability Benefits Travel time savings provided by the IDAS program in $1995 dollar were converted back to travel time reduction in vehicle hours of time saved, using the 1995 value of time $9.63/hour used by the IDAS model. To convert travel time reductions in 2013 dollars, 2014 NOFA recommended value of time ($12.98/hour) was used. In order to be more conservative, vehicle occupancy was assumed to be 1.0. Traffic growth in the area was assumed at a conservative level of 1.5% per year. This component of the project provides the most benefit both quantitatively as well qualitatively.

Safety Benefits The accident savings monetized value available from IDAS analysis was inflated to 2013 dollars using BLS's inflation calculator (http://www.bls.gov/data/inflation_calculator.htm).

Sustainability Benefits Sustainability benefits for this project are co-benefits of congestion reduction (both recurring and non-recurring) expected to occur as a result of this project. EPA publication "Potential Changes in Emissions Due to Improvements in Travel Efficiency –Supplemental Report: Analysis of Potential C-Benefits" describes the use of TRIMMS model to assess the emission and fuel savings as a co-benefit of congestion reduction. For the BCA of this project, instead of the TRIMMS model a simple approach was used.

The hypothesis for assessing emission reductions and fuel savings is that reduction in travel time will correspond to vehicle engines not running for that amount of time and thus not burning fuel and not emitting pollutants in the air. However, emission factors available from research require reduction in Vehicle Miles Traveled to compute the reduction in pollutants and fuel consumption. The travel time reductions (vehicle-hours) were converted to equivalent vehicle miles traveled by assuming that vehicles would be traveling in congestion at an average speed of 20 mph for the amount of time that is expected to be saved due to the project implementation. Detailed emissions and fuel savings calculation are attached in the appendix.

Cost Estimate For the benefit/cost analysis, the evaluation plan estimate of capital and operating costs for the HITS system are based upon recently completed project data in the region and bid item data. The O&M costs were grown by 3% per annum to account for inflation for future years. Complete BCA analysis is available at http://www.publicworks.houstontx.gov/traffic/traffic/tiger-2014.html.

Benefit Cost Analysis Tables This section presents summary tables (Tables 5-A thru 6-B) for the Baseline and for the proposed project benefits and costs discounted at 7% per annum and 3% per annum respectively. Microsoft Excel spreadsheets are included as a separate attachment.

Table 5-A: Summary of BCA Results Discounted at 7% per Annum (Baseline)

Year	Total Cost Discounted to 7%	Livability	Safety	Sustainability		Benefits Discounted at 7 % - Excluding reduction in CO_2	Sustainability	Total Benefits Discount to 2014 at 7 %
		Annual Travel Time Savings from HITS	Accident Savings due to Incident Management	Air Pollution Benefits excluding CO_2	Fuel Saving Benefits		NPV of CO_2 Benefits at 3% SCC	
2014	$20,944,859	$0	$0	$0	$0	$0	$0	$0
2015	$151,869	$4,987,059	$1,506,306	$57,829	$1,075,693	$7,127,932	$123,679	$7,251,610
2016	$146,192	$5,061,863	$1,528,900	$58,697	$1,091,828	$6,761,540	$124,586	$6,886,126
2017	$140,727	$5,137,796	$1,551,834	$59,577	$1,108,206	$6,413,990	$125,441	$6,539,430
2018	$135,466	$5,214,858	$1,575,111	$60,471	$1,124,828	$6,084,294	$128,874	$6,213,168
2019	$130,402	$5,293,075	$1,598,738	$61,378	$1,141,700	$5,771,545	$132,180	$5,903,726
2020	$125,527	$5,372,474	$1,622,719	$62,299	$1,158,826	$5,474,879	$132,810	$5,607,689
2021	$120,834	$5,453,067	$1,647,060	$63,233	$1,176,209	$5,193,465	$130,876	$5,324,340
2022	$116,317	$5,534,854	$1,671,766	$64,182	$1,193,851	$4,926,504	$133,930	$5,060,434
2023	$111,969	$5,617,887	$1,696,842	$65,144	$1,211,761	$4,673,279	$134,424	$4,807,703
2024	$107,783	$5,702,153	$1,722,295	$66,121	$1,229,936	$4,433,063	$134,874	$4,567,937
2025	$103,754	$5,787,678	$1,748,129	$67,113	$1,248,384	$4,205,191	$135,283	$4,340,474
2026	$99,875	$5,874,501	$1,774,351	$68,120	$1,267,111	$3,989,041	$135,652	$4,124,693
2027	$96,142	$5,962,610	$1,800,967	$69,142	$1,286,116	$3,783,992	$138,286	$3,922,278
2028	$92,547	$6,052,055	$1,827,981	$70,179	$1,305,409	$3,589,491	$138,544	$3,728,034
2029	$89,088	$6,142,837	$1,855,401	$71,232	$1,324,991	$3,404,985	$138,764	$3,543,749
2030	$85,757	$6,234,982	$1,883,232	$72,300	$1,344,866	$3,229,963	$138,949	$3,368,912
2031	$82,551	$6,328,503	$1,911,480	$73,385	$1,365,038	$3,063,935	$136,925	$3,200,861
2032	$79,465	$6,423,426	$1,940,152	$74,485	$1,385,513	$2,906,442	$139,215	$3,045,656
2033	$76,495	$6,519,776	$1,969,255	$75,603	$1,406,295	$2,757,045	$139,298	$2,896,343
2034	$73,635	$6,617,580	$1,998,794	$76,737	$1,427,391	$2,615,330	$139,349	$2,754,679
Total	**$23,111,254**	**$115,319,032**	**$34,831,313**	**$1,337,226**	**$24,873,953**	**$90,405,905**	**$2,681,937**	**$93,087,843**

Table 5-B: Summary of BCA Results Discounted at 3% per Annum (Baseline)

Year	Total Cost Discounted to 3%	Livability	Safety	Sustainability		Benefits Discounted at 3% - Excluding reduction in CO_2	Sustainability	Total Benefits Discount to 2014 at 3 %
		Annual Travel Time Savings from HITS	Accident Savings due to Incident Management	Air Pollution Benefits excluding CO_2	Fuel Saving Benefits		NPV of CO_2 Benefits at 3% SCC	
2014	$20,944,859	$0	$0	$0	$0	$0	$0	$0
2015	$157,767	$4,987,059	$1,506,306	$57,829	$1,075,693	$7,404,745	$123,679	$7,528,423
2016	$157,767	$5,061,863	$1,528,900	$58,697	$1,091,828	$7,296,906	$124,586	$7,421,491
2017	$157,767	$5,137,796	$1,551,834	$59,577	$1,108,206	$7,190,646	$125,441	$7,316,087
2018	$157,767	$5,214,858	$1,575,111	$60,471	$1,124,828	$7,085,922	$128,874	$7,214,796
2019	$157,767	$5,293,075	$1,598,738	$61,378	$1,141,700	$6,982,724	$132,180	$7,114,904
2020	$157,767	$5,372,474	$1,622,719	$62,299	$1,158,826	$6,881,036	$132,810	$7,013,846
2021	$157,767	$5,453,067	$1,647,060	$63,233	$1,176,209	$6,780,833	$130,876	$6,911,708
2022	$157,767	$5,534,854	$1,671,766	$64,182	$1,193,851	$6,682,074	$133,930	$6,816,004
2023	$157,767	$5,617,887	$1,696,842	$65,144	$1,211,761	$6,584,772	$134,424	$6,719,195
2024	$157,767	$5,702,153	$1,722,295	$66,121	$1,229,936	$6,488,875	$134,874	$6,623,750
2025	$157,767	$5,787,678	$1,748,129	$67,113	$1,248,384	$6,394,371	$135,283	$6,529,654
2026	$157,767	$5,874,501	$1,774,351	$68,120	$1,267,111	$6,301,256	$135,652	$6,436,908
2027	$157,767	$5,962,610	$1,800,967	$69,142	$1,286,116	$6,209,483	$138,286	$6,347,769
2028	$157,767	$6,052,055	$1,827,981	$70,179	$1,305,409	$6,119,058	$138,544	$6,257,601
2029	$157,767	$6,142,837	$1,855,401	$71,232	$1,324,991	$6,029,946	$138,764	$6,168,711
2030	$157,767	$6,234,982	$1,883,232	$72,300	$1,344,866	$5,942,134	$138,949	$6,081,082
2031	$157,767	$6,328,503	$1,911,480	$73,385	$1,365,038	$5,855,595	$136,925	$5,992,520
2032	$157,767	$6,423,426	$1,940,152	$74,485	$1,385,513	$5,770,315	$139,215	$5,909,530
2033	$157,767	$6,519,776	$1,969,255	$75,603	$1,406,295	$5,686,281	$139,298	$5,825,579
2034	$157,767	$6,617,580	$1,998,794	$76,737	$1,427,391	$5,603,477	$139,349	$5,742,826
Total	**$24,100,199**	**$115,319,032**	**$34,831,313**	**$1,337,226**	**$24,873,953**	**$129,290,448**	**$2,681,937**	**$131,972,386**

Table 6-A: Summary of BCA Results Discounted at 7% per Annum (TIGER Grant Proposed Project)

Year	Total Cost Discounted to 7%	Livability	Safety	Sustainability		Benefits Discounted at 7 % - Excluding reduction in CO_2	Sustainability	Total Benefits Discount to 2014 at 7 %
		Annual Travel Time Savings from HITS	Accident Savings due to Incident Management	Air Pollution Benefits excluding CO_2	Fuel Saving Benefits		NPV of CO_2 Benefits at 3% SCC	
2014	$24,096,050	$0	$0	$0	$0	$0	$0	$0
2015	$259,346	$6,769,706	$2,044,748	$78,501	$1,460,204	$9,675,850	$167,888	$9,843,738
2016	$242,379	$13,742,497	$4,150,838	$159,356	$2,964,213	$18,356,979	$338,239	$18,695,218
2017	$226,523	$23,247,712	$7,021,834	$269,578	$5,014,458	$29,022,314	$567,599	$29,589,912
2018	$218,055	$23,596,433	$7,127,161	$273,621	$5,089,676	$27,530,517	$583,134	$28,113,651
2019	$209,903	$23,950,372	$7,234,069	$277,726	$5,166,020	$26,115,390	$598,096	$26,713,487
2020	$202,056	$24,309,632	$7,342,580	$281,892	$5,243,511	$24,773,014	$600,943	$25,373,958
2021	$194,503	$24,674,279	$7,452,718	$286,120	$5,322,164	$23,499,637	$592,191	$24,091,828
2022	$187,231	$25,044,391	$7,564,509	$290,412	$5,401,996	$22,291,710	$606,012	$22,897,722
2023	$180,232	$25,420,058	$7,677,977	$294,768	$5,483,027	$21,145,875	$608,246	$21,754,121
2024	$173,495	$25,801,358	$7,793,146	$299,189	$5,565,272	$20,058,937	$610,286	$20,669,223
2025	$167,009	$26,188,383	$7,910,044	$303,677	$5,648,752	$19,027,873	$612,138	$19,640,011
2026	$160,765	$26,581,210	$8,028,694	$308,233	$5,733,483	$18,049,805	$613,806	$18,663,611
2027	$154,756	$26,979,929	$8,149,125	$312,856	$5,819,486	$17,122,013	$625,724	$17,747,737
2028	$148,970	$27,384,620	$8,271,362	$317,549	$5,906,776	$16,241,905	$626,889	$16,868,794
2029	$143,401	$27,795,385	$8,395,432	$322,312	$5,995,377	$15,407,039	$627,886	$16,034,925
2030	$138,040	$28,212,329	$8,521,364	$327,147	$6,085,311	$14,615,094	$628,722	$15,243,816
2031	$132,880	$28,635,503	$8,649,184	$332,054	$6,176,588	$13,863,846	$619,566	$14,483,412
2032	$127,913	$29,065,037	$8,778,922	$337,035	$6,269,237	$13,151,219	$629,925	$13,781,145
2033	$123,131	$29,501,009	$8,910,606	$342,090	$6,363,275	$12,475,221	$630,302	$13,105,523
2034	$118,528	$29,943,536	$9,044,265	$347,222	$6,458,727	$11,833,975	$630,534	$12,464,509
2035	$114,097	$30,392,683	$9,179,929	$352,430	$6,555,606	$11,225,685	$630,625	$11,856,310
2036	$109,832	$30,848,580	$9,317,628	$357,716	$6,653,942	$10,648,665	$630,580	$11,279,245
Total	**$27,829,094**	**$558,084,640**	**$168,566,135**	**$6,471,483**	**$120,377,103**	**$396,132,564**	**$12,779,331**	**$408,911,895**

Table 6-B: Summary of BCA Results Discounted at 3% per Annum (TIGER Grant Proposed Project)

Year	Total Cost Discounted to 3%	Livability	Safety	Sustainability		Benefits Discounted at 3% - Excluding reduction in CO_2	Sustainability	Total Benefits Discount to 2014 at 3 %
		Annual Travel Time Savings from HITS	Accident Savings due to Incident Management	Air Pollution Benefits excluding CO_2	Fuel Saving Benefits		NPV of CO_2 Benefits at 3% SCC	
2014	$24,096,050	$0	$0	$0	$0	$0	$0	$0
2015	$269,417	$6,769,706	$2,044,748	$78,501	$1,460,204	$10,051,611	$167,888	$10,219,499
2016	$261,570	$13,742,497	$4,150,838	$159,356	$2,964,213	$19,810,449	$338,239	$20,148,688
2017	$253,952	$23,247,712	$7,021,834	$269,578	$5,014,458	$32,536,564	$567,599	$33,104,163
2018	$253,952	$23,596,433	$7,127,161	$273,621	$5,089,676	$32,062,736	$583,134	$32,645,870
2019	$253,952	$23,950,372	$7,234,069	$277,726	$5,166,020	$31,595,795	$598,096	$32,193,891
2020	$253,952	$24,309,632	$7,342,580	$281,892	$5,243,511	$31,135,667	$600,943	$31,736,610
2021	$253,952	$24,674,279	$7,452,718	$286,120	$5,322,164	$30,682,237	$592,191	$31,274,429
2022	$253,952	$25,044,391	$7,564,509	$290,412	$5,401,996	$30,235,406	$606,012	$30,841,418
2023	$253,952	$25,420,058	$7,677,977	$294,768	$5,483,027	$29,795,086	$608,246	$30,403,332
2024	$253,952	$25,801,358	$7,793,146	$299,189	$5,565,272	$29,361,176	$610,286	$29,971,462
2025	$253,952	$26,188,383	$7,910,044	$303,677	$5,648,752	$28,933,591	$612,138	$29,545,728
2026	$253,952	$26,581,210	$8,028,694	$308,233	$5,733,483	$28,512,228	$613,806	$29,126,034
2027	$253,952	$26,979,929	$8,149,125	$312,856	$5,819,486	$28,097,003	$625,724	$28,722,728
2028	$253,952	$27,384,620	$8,271,362	$317,549	$5,906,776	$27,687,817	$626,889	$28,314,705
2029	$253,952	$27,795,385	$8,395,432	$322,312	$5,995,377	$27,284,593	$627,886	$27,912,479
2030	$253,952	$28,212,329	$8,521,364	$327,147	$6,085,311	$26,887,254	$628,722	$27,515,976
2031	$253,952	$28,635,503	$8,649,184	$332,054	$6,176,588	$26,495,684	$619,566	$27,115,250
2032	$253,952	$29,065,037	$8,778,922	$337,035	$6,269,237	$26,109,826	$629,925	$26,739,751
2033	$253,952	$29,501,009	$8,910,606	$342,090	$6,363,275	$25,729,583	$630,302	$26,359,885
2034	$253,952	$29,943,536	$9,044,265	$347,222	$6,458,727	$25,354,889	$630,534	$25,985,422
2035	$253,952	$30,392,683	$9,179,929	$352,430	$6,555,606	$24,985,639	$630,625	$25,616,264
2036	$253,952	$30,848,580	$9,317,628	$357,716	$6,653,942	$24,621,774	$630,580	$25,252,354
Total	**$29,706,074**	**$558,084,640**	**$168,566,135**	**$6,471,483**	**$120,377,103**	**$597,966,608**	**$12,779,331**	**$610,745,939**

Project Readiness

Project Schedule

Deployment Plan

The City of Houston's transportation infrastructure spans 640 square miles. It consists of 6,000 center lane miles of streets and 2,459 traffic signals. Due to the size of the project area HITS will be implemented in 16 zones (see figure 5). The Bluetooth AVI travel time and central software projects are planned for letting during the summer of 2014. CCTV and count station deployment in zone 1 will be completed May 2014. If awarded the TIGER 2014, the city will move quickly to finalize the design and placement of ITS devices and begin the procurement process. Procurement for the entire system (and obligation of funds) will begin in the 4th quarter of 2014. We plan to construct multiple zones simultaneously with a project complete date during the 4th quarter of 2016.

Project Schedule

Year		**2014**		**2015**				**2016**			
Quarter		**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Bluetooth AVI		P	C	C	C	C	C	I	I		
Central Software		P	C	C	C	C	C	I	I		
DMS, CCTV, Detection, Count Stations	Phase 1 (4 zones)	D	D/P	P	C	C	C	I			
	Phase 2 (4 zones)	D	D/P	P		C	C	C	I		
	Phase 3 (4 zones)	D	D/P	P			C	C	C	I	
	Phase 4 (4 zones)	D	D/P	P				C	C	C	I
System Integration / Testing								I	I	I	I

Legend	
Design	D
Procurement	P
Construction	C
Integration/ Testing	I

Legislative Approval

The City Council, the City of Houston's legislative body, approved the submission of 2014 TIGER proposal on April 23, 2014. No other legislative action is required to move forward with the project. The HITS project is widely supported by elected officials, transportation agencies, emergency response communities and Management Districts. The support letters from these officials, as well as regional agencies, are contained in a separate attachment.

State and Local Planning

The HITS project is supported by the Houston-Galveston Area Council (HGAC) the regions Metropolitan Planning Organization (MPO) as well as other local agencies. The system works in conjunction with other TranStar partner agencies to achieve the long term goal of effective transportation and emergency management.

Technical Feasibility

The HITS project will use off-the-shelf components to develop the system. Both the City of Houston and partner agencies have proven and successful experiences in using these components in prototype systems currently in operation. The freeway management system currently in operation from Houston TranStar uses most of the components (CCTV, DMS, Bluetooth sensors, AVI, communication systems, and radar sensors) that are being proposed for the HITS project. The City of Houston is currently operating a prototype arterial ITS system in west Houston that integrates CCTV, Bluetooth sensors, and traffic signal control data, all of which stream back to Houston TranStar using a WiMax communication network. The HITS project will employ most of the same components, but on the scale of the entire roadway network.

Financial Feasibility

If we are granted federal funding under the TIGER 2014 program, the City of Houston and HITS will be fully capitalized. The City of Houston has committed $7,501,100 to fund various components of HITS. This funding, along with the $16,594,950 requested from the TIGER FY 2014 program, will fully capitalize the project up front.

In addition to the capital investment, the City of Houston has committed significant resources in signal/ITS operations and maintenance, which will provide the foundation for daily and long term success of HITS. The City currently dedicates the following groups to various HITS components.

- Signal Timing and Operations Section – 13 full-timed staff
- ITS Section – 4 full-time staff
- Signal Maintenance Section – 71 full-timed staff
- Traffic Count Section – 4 full-timed staff

A majority of maintenance staff time is spent on field visits and diagnosing issues. The time and resources associated with field visits will be greatly reduced by the real-time capabilities of HITS. The City of Houston envisions that resources freed up by HITS technologies can be redirected to performance assessment and system optimization.

The City of Houston has extensive experience administering federal grants and aid, including an FTA grant, TIGER grants, hurricane relief funds, and entitlement grants.

Environmental Approvals

All HITS physical components will be attached to existing equipment or to new poles that will be installed within the public right-of-way. These poles along with underground conduits will require little excavation and their installations meet the criteria for categorical exclusions per Tittle 23 CFR 771.117(c)(21). Therefore, it is anticipated that the project will receive categorical exclusions and no environmental approvals will be necessary from federal or state regulatory agencies.

Federal Wage Rate Certification

CITY OF HOUSTON
Department of Public Works & Engineering

Annise D. Parker
Mayor

Daniel W. Krueger, P.E., Director
P.O. Box 1562
Houston, Texas 77251-1562

T. 832 395-2500
F. 832 395-3052
www.houstontx.gov

April 24, 2014

The Honorable Anthony Foxx
Secretary
Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590-001

Re: City of Houston's Transportation Investment Generating Economic Recovery (TIGER) 2014 Grant Application

Dear Secretary Foxx,

The City of Houston Public Works and Engineering Department along with its contractors and sub-contractors assures that any funds expended in conjunction with projects or activities associated with the TIGER 2014 grant shall fully comply with Subchapter IV of Chapter 31 of Title 40, United States Code (Davis-Bacon Act). Notwithstanding any other provision of law, all laborers and mechanics employed by vendors, contractors and subcontractors on projects funded directly or assisted in whole or in part by the TIGER 2014 grant, shall be paid wages at rates not less than those prevailing on projects of a similar character in the locality as determined by Secretary of Labor in accordance with Subchapter IV of Chapter 31 of Title 40, United States Code. With respect to the standards specified in this section, the Secretary of Labor shall have the authority and functions set forth in Reorganization Plan numbered 14 of 1950 (64 Stat. 1267; 5 U.S.C. App.) and 3145 of title 40 United States Code. For City Construction Contracts, these rates are found at: https://purchasing.houstontx.gov/forms.shtml. This location provides access to the current wage rates posted for engineering and construction projects.

Should you have any further questions, please contact Michael Wahl, Supervising Engineer, at (713) 881-5032.

Sincerely,

Daniel W. Krueger, P.E.
Director

DWK:JSW:mw

Council Members: Brenda Stardig Jerry Davis Ellen R. Cohen Dwight A. Boykins Dave Martin Richard Nguyen Oliver Pennington Edward Gonzalez
Robert Gallegos Mike Laster Larry V. Green Stephen C. Costello David W. Robinson Michael Kubosh C.O. "Brad" Bradford Jack Christie
Controller: Ronald C. Green