US 69 Hurricane Evacuation Corridor Improvements

November 2017

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Was an INFRA application for this project submitted previously?	No
If yes, what was the name of the project in the previous application?	N/A
Previously Incurred Project Cost	$0
Future Eligible Project Cost	$186,000,000
Total Project Cost (Sum of the two previous rows)	$186,000,000
INFRA Request	$111,000,000
Total Federal Funding (including INFRA)	$111,000,000
Are matching funds restricted to a specific project component? If so, which one?	No
Is the project or a portion of the project currently on National Highway Freight Network?	Yes
Is the project or a portion of the project on the National Highway System?	Yes
Does the project add capacity to the Interstate system?	No
Is the project in a national scenic area?	No
Do the project components include a railway-highway grade crossing or grade separation project?	No
Do the project components include an intermodal or freight rail project, or freight project within boundaries of a public or private freight rail, water, or intermodal facility?	No
If answered yes to either of the two component questions above, how much of requested INFRA funds will be spent on each of these projects components?	N/A
State(s) in which project is located.	Texas
Small or large project	Large, Rural
Urbanized Area in which project is located, if applicable.	N/A
Population of Urbanized Area.	N/A
Is the project currently programmed in the:	Texas Rural Transportation Plan
▪ TIP?	No
▪ STIP?	No
▪ MPO Long Range Transportation Plan?	Yes
▪ State Long Range Transportation Plan?	Yes
▪ State Freight Plan?	Yes

Executive Summary

The Texas Department of Transportation (TxDOT) is requesting $111 million in INFRA grant funding to be used to widen United States Highway 69 (US 69) from two lanes to four lanes, between Warren and north of Kountze, Texas, as the US 69 Hurricane Evacuation Corridor Improvements Project. ***This 14-mile section is currently a two-lane facility that has become a critical bottleneck in this important freight and emergency evacuation corridor in the region.***

US 69 connects Interstates 10 and 69 and future Interstate 14 with the Port of Beaumont, Texas, and serves as a major corridor for the Texas timber industry. The Port of Beaumont is the fourth busiest port in the United States by tonnage and the busiest military cargo port in the world. The 14 miles of US 69 are currently restricted to a two-lane rural roadway and additional capacity is needed to allow for the safe and efficient movement of people in times of emergency, the critical movement of timber from the Big Thicket National Preserve, and military equipment and personnel from Fort Polk to the Port of Beaumont.

The project's proximity to various natural and cultural resources poses numerous environmental and right-of-way challenges and will require seamless coordination with many federal and state agencies to obtain environmental clearance and the needed regulatory permits. These coordination challenges make the project uniquely situated to take advantage of USDOT's interest in using INFRA Grant applicant projects as potential models for streamlining future environmental review and permitting improvements.

In addition, ***TxDOT proposes to utilize an innovative critical path schedule timeline for procurement, environmental review, right-of-way acquisition, and utility adjustments which will allow the project to go to construction two years earlier, saving the state approximately $14 million in materials and labor costs.***

Furthering the need for INFRA Grant funding is the fact that the Texas Gulf Coast is vulnerable to impacts from catastrophic events such as Hurricane Harvey, and the establishment of more efficient and effective evacuation routes to allow residents to evacuate from their Gulf Coast communities is critical. One of the primary evacuation corridors in East Texas is US 69 because it functions as an important north-south route through east Texas connecting major cities such as Beaumont, Lufkin, Tyler, and Denison.

Additionally, the Big Thicket National Preserve is a national park and major asset to East Texas for residents and visiting tourists alike. Benefits of this project will include improved accessibility to park facilities that include hiking, biking, and paddling as well as the expansion of protected parkland habitats through collaboration and land swapping.

A summary of the public benefits realized by this project are shown in **Table ES-1**.

Table ES-1: Summary of Benefit Cost Analysis Statistics.

Statistics	Undiscounted	Discounted @ 7%	Discounted @ 3%
Total Benefits	**$563.4 M**	**$127.5 M**	**$282.9 M**
Travel Time Benefits	$0.0 M	$0.0 M	$0.0 M
Vehicle Operating Cost Benefits	$0.0 M	$0.0 M	$0.0 M
Emission Cost Benefits	$0.0 M	$0.0 M	$0.0 M
Accident Cost Benefits	$313.7 M	$67.4 M	$154.2 M
Hurricane Resiliency Benefits	$249.7 M	$60.1 M	$128.8 M
Incremental O&M Costs	$0.0 M	$0.0 M	$0.0 M
Total Capital Costs	**$186.0 M**	**$127.5 M**	**$157.5 M**
Project Support Costs	$26.0 M	$20.9 M	$23.6 M
Right of Way Costs	$20.0 M	$15.8 M	$18.0 M
Construction Costs	$140.0 M	$90.8 M	$115.8 M
Net Present Value (NPV)		$0.0 M	$125.5 M
Benefit-Cost Ratio (BCR)		1.00	1.80
Return on Investment (ROI)		0%	80%
Internal Rate of Return (IRR)		7.0%	

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1 Project Description

The Texas Gulf Coast is vulnerable to impacts from catastrophic events such as the recent Hurricane Harvey, and the establishment of more efficient and effective evacuation routes to allow those residents to evacuate from their Gulf Coast communities inland is critical (**Figure 1-1**). One of the primary evacuation corridors in East Texas is United States Highway 69 (US 69). The US 69 corridor from State Highway 87 in Port Arthur, Texas, to US 75 in Denison, Texas, covers approximately 345 miles. The US 69 corridor functions as an important north-south route through East Texas, connecting major cities such as Beaumont, Lufkin, Tyler, and Denison. The Texas Department of Transportation (TxDOT) has designated US 69 as a Hurricane Evacuation Route, as far north as Tyler, Texas.

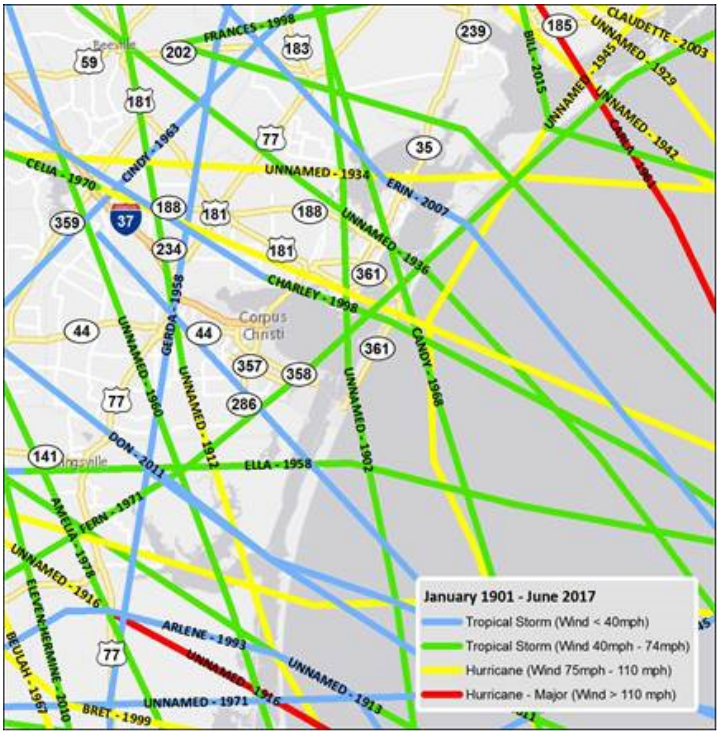


Figure 1-1: Hurricane Events in the Texas Gulf Coast Area, January 1901 to June 2017.

Source: NOAA – National Centers for Environmental Information)

This critical evacuation corridor must have the capacity to provide safe passage during extreme events for the residents living along the Gulf Coast. As a result of the need for additional capacity along a 14-mile segment from Warren to north of Kountze, Texas, on US 69, TxDOT is requesting $111 million in INFRA Grant funds to close the funding gap for this critical project.

US 69 is also a major freight corridor in the region, connecting interstates 10 and 69 and future Interstate 14 with the Port of Beaumont and serves as the major corridor for the Texas timber industry transporting raw materials from the Big Thicket to the port (Tyler and Hardin Counties are the highest timber producing counties in Texas). The Texas Freight Mobility Plan (January 25, 2016) identifies the US 69 corridor as part of the Secondary Freight Network/Emerging Freight Corridor. Because the US 69 corridor has been identified an Emerging Freight Corridor, it has also been reviewed from a multimodal aspect.

1.1 Transportation Needs and Challenges

In Southeast Texas, US 69 currently has varying cross-sections from a two-lane rural roadway to a four-lane facility, some with frontage roads. Several projects to improve this corridor are programmed for construction in TxDOT's Unified Transportation Program and the Statewide Transportation Improvement Program beginning as early as this year through FY 2020. ***The 14-mile section from Warren to north of Kountze on US 69 is currently only a two-lane facility that represents a critical bottleneck in this important freight and emergency evacuation corridor (Figure 1-2).*** Additional capacity is needed along this segment to allow for the safe and efficient movement of people in times of emergency as well as the critical movement of timber from the Big Thicket to the Port of Beaumont. The Texas Transportation Commission has designated $140 million in funding for this project. However, TxDOT is requesting additional funding from the INFRA Grant program to allow for this project to be completed in an expedited manner and to close a gap in state funding.

Figure 1-2: US 69 Before and After Flooding Resulting from the Impact of Hurricane Harvey

The corridor's needs were reviewed as a whole and prioritized from a statewide perspective in TxDOT's recent Corridor Assessment Report of US 69 from Port Arthur, Texas to Denison, Texas (TxDOT, March 2017). Consistent with the Texas Transportation Plan (TTP) 2040, this study considers needs for passenger and large truck vehicles over a 25-year horizon. The TTP identifies US 69 as one of the Alternative Rural Corridors where corridor improvements are needed to serve existing travel demands. Improvements along these alternative routes may include widening roadway sections to Super 2 standards, reconstructing to four and six lanes, and constructing relief routes at priority locations.

By the year 2040, traffic volume is expected to increase by 20 to 60 percent in the Beaumont area, as much as 30 percent in the Tyler area, and up to 20 percent in other areas, as shown in Figure 1-3.

To address Emerging Freight Corridor needs, projects that will enhance mobility of freight (and passenger) vehicles to year 2040, were identified. Consistent with the project goals, priority projects would improve safety and optimize system performance by reducing congestion all while preserving assets and fostering stewardship.

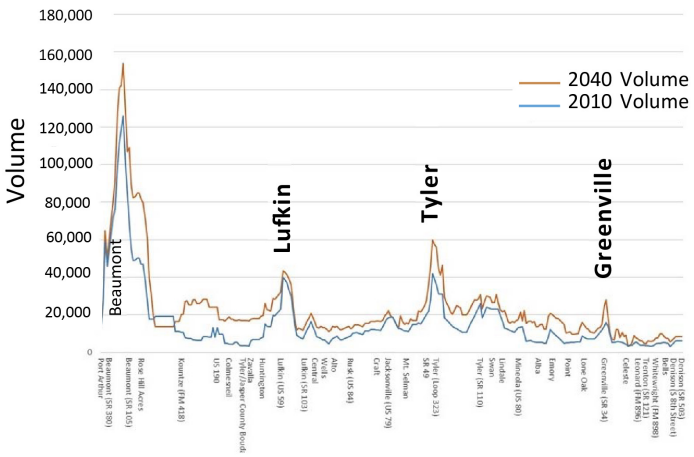


Figure 1-3: US 69 2040/2010 Traffic Volume

As an Alternative Rural Corridor, the census data confirm that most of the population lives in urban areas along the corridor. Specific challenges for safely mitigating congestion in rural and urban areas were addressed. In rural areas, facilities such as "Super 2s" are proposed. In more urban areas, increasing lane capacities to accommodate the expected volume growth is the proposed improvement.

TxDOT designates US 69 as a Hurricane Evacuation Route, as far north as Tyler, and it is imperative that there is sufficient capacity to provide safe passage to the populous during extreme events. Improvements to the US 69 corridor will provide additional capacity to accommodate population growth expected in the region, and provide safer roadway conditions. ***Improved capacity on the roadway will remove a bottleneck in a major hurricane evacuation route and allow for the safe transportation of people and goods in times of excessive demand on the roads.***

In addition, safety and mobility challenges include identifying projects that will:

- Reduce the number or severity of the crash hot spots
- Improve the Level of Service (LOS) along the corridor

Figure 1-4: Flooded Section of US 69 from Hurricane Harvey Impacts

The study provided an objective, data driven analysis of the corridor. The goals for this assessment are based on safety, mobility, economic vitality, socioeconomic effects, environmental factors, and all transportation modes. Additionally, the corridor assessment must meet the overall TxDOT goals and objectives, which in turn support their values, vision, and mission.

The analysis included elements from current to year 2040, such as:

- Freight and traffic volumes
- LOS and roadway capacity
- Poor bridge sufficiency rating or low clearance that could limit truck traffic
- Roadway speed, crash rates, and system reliability
- Environmental impacts as well as socioeconomic impacts
- Potential improvements to intermodal connectivity and transit options
- Future development patterns for growth and economic vitality

Metrics consistent with TxDOT goals and objectives are used to evaluate the selected projects based on the following elements:

- Promote Safety
    - High crash rate areas
    - Fatal and incapacitating injury accident hot spots
    - Low vertical clearance at bridges
    - Bridge sufficiency ratings
    - Shoulder widths
    - Use as a Hurricane Evacuation Route
- Optimize System Performance
    - Population within 5 miles of project
    - Project cost per vehicle-mile traveled
    - Volume to Capacity (V/C) Ratio (LOS)
        - Existing traffic LOS on existing facility
        - Future traffic LOS on existing facility
        - Future traffic LOS on proposed facility (change in LOS if project is built)
    - Truck traffic
        - Existing truck percentage
        - Projected truck percentage
    - Number of passing opportunities
    - Potential of a project to fill a gap
- Preserve Our Assets
    - Pavement conditions
- Foster Stewardship
    - Potential impacts to environmental resources.

A Travel Demand Model was performed on the corridor as part of the corridor study. Because the US 69 corridor is largely a rural highway, the Texas Statewide Analysis Model, Version 3.0 (SAM-V3) was chosen as the most appropriate model for use in the analysis of travel demand. This corridor traverses three Metropolitan Planning Organizations (MPOs), including the South East Texas Regional Planning Commission, the Sherman-Denison MPO, and the Tyler MPO, all of which develop and maintain their own MPO models. However, it was determined that the SAM-V3 would be the best model for forecasting travel demand, as two of the three MPOs are corridor endpoints, and the SAM-V3 provides the best representation of traffic in the rural segments between the MPO boundaries.

Along the US 69 corridor, the main lanes vary in number and width. In urban areas, the lane configuration of the highway varies from one to three lanes in each direction of travel, with a center left turn lane in some areas. In most rural portions along the US 69 corridor, the lane configuration is two lanes undivided. Frontage roads do not run continuously along the length of the studied corridors, and only run parallel to approximately 30 miles of the US 69 corridor. Frontage roads along the corridor are present mainly in the urban areas to facilitate easier access to businesses. From Port Arthur through Beaumont, and in Lufkin and Tyler's city limits, as well as through Silsbee and Evadale, the frontage roads in both the southbound and northbound directions vary between two and three lanes per direction.

1.1.1 Environmental Review and Permitting Challenges

Based on the results of the Corridor Analysis, the section of US 69 from Warren to North of Kountze was recommended for widening. However, because of this project's proximity to various natural and cultural resources, it faces numerous environmental and right-of-way challenges. These challenges could include:

- National Environmental Policy Act (NEPA) Approval
    - Identify the lead agency and cooperating agencies that can use the project's NEPA clearance document as their decision document
    - Potential environmental issues include environmental justice, community impacts, noise analysis, cultural resources, habitat and biota, water resources, and hazardous materials
- Permitting for Bridges
    - Usually a separate process
- Permitting for Lighting
- Section 106 Consultation and Section 4(f) Coordination for Historic Resources
    - Involve the Texas Historic Commission, the Tribes, and the National Park Service (NPS) early in the consultation process
    - Federal Highway Administration (FHWA) finding on Section 4(f) uses as needed

- Clean Water Act (Water Quality Certification, Wetlands Permits, MS4 Permit Coordination)
    - Encourage the U.S. Army Corps of Engineers, Environmental Protection Agency (EPA), and Texas Council on Environmental Quality (TCEQ) to use the project's NEPA clearance document as their decision document
- Endanger Species Act and Migratory Bird Treaty Act Analysis and Coordination
    - Encourage the U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department and the Texas Parks and Wildlife Department Kills and Spills Team to use the project's NEPA clearance document as their decision document
- Coordination with the Texas General Land Office, the Texas A&M Forest Service, the Natural Resources Conservation Service, Federal Emergency Management Administration, and local floodplain administrators
- Hazardous materials remediation
    - Encourage EPA, TCEQ, and the Texas Department of State Health Services to use the project's NEPA clearance document as their decision document
- Property acquisition/donation from NPS
- MTP/TIP/STIP Consistency (FHWA).

1.2 Detailed Description

US 69 is currently a two-lane rural roadway, and additional capacity is needed to allow for the safe and efficient movement of people in times of emergency. INFRA Grant funding will be used to widen from two to four lanes a segment of US 69 from Warren to north of Kountze, as shown in **Figure 1-5.** The four-lane reconstruction project adds capacity to the existing two-lane facility

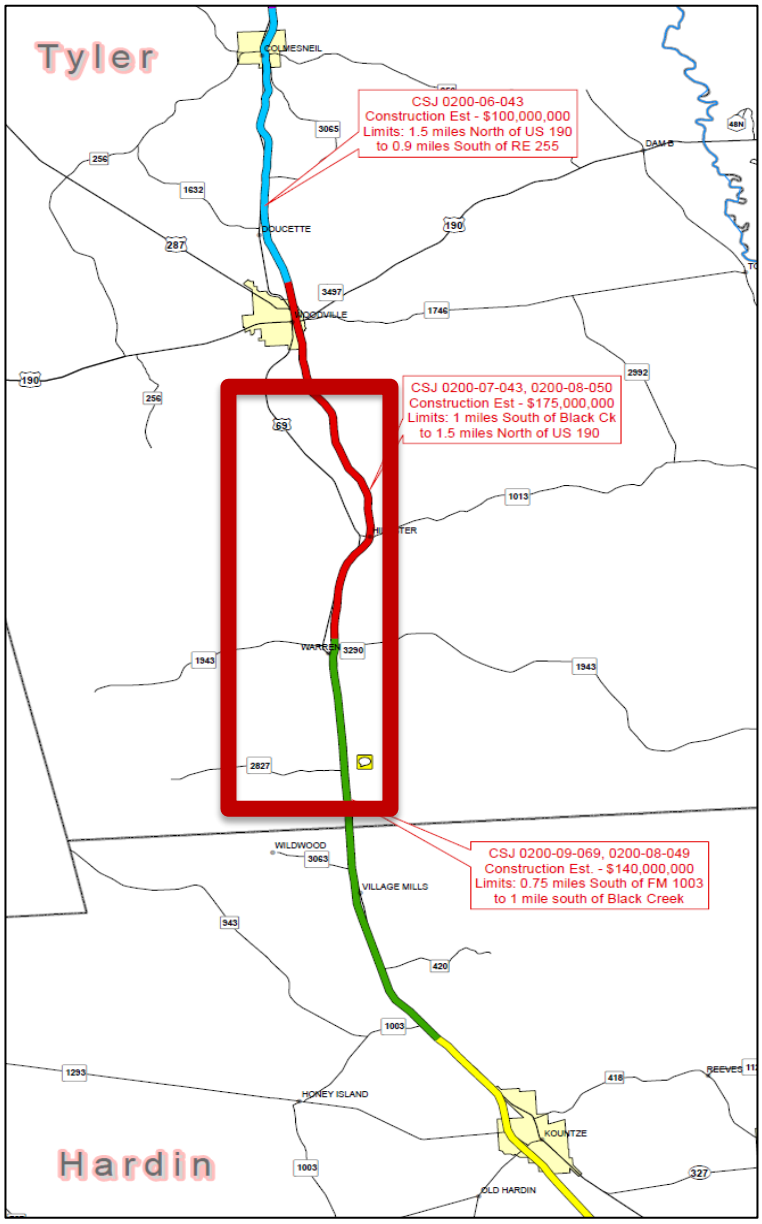


Figure 1-5: US 69 Evacuation Corridor Segment Map

by adding a lane in each direction. The typical section for this type of project is shown in **Figure 1-6**.

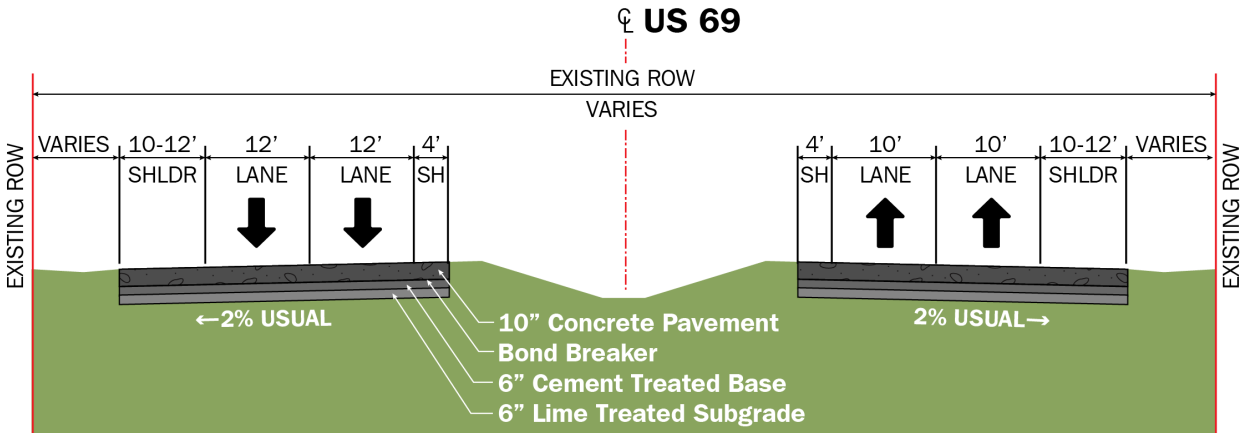


Figure 1-6: Construct Four-Lane Divided Roadway Typical Section

A construction cost per mile was determined for each typical section and type of spot location improvement. Construction costs were estimated using 2017 average unit bid prices where applicable and costs per mile or each based on previous project experience and industry standards. The cost per mile considered costs for the following construction elements:

Mobilization and right of way preparation

- Pavement, excavation, and embankment
- Cross culverts with headwalls at half mile intervals
- Mast arm signalization at major cross street
- Pavement striping and longitudinal cable barriers
- Storm water pollution prevention and traffic control.

Program costs based on a percentage of construction cost were estimated including:

- Preliminary and Final Engineering Costs
- Cost for right-of-way acquisition
- Costs for environmental mitigation
- Utility relocation costs
- Engineering and inspection costs for construction phase services.

The construction and program costs were estimated in 2017 dollars. The total project cost, including both construction and program costs, was used for the project analysis to determine the most effective and strategic allocation of monetary resources based on system usage. A summary of the construction and program costs estimates can be found in Table 1-1.

Table 1-1: Project Costs

Source	Cost
Right-of-Way Acquisition	$20,000,000
Project Development	$26,000,000
Construction	$140,000,000
Total Project Cost	$186,000,000

Because of this project's proximity to various natural and cultural resources, it faces numerous environmental and right-of-way challenges and will require coordination with many federal and state agencies to obtain needed regulatory permits. These coordination challenges make the project uniquely situated to take advantage of USDOT's interest in using INFRA Grant applicant projects as potential models for future environmental review and permitting improvements. ***In addition, TxDOT proposes to utilize an innovative critical path schedule timeline for procurement, environmental review, right-of-way acquisition, and utility adjustments which will allow the project to go to construction two years earlier, saving the state approximately $14 million in materials and labor costs.***

1.3 Eligibility

The TxDOT is an eligible applicant for INFRA Grant as specified in the INFRA Notice of Funding Opportunity (NOFO) and is requesting a $111 million large project INFRA grant for the US 69 Hurricane Evacuation Corridor Improvements Project in Tyler and Hardin Counties, Texas. The region undoubtedly benefits from enhanced through-movement provided by general purpose and managed lane construction.

2 Project Location

The project is located in Tyler County and Hardin County in eastern Texas, as shown in Figure 2-1.

Figure 2-1. Project Location

3 Project Parties

The US 69 Hurricane Evacuation Corridor Improvements Project grant recipient will be the TxDOT Beaumont District, which is responsible for executing TxDOT's regional responsibilities. TxDOT, in partnership with local and regional officials, is responsible for planning, designing, building, operating, and maintaining the state's transportation system. This includes acquiring right-of-way for state highways and other modes of transportation; researching issues to solve transportation problems and save lives; constructing roads and bridges; and improving and

maintaining roadways, bridges, airports, and other transportation infrastructure. Letters of Support from others are included in Appendix A.

4 Grant Funds and Sources and Uses of All Project Funds

The US 69 Hurricane Evacuation Corridor Improvements Project represents a significant surface transportation infrastructure investment to improve freight and passenger vehicle mobility. Accordingly, the requested INFRA grant funds will be utilized throughout construction to balance project needs against the broader fiscal constraints of TxDOT's statewide construction program. Tables 4-1 and 4-2 show the planned sources and uses of project funds, which assume an $111,000,000 INFRA grant.

Table 4-1: Overall Project Source Funds

Source	Cost
INFRA (Grant)	$111,000,000
Other Federal Funds	$0
State Funding (CAT 12)	$75,000,000
TOTAL SOURCES	$186,000,000

Table 4-2: Overall Project Fund Uses

Use	Cost
ROW Acquisition	$20,000,000
Project Development	$26,000,000
Construction	$140,000,000
TOTAL PROJECT COST	$186,000,000

Viability and Completeness of the Project's Financing

Table 4-1 shows that the INFRA grant will meet the requirements that it cover no more than 60 percent of the total project costs. Also, the proposed funding plan meets the requirement that federal funds do not exceed 80 percent of the total funding for the project because the Texas State CAT 12 funds would represent 40 percent of the total sources.

Stable and Reliable Fund Commitments

TxDOT annually oversees $7.5 billion in the state highway fund (35 percent), $3.4 billion in state bond proceeds (16 percent), $1.8 billion in other funding mechanisms (tolls, mobility fund, concession fees), and over $8.6 billion in federal funds (40 percent) to construct, maintain, and operate approximately 197,100 miles of state highway system.

Contingency Reserves

Despite the strong funding plan that is in place, TxDOT recognizes the need for contingency funding in the event of funding interruptions. The possibility of federal or state transportation dollars being unavailable for project expenditures is remote. Historically, periodic short-term interruptions in federal reimbursements have been successfully managed through cash management practices. In 1946, language was added to the Texas Constitution requiring three-fourths of all net revenue generated by motor fuels taxes to be used only for acquiring right-of-way; constructing, maintaining, and policing public roadways;

or for the payment of principal and interest on certain road district bonds or warrants. In the unlikely event that federal and state dollars are both unavailable, Texas has contingency solutions ranging from short-term cash management techniques to longer-term access to credit and capital markets.

Financial Condition of the Project Sponsor
As a 100-year-old organization, TxDOT has the financial wherewithal to see the US 69 Hurricane Evacuation Corridor Improvements Project through to completion. TxDOT oversees a biennial budget of $8.6 billion and can access capital markets by selling general obligation debt backed by the full faith and credit of the state government. This debt is rated triple-A by all three national rating agencies.

Ability to Manage Grants
TxDOT has a long and successful track record of managing several types of federal grants and hundreds of federal contracts, both as a recipient and a pass-through agency for sub-recipients. TxDOT complies with all federal government expenditure and reporting requirements, including the general requirements of the Office of Management and Budget's "Super Circular" and the transportation specific guidance outlined in the Stewardship and Oversight Agreement between TxDOT and FHWA.

Future Eligible Cost
The future eligible cost of this project, $186,000,000, is comprised of design, permitting, construction, right-of-way, and utilities, which are deemed as eligible costs under this funding program.

Availability and Commitment of Funds
As previously described, funding commitment and availability is shown in Tables 4-1 and 4-2.

Federal Funds Already Provided
The project has not received any federal funds to date.

5 Merit Criteria

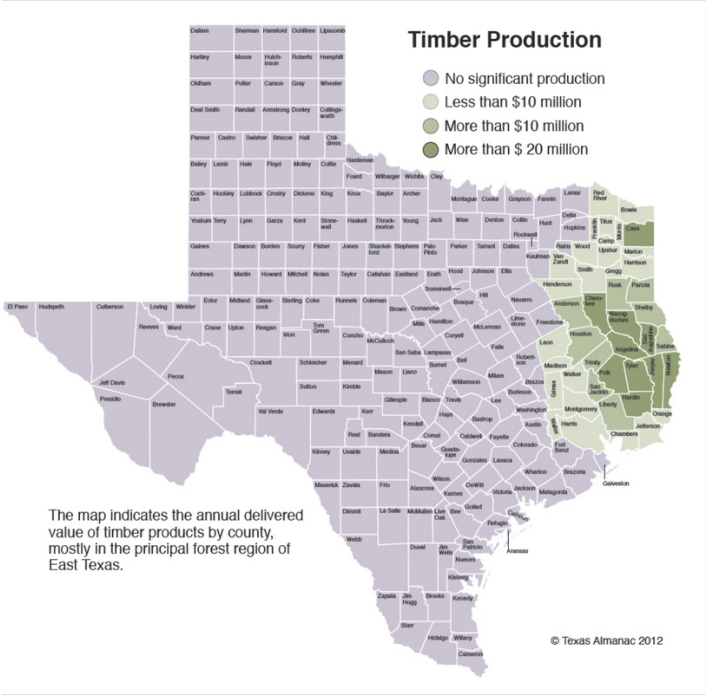
5.1 Support for National or Regional Economic Vitality

The US 69 Hurricane Evacuation Corridor Improvements Project is a critical element in the region's emergency planning efforts. ***As one of the primary road arteries connecting the vulnerable East Texas Gulf Coast communities such as Beaumont, the US 69 widening project is vital to the region's economic vitality.***

US 69 is also a vital connector to the Port of Beaumont. The Port of Beaumont is a deep water international public seaport in Jefferson County, Texas, on the Neches River 40 miles inland from the Gulf of Mexico. The Port of Beaumont Navigation District covers an area of approximately 150 square miles including the City of Beaumont, Texas. Situated 84 miles east of Houston, Texas, and 270 miles west of New Orleans, Louisiana, the Port of Beaumont (Latitude 30°4'6"N, Longitude 94°5'4"W) is accessible from the Gulf of Mexico and Intracoastal Waterway via the federally maintained Sabine-Neches Ship Channel, 42 miles upstream from the Gulf. The combined Intracoastal Waterway and Mississippi River connect Beaumont, Texas, with a vast inland waterway system serving such cities as Memphis, Tennessee; Louisville, Kentucky; St. Louis and Kansas City, Missouri; Omaha, Nebraska; Chicago, Illinois; and Minneapolis, Minnesota. ***The US 69 widening project will create an expanded entry to port traffic, allowing for an increased volume of valuable freight commodities to be handled by the port.***

The Port of Beaumont also acts as a critical component of transportation and logistics for our nation's military. It hosts the U.S. Surface Deployment and Distribution Command's 842nd Transportation Battalion and serves as the primary port for Fort Polk in Louisiana and an important port for Fort Bragg in North Carolina. Fort Polk in particular is one of three Joint Readiness Training Centers (JRTC) for the U.S. Army that has the mission to train and deploy combat and combat support units. The JRTC provides advance level joint training for the Army (Active and Reserve Component), Air Force, and Navy contingency forces in deployment and tactical operations under realistic conditions of low- to mid-intensity combat. Currently, Fort Polk is supporting the training for the War on Terrorism by providing contingency training for the Army's light infantry and special operations forces and by deploying home station and reserve component forces as well. ***As part of the future "Forts to Ports" Interstate 14—and with potential for designation as part of the Interstate 14-Gulf Coast Strategic Highway System—US 69 will continue to serve as one of the primary transportation arteries for the transfer of JRTC and other forces to and from Port Beaumont.***

US 69 is also an important corridor for the movement of timber from the largest lumber industry are in Texas. The East Texas pine-hardwood region, often called the Big Thicket, is the principal forest region in Texas. The 43-county region forms the western edge of the southern pine region, extending from Bowie and Red River counties in northeast Texas to Jefferson, Harris, and Waller counties in southeast Texas.



The counties contain 12.1 million acres of forestland of which 11.9 million acres are classified as productive timberland and produce nearly all of the state's commercial timber. ***Much of the timber produced is transported on US 69 to the Port of Beaumont and other parts of the Gulf Coast region.***

Some counties in the East Texas area are classified as economically disadvantaged by the Texas Transportation Commission. Economically disadvantaged counties are those with the following characteristics: below average per capita taxable property value, below average per capita income, and above average unemployment. ***Development of the improvements on US 69 under the project will provide public benefits to these economically disadvantaged areas.***

5.1.1 Benefit Cost Analysis

A Benefit-Cost Analysis (BCA) of the US 69 Hurricane Evacuation Corridor Improvements Project was conducted in conformance with Federal guidance regarding evaluation criteria, discount and monetization rates, and evaluation methods recommended by the USDOT in the July 2017 Benefit-Cost Analysis Guidance for TIGER and INFRA Applications. The BCA model incorporated the parameter updates in accordance with the above reference USDOT guidance, including the value of travel time, the values of statistical life (VSL), injuries and property damage only crashes, damage costs by emission type, and other factors. The USDOT recommended default values are used unless otherwise stated. The real discount rates of 3 and 7 percent, consistent with U.S. DOT guidance and OMB Circular A-45 are used to compute net present value (NPV) of benefits and costs.

A summary of the BCA results is provided in this section and more detail regarding data inputs, sources, and estimation of each benefit category is provided in **Appendix B**. All

monetary values are presented in 2017 dollars, the default value of the USDOT Benefit-Cost Analysis (BCA) Resource Guide (November 2016). In instances where certain values are expressed in dollar values in other (historical) years, the U.S. Bureau of Labor Statistics' Consumer Price Index for All Urban Consumers (CPI-U) is used to adjust them.

Table 5-1: Summary of Benefit Cost Analysis Statistics

Statistics	Undiscounted	Discounted @ 7%	Discounted @ 3%
Total Benefits	**$563.4 M**	**$127.5 M**	**$282.9 M**
Travel Time Benefits	$0.0 M	$0.0 M	$0.0 M
Vehicle Operating Cost Benefits	$0.0 M	$0.0 M	$0.0 M
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Hurricane Resiliency Benefits	$249.7 M	$60.1 M	$128.8 M
Incremental O&M Costs	$0.0 M	$0.0 M	$0.0 M
Total Capital Costs	**$186.0 M**	**$127.5 M**	**$157.5 M**
Project Support Costs	$26.0 M	$20.9 M	$23.6 M
Right of Way Costs	$20.0 M	$15.8 M	$18.0 M
Construction Costs	$140.0 M	$90.8 M	$115.8 M
Net Present Value (NPV)		$0.0 M	$125.5 M
Benefit-Cost Ratio (BCR)		1.00	1.80
Return on Investment (ROI)		0%	80%
Internal Rate of Return (IRR)		7.0%	

5.2 Leveraging of Federal Funding

The INFRA grant will meet the requirements that it cover no more than 60 percent of the total project costs. Also, the proposed funding plan meets the requirement that federal funds do not exceed 80 percent of the total funding for the project because the combination of INFRA grant and State funds would represent 40 percent of the total sources.

Table 5-2: Sources of Project Funding

Source	Cost
INFRA (Grant)	$111,000,000
Other Federal Funds	$0
State Funding (CAT 12)	$75,000,000
TOTAL SOURCES	$186,000,000

5.3 Potential for Innovation

An illustration showing the current project development critical path is shown in **Figure 5-1.** ***However, as a possible innovative approach, TxDOT proposes to "overlap" portions of the process (such as completing right-of-way appraisals before environmental clearance, early coordination with utility companies, and so on), such that the project could be ready for construction nearly two years earlier than expected.*** Streamlining the property acquisition/donation process for federal lands (such as NPS) could also save a significant amount of time. Additionally, if deed restrictions imposed regarding the federal "Rails to Trails" program were lifted, the project could progress more efficiently.

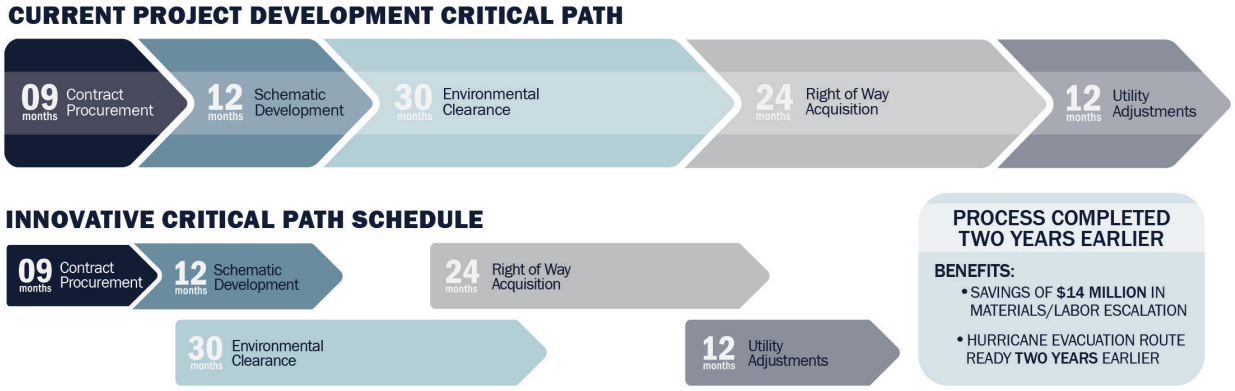

Figure 5-1: Current Project Development Critical Path

5.4 Performance and Accountability

In order to maximize public benefits from INFRA funds and to promote local activity that will provide benefits beyond the INFRA-funded project, TxDOT will utilize funds on specific, measurable outcomes, and provide accountability for project performance. TxDOT understands that USDOT is exploring strategies for potential conditioning of INFRA funds for appropriate projects. The proposed structure of conditions on funding above advances INFRA program goals by providing specific, measurable outcomes that achieve transportation performance objectives supporting economic vitality and improved safety, all while assuring timely delivery of the US 69 Hurricane Evacuation Corridor Improvements Project.

6 Project Readiness

6.1 Technical Feasibility

The US 69 Hurricane Evacuation Corridor Improvements Project is ready to begin concurrent design and construction within 18 months of receipt of the INFRA grant funding. TxDOT has completed schematic-level drawings with final design services and construction activities to be performed by the developer. The Project Schedule section includes additional information on the project's timeframes.

The project design criteria follow the TxDOT Roadway Design Manual, TxDOT Bridge Design Manual, Texas Manual on Uniform Traffic Control Devices, and other state and federally approved design standards.

The cost estimate, which includes agency, financial, design, construction costs, and contingency, is based on a detailed review of the preliminary design drawings, experience on similar projects, and concessionaire information. A 10 percent project contingency is included in the cost estimate.

6.2 Project Schedule

The Project Schedule in **Figure 6-1** discusses anticipated timeframes for major milestones. Construction activities for the INFRA grant meet all identified schedule requirements.

US 69 Corridor Project (0200-08-049, etc)
Draft Project Development Timeline

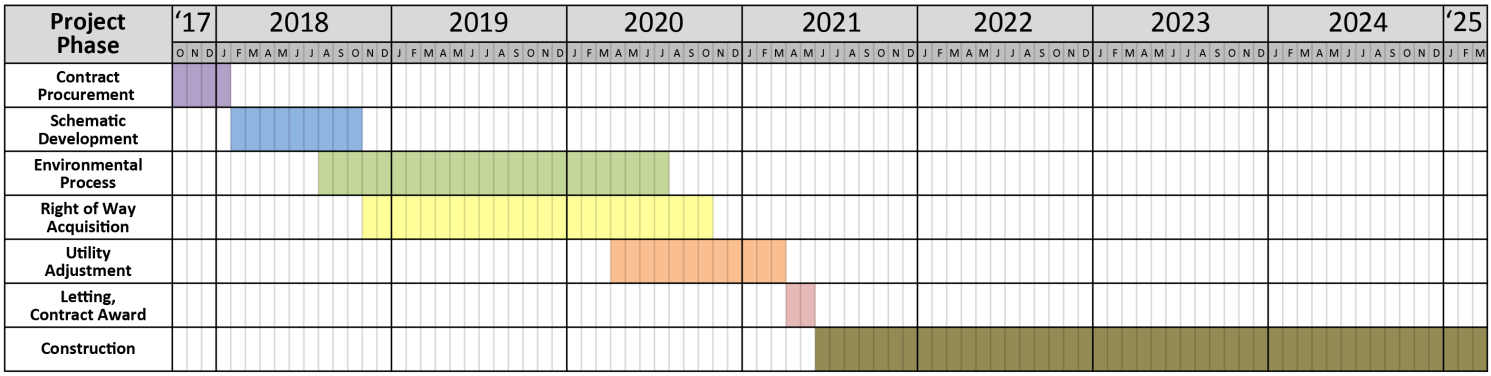

Figure 6-1: Project Schedule

(a) Necessary Activities to Allow Grant Funds to Be Obligated

Project development, environmental permitting, right-of-way acquisition, and utility relocation will all begin in 2018. Right-of-way acquisition will be completed by the end of 2020. Thus, the activities that allow project construction and obligation of funds meet the INFRA requirements.

Project Construction Timeline

As shown in **Figure 6-1**, construction activities are expected to begin in mid-2021 and be completed by the end of 2024.

Property and/or Right-of-Way Acquisition Timeline

All right-of-way acquisition for the US 69 Hurricane Evacuation Corridor Improvements Project is anticipated to be completed by the end of 2020. This will allow for the INFRA funds to be obligated within the required project timeframe.

Required Approvals

The US 69 Hurricane Evacuation Corridor Improvements Project has been approved by TxDOT in its current Unified Transportation Program (UTP) Projects and is currently scheduled for a letting date of April 2021.

Approvals and Permits by Other Agencies

As previously described, this project may require approvals and permits by several agencies. As a possible innovative approach, TxDOT proposes to "overlap" portions of the process (such as completing right-of-way appraisals before environmental clearance, early coordination with utility companies, etc.) such that the project could be ready for construction nearly two years earlier than expected. Streamlining the property acquisition/donation process for Federal lands (such as the National Park Service) could also save a significant amount of time. Additionally, if deed restrictions imposed regarding the Federal "Rails to Trails" program were lifted, the project could progress more efficiently.

6.3 Project Risks and Mitigation Strategies

A table has been developed assessing the risks that may potentially pose a threat to the ability of the US 69 Hurricane Evacuation Corridor Improvements Project to meet its objectives and schedule along with proposed mitigation actions. **Table 6-1** below shows the general categories of risk assessed and mitigation strategies.

Table 6-1: Project Risks and Mitigation

1 = Low 2 = Minor 3 = Moderate 4 = Significant

Risk #	Risk Category	Risk Name	Description	Likelihood	Impact		Mitigation Strategies
					Cost	Schedule	
1	Financial	Loss of Public or Private Funding	Loss of funding because of unforeseen circumstances	1	2	2	Given public and private benefits, this project will need both Federal and State sources to be completed in a timely manner. If a funding source does not materialize, the project will be delayed.
2	Management	Stakeholders	Stakeholders may have varying procedures and objectives	1	2	2	TxDOT has successfully worked numerous times with the groups involved, and feels all obstacles could be overcome with

Risk #	Risk Category	Risk Name	Description	Likelihood	Impact		Mitigation Strategies
					Cost	Schedule	
							stakeholder communication to address potential concerns.
3	Contracting & Procurement	Administrative Burden	TxDOT will manage all contracts	1	1	1	TxDOT will administer all contracts. It has successfully completed many capital projects, in the past, with a similar scope.
4	Contracting & Procurement	Availability of Qualified Contractors	Project involves specialized construction, and is being undertaken in a rural area	1	1	1	TxDOT has experience delivering capital projects. It will manage resources in line with the funding requirements and established time requirements.
5	Construction	Traffic	Roadway traffic congestion resulting from construction and site infrastructure	2	1	2	Project phasing will reduce impact. Coordination by TxDOT with the local jurisdiction, Port of Beaumont, and other highway users and stakeholders will occur prior to scheduling work and any potential outages or road closures or detours in order to minimize potential impacts.
6	Construction	Business Disruption	The Port of Beaumont's existing businesses may be impacted by construction	1	1	2	Project phasing and stakeholder coordination will reduce impact. Coordination with customers will occur to minimize business disruption.

Risk #	Risk Category	Risk Name	Description	Likelihood	Impact		Mitigation Strategies
					Cost	Schedule	
7	Environmental	State Historic Preservation Officers (SHPO)	Historic/ archaeological/ cultural resources discoveries	1	2	2	Required regulations will be followed and responded to accordingly by TxDOT and other stakeholders, if any such resources are found in the area.
8	Environmental	Wetlands	Project impact on existing wetlands	2	2	2	Required environmental regulations will be followed and responded to accordingly.
9	Environmental	Endangered Species	Impact to any endangered species within the project area	1	1	2	Required environmental regulations will be followed and responded to accordingly, if any known threatened or endangered species are discovered within the project area.
10	Environmental	NEPA	Compliance with NEPA because of federal funding	2	2	2	Identify lead agency and cooperating agencies that can use the project's NEPA clearance document as their decision document. Potential environmental issues include environmental justice, community impacts, noise analysis, cultural resources, habitat and biota, water resources, and hazardous materials.
11	Real Estate	Property acquisitions	Need for property acquisition	2	2	2	Property acquisitions are required per preliminary design.

Risk #	Risk Category	Risk Name	Description	Likelihood	Impact		Mitigation Strategies
					Cost	Schedule	
12	Utilities	Utility Relocations	Need for some utilities to be relocated as a result of project	2	2	2	Coordination is ongoing with affected utility companies to relocate utility lines as necessary.

7 Large/Small Project Requirements

The US 69 Hurricane Evacuation Corridor Improvements Project is considered a Large Project under the INFRA Grant program requirements. As such, this project meets the criteria listed in the NOFO as identified in the following section.

The Project Generates National or Regional Economic, Mobility, and Safety Benefits
TxDOT has designated the US 69 corridor as a Hurricane Evacuation Route from Port Arthur to Interstate Highway 20 in Tyler. From Beaumont to Zavalla, US 69 is designated as a 'Potential EvacuLane on Major Evacuation Route.' On the eastern portion of SL 287 from where US 69 is coincident with SL 287 to the divergence point of US 59, it is designated as a 'Potential Contraflow Route.' Hurricane Evacuation Routes are important to mobility during hurricane level storms impacting the area around the corridor. How well roadways are connected and serve as critical arteries for the region's major evacuation route is an essential part of this project, providing significant mobility and safety benefits.

Also, because US 69 is one of the major connectors to the Port of Beaumont, the more efficient movement of freight (including critical military assets) will also be realized with the improvements provided by this project.

The Project is Cost Effective
The cost of the project per future vehicle-mile traveled (VMT) is important in identifying projects that provide more mobility and congestion relief per dollar. Projects that improve upon congestion for a lower amount spent per VMT are the most beneficial to the corridor, therefore receiving a higher score. Projects that are more expensive to fund per VMT are given a lower score. Cost per VMT was determined using the program cost, for a particular project divided by the VMT. The VMT for the project was determined by multiplying the 2040 ADT in the project limits multiplied by the project length. The highest priority projects, in general, are those in the Beaumont District, where traffic volumes and truck volumes are the highest and the population is the greatest within the corridor limits. ***The US 69 Hurricane Evacuation Corridor Improvements Project ranked near the top based on its percentile rank within the analyzed set of projects.***

The Project Contributes to One or More of the Goals Listed under 23 USC 150

Safety. Difference in High Crash Rates – High crash rate areas are indicative of potential issues on the existing corridor, whether due to roadway geometry or confusion due to other elements. Addressing high crash rate areas will help to improve safety along the corridor. Projects under consideration are ranked by whether the crash rate area problems are addressed. Scores are generated based on the severity of the crash rate for the project area, which is based on the percentage above (or below) the statewide average rates for that type of facility. Crash rates were determined using the Current Research Information System data and the ADT interpolated between the Statewide Analysis Model (SAM) output for 2010 and 2020. ***The segment of US 69 between Warren and Kountze scored near the top. This project will result in nearly $314 million in Accident Cost Benefits (discounted at 7%).***

Project Impact on Fatal and Incapacitating Injury Accident Hot Spots

This criterion analyzes fatal and incapacitating injury accident hot spots that fall within proposed project limits and how they are influenced by the project's proposed improvements, such as the addition of passing lanes or roadway widening that increase safety along the corridor. Projects are ranked by the degree of impact they have on the accident hot spots that fall within their boundaries. Projects that help to alleviate most of the reasons and problems with fatal and incapacitating accident areas are categorized as having significant impact, receiving the most points. Projects that only help to alleviate some of the reasons for fatal and incapacitating injury accidents occurring in certain spots are categorized as having a moderate impact on the area, while those that do not help to alleviate the reasons for crashes have no significant impact. This is often where accidents are due to driver error and not roadway geometry. Projects that do not have hot spots within their limits are categorized as being not applicable, receiving no points in the ranking system. ***Again, the segment of US 69 between Warren and Kountze scored near the top.***

Congestion Reduction

Managed lanes and continuous frontage roads add capacity for the through movement within the corridor. Elements requested as part of this INFRA grant enhance the mobility of local passenger car traffic as well as the last-mile truck traffic and long-haul truck movements, ***as well as improving a critical hurricane evacuation route for the Eastern Gulf Coast communities in Texas.*** Existing pavement touched by this project will be completely replaced and protected with a 52-year operations and maintenance agreement as part of the Comprehensive Development Agreement (CDA). The operations and maintenance agreement means TxDOT can shift limited funding resources to other area projects.

System Reliability/Freight Movement and Economic Vitality

The population around the US 69 corridor influences the volume of traffic that may be generated along the corridor; the more people populating the area, the more likely the volume of traffic and corresponding congestion on the corridor increase. For this project, the population in a 5-mile buffer around the project was compared, using census blocks from the 2010 U.S. Census data. Project scoring was by percentile-ranking within the analyzed set of projects. Projects with higher populations are given a higher ranking as the project will be beneficial to a larger volume of population. Projects with lower populations are given a lower score. ***The US 69 Hurricane Evacuation Corridor Improvements Project scored near the top in this area, as well. This project will provide nearly $250 million in Hurricane Resiliency Benefits (discounted at 7%).***

The proposed improvements enhance the reliability of these roadways and have significant long-term economic benefits associated with the projects, and is regionally an important project. Location advantages in terms of travel time savings for highway users. ***Travel time savings to be generated by the Project will have a positive impact in the cost of conducting business of key industry clusters near the Port of Beaumont, contributing to the regional economic competitiveness.***

Environmental Sustainability

In order to identify the environmental constraints associated with the study area, information was collected through database searches, imagery analyses, Google Maps and Google Earth, desktop Geographic Information System (GIS) analyses, and limited field reconnaissance. The field reconnaissance consisted of windshield surveys performed in August 2016. The Project was analyzed for potential environmental impacts in the following major categories:

- Section 4(f)/6(f) Properties
- Waters of the United States
- Floodplain
- Cultural Resources
- Critical Habitat
- Hazardous Materials.

The US 69 Hurricane Evacuation Corridor Improvements Project shows potential impacts to each of these areas, therefore the project's environmental permitting and mitigation requirements could potentially delay the project's implementation. Because of this project's proximity to various natural and cultural resources, it faces numerous environmental and right-of-way challenges and will require coordination with many federal and state agencies to obtain needed regulatory permits. These coordination challenges make the project uniquely situated to take advantage of USDOT's interest in using INFRA grant applicant projects as

potential models for future environmental review and permitting improvements. TxDOT is willing to work with the USDOT and the appropriate regulatory agencies to explore accelerated environmental approvals for the project.

Reduced Project Delivery Delays

TxDOT proposes to utilize an innovative critical path schedule timeline for procurement, environmental review, right-of-way acquisition, and utility adjustments which will allow the project to go to construction two years earlier, saving the state approximately $14 million in materials and labor costs. It would also promote jobs as well as the local, state, national, and international economies by expediting the movement of people and international trade goods through the Port of Beaumont.

The Project is Based on the Results of Preliminary Engineering

TxDOT has completed preliminary engineering for this project as described earlier in this INFRA grant application, through the Corridor Assessment Report (TxDOT, March 2017).

The Project has One or More Stable and Dependable Funding or Financing Sources

TxDOT annually oversees $7.5 billion in the state highway fund (35 percent), $3.4 billion in state bond proceeds (16 percent), $1.8 billion in other funding mechanisms (tolls, mobility fund, concession fees), and over $8.6 billion in federal funds (40 percent) to construct, maintain, and operate approximately 197,100 miles of state highway system. Despite the strong funding plan that is in place, TxDOT recognizes the need for contingency funding in the event of funding interruptions. The possibility of federal or state transportation dollars being unavailable for project expenditures is remote. Historically, periodic short-term interruptions in federal reimbursements have been successfully managed through cash management practices. In 1946, language was added to the Texas Constitution requiring three-fourths of all net revenue generated by motor fuels taxes to be used only for acquiring ROW; constructing, maintaining, and policing public roadways; or for the payment of principal and interest on certain road district bonds or warrants. In the unlikely event that federal and state dollars are both unavailable, Texas has a contingency solutions ranging from short-term cash management techniques to longer term access to credit and capital markets.

The Project Cannot be Easily and Efficiently Completed without Other Federal Funding

The requested federal funding through the INFRA grant will allow TxDOT to expedite certain project activities such as right-of-way acquisition and utility relocation. Also, as described previously, TxDOT would like to work with USDOT to develop a more streamlined approach to environmental permitting and approvals for the project that could expedite project construction by two years.

The Project is Reasonably Expected to Begin Construction No Later than 18 Months from Obligation

TxDOT is ready to begin concurrent design, permitting, and right-of-way acquisition of the US 69 Hurricane Evacuation Corridor Improvements Project within 18 months of receipt of the INFRA grant funding. TxDOT has completed schematic-level drawings with final design services and construction activities to be performed by the end of 2024. The Project Schedule section includes additional information on the project's timeframes.

8 Federal Wage Certification Letter

Signed certification stating that TxDOT will comply with the requirements of Subchapter IV of Chapter 31 of Title 40, United States Code (federal wage rate requirements) as required by the FY2016 Appropriations Act is completed and attached as Appendix C.

9 Standard Form 424 (Application for Federal Assistance)

TxDOT has completed the Standard Form 424 and has uploaded it to www.grants.gov.

10 Standard Form 424C (Budget Information for Construction Projects)

TxDOT has completed the Standard Form 424C and has uploaded it to www.grants.gov.

Appendix A. Letters of Support

Appendix B. Benefit Cost Analysis

Appendix C. Federal Wage Certification Letter

US 69 Hurricane Evacuation Corridor Improvements

November 2017

Executive Summary

The Benefit-Cost Analysis conducted for this grant application compares the costs associated with the proposed investment to the benefits of the project. To the extent possible, benefits have been monetized. Where it was not possible to assign a dollar value to a benefit, efforts have been made to quantify it. A qualitative discussion is also provided when a benefit is anticipated to be generated but is not easily monetized or quantified.

Figure ES-1: US 69 before and after flooding resulting from the impact of Hurricane Harvey

The United States Highway 69 (US 69) corridor from SH 87 in Port Arthur to US 75 in Denison spans a length of approximately 345 miles. The US 69 corridor functions as an important north-south route through east Texas, connecting major cities such as Beaumont, Lufkin, Tyler and Denison and is a critical hurricane evacuation corridor for southeast Texas. US 69 connects I-10, I-69 and future I-14 with the Port of Beaumont and serves as a major corridor for the Texas timber industry. TxDOT designates US 69 as a Hurricane Evacuation Route, as far north as Tyler, and it is imperative that there is sufficient capacity to provide safe passage to the populous during extreme events. Improvements to the US 69 corridor will provide additional capacity to accommodate population growth expected in the region, and provide safer roadway conditions. Improved capacity on the roadway will remove a bottleneck in a major hurricane evacuation route and allow for the safe transportation of people and goods in times of excessive demand on the roads. As a result of the need for additional capacity and improved safety, TxDOT is requesting $111 million in INFRA Grant funds to close the funding gap for this critical project.

A table summarizing the changes expected from the project, and the associated benefits, is provided below including brief descriptions of both monetized and non-monetized benefits.

Table ES-1: Merit Criteria and Cost-Effectiveness - Summary of Infrastructure Improvements and Associated Benefits, Discounted 2016 Dollars

Current Status or Baseline & Problems to be Addressed	Changes to Baseline / Alternatives	Type of Impacts	Economic Benefit	Summary of Results (7%)	Page Reference
US 69 is a major hurricane evacuation route for Beaumont and the surrounding area. Given the expected growth of the region, the stretch of US 69 between Kountze and Warren is ill equipped to handle the capacity required to serve as an evacuation route. The two lane, two way highway acts as a bottleneck during evacuations and will prevent the safe evacuation of people and goods from the region.	Widening of 2 lane, two-way highway to 4 lane divided highway to increase the capacity for evacuations allowing for the safe and efficient movement of people and goods. In addition, changing the road type will prevent crashes improving safety of the road.	Reduced travel time costs from increases in roadway capacity	Reduced Travel Time Costs	$205	Pg. 10
		Improved travel time reliability during delays caused by accidents or during evacuations		N/A	Pg. 11
		Avoided emission costs from reduced travel time	Avoided Emission Costs	$0	Pg. 16
		Reduced non-Fuel vehicle operating costs	Reduced Vehicle Operating Costs	$0	Pg. 12
		Reduced fuel vehicle operating costs		$42	Pg. 12
		Avoided accident costs from converting two-way 2 lane highway to 4 lane divided highway	Reduced Accident Costs	$67,382,804	Pg. 20
		Avoided casualties during evacuations	Hurricane Resiliency Benefits	$60,101,976	Pg. 23

In addition to benefits that can be monetized and quantified, a number of qualitative benefits are also likely to be generated by this improvement. The addition of a second lane in each direction will allow for improved travel time reliability during periods of exceptional

demand on the roadway. Delays caused by accidents or evacuations will be reduced with the widening of US-69, resulting in travel time savings, fewer emissions, and lower vehicle operating costs from improved traffic flow. However, given the uncertainty of events occurring that would cause delays and evacuations, the benefits are difficult to monetize.

The period of analysis used in the monetization of benefits and costs corresponds to 38 years, including eight years of project development and construction and 30 years of operation. Project support costs are expected to begin in 2018 and continue until construction begins in 2021. The total project costs are $186 million dollars and are expected to be financed by Federal and State funds according to the distribution shown in Table ES-2.

Table ES-2: Summary of Project Costs and Anticipated Funding Sources, in Thousands of Undiscounted 2016 Dollars

Funding Source	Capital Costs	Percent of Total Cost Financed by Source
Federal	$111,000	59.7%
State	$75,000	40.3%
Local		0.0%
Private		0.0%
TOTAL	$186,000	100%

A summary of the relevant data and calculations used to derive the monetized benefits and costs of the project are shown in Tables ES-3, ES-4, (in 2016 dollars) and ES-5. Based on the analysis presented in the rest of this document, the project is expected to generate $116 million in discounted benefits and $116 million in discounted costs, using a 7 percent real discount rate. Therefore, the project is expected to generate a Net Present Value of $0 million and a Benefit/Cost Ratio of 1.00.

In addition to the monetized benefits presented in Table ES-4, the project would generate other benefits that are difficult to monetize, but can be quantified using units that are not dollar values. These quantified benefits are presented below, as are qualitative benefits of the project.

Travel Time Reliability

In periods of excessive demand, such as lanes closed due to an accident or an evacuation is underway, travel times will be shorter due to the additional capacity the roadway has. Given uncertainty surrounding the likelihood of these events, the effects were not monetized.

Table ES-3: Summary of Pertinent Data, Quantifiable Benefits and Costs

Calendar Year	Project Year	Total Benefits (Undiscounted)	Total Costs (Undiscounted)	Undiscounted Net Benefits	Discounted Total Benefits (7%)	Discounted Total Costs (7%)	Discounted Net Benefits (7%)
2017	1	-	-	-	-	-	-
2018	2	-	$5,000,000	-$5,000,000	-	$4,367,194	-$4,367,194
2019	3	-	$20,000,000	-$20,000,000	-	$16,325,958	-$16,325,958
2020	4	-	$20,000,000	-$20,000,000	-	$15,257,904	-$15,257,904
2021	5	-	$31,000,000	-$31,000,000	-	$22,102,572	-$22,102,572
2022	6	-	$40,000,000	-$40,000,000	-	$26,653,689	-$26,653,689
2023	7	-	$50,000,000	-$50,000,000	-	$31,137,487	-$31,137,487
2024	8	-	$20,000,000	-$20,000,000	-	$11,640,182	-$11,640,182
2025	9	$14,707,431	-	$14,707,431	$7,999,868	-	$7,999,868
2026	10	$14,987,057	-	$14,987,057	$7,618,660	-	$7,618,660
2027	11	$15,278,929	-	$15,278,929	$7,258,909	-	$7,258,909
2028	12	$15,583,581	-	$15,583,581	$6,919,296	-	$6,919,296
2029	13	$15,901,575	-	$15,901,575	$6,598,588	-	$6,598,588
2030	14	$16,233,493	-	$16,233,493	$6,295,629	-	$6,295,629
2031	15	$16,579,947	-	$16,579,947	$6,009,336	-	$6,009,336
2032	16	$16,941,573	-	$16,941,573	$5,738,697	-	$5,738,697
2033	17	$17,319,034	-	$17,319,034	$5,482,763	-	$5,482,763
2034	18	$17,713,025	-	$17,713,025	$5,240,645	-	$5,240,645
2035	19	$18,124,271	-	$18,124,271	$5,011,512	-	$5,011,512

Calendar Year	Project Year	Total Benefits (Undiscounted)	Total Costs (Undiscounted)	Undiscounted Net Benefits	Discounted Total Benefits (7%)	Discounted Total Costs (7%)	Discounted Net Benefits (7%)
2036	20	$18,553,527	-	$18,553,527	$4,794,584	-	$4,794,584
2037	21	$19,001,583	-	$19,001,583	$4,589,131	-	$4,589,131
2038	22	$19,469,264	-	$19,469,264	$4,394,469	-	$4,394,469
2039	23	$19,957,432	-	$19,957,432	$4,209,958	-	$4,209,958
2040	24	$20,466,989	-	$20,466,989	$4,034,998	-	$4,034,998
2041	25	$20,466,989	-	$20,466,989	$3,771,026	-	$3,771,026
2042	26	$20,466,989	-	$20,466,989	$3,524,323	-	$3,524,323
2043	27	$20,466,989	-	$20,466,989	$3,293,760	-	$3,293,760
2044	28	$20,466,989	-	$20,466,989	$3,078,280	-	$3,078,280
2045	29	$20,466,989	-	$20,466,989	$2,876,898	-	$2,876,898
2046	30	$20,466,989	-	$20,466,989	$2,688,689	-	$2,688,689
2047	31	$20,466,989	-	$20,466,989	$2,512,794	-	$2,512,794
2048	32	$20,466,989	-	$20,466,989	$2,348,405	-	$2,348,405
2049	33	$20,466,989	-	$20,466,989	$2,194,771	-	$2,194,771
2050	34	$20,466,989	-	$20,466,989	$2,051,188	-	$2,051,188
2051	35	$20,466,989	-	$20,466,989	$1,916,998	-	$1,916,998
2052	36	$20,466,989	-	$20,466,989	$1,791,587	-	$1,791,587
2053	37	$20,466,989	-	$20,466,989	$1,674,381	-	$1,674,381
2054	38	$20,466,989	-	$20,466,989	$1,564,842	-	$1,564,842
Total		$563,356,556	$186,000,000	$377,356,556	$127,484,985	$127,484,985	$0

Table ES-4: Summary of Project Benefits by Benefit Type, in Undiscounted 2016 Dollars

Calendar Year	Project Year	Reduced Travel Time Costs	Reduced Vehicle Operating Costs	Reduced Emission Costs	Avoided Accident Costs	Hurricane Resiliency Benefits
2025	9	-	-	-	$6,385,564	$8,321,866
2026	10	$0	-	-	$6,665,191	$8,321,866
2027	11	$0	-	-	$6,957,062	$8,321,866
2028	12	$0	-	-	$7,261,714	$8,321,866
2029	13	$0	-	-	$7,579,708	$8,321,866
2030	14	$1	-	-	$7,911,626	$8,321,866
2031	15	$1	-	-	$8,258,079	$8,321,866
2032	16	$2	-	-	$8,619,704	$8,321,866
2033	17	$3	-	-	$8,997,164	$8,321,866
2034	18	$5	-	-	$9,391,154	$8,321,866
2035	19	$8	-	-	$9,802,396	$8,321,866
2036	20	$13	-	-	$10,231,647	$8,321,866
2037	21	$22	-	-	$10,679,695	$8,321,866
2038	22	$35	-	-	$11,147,363	$8,321,866
2039	23	$55	-	-	$11,635,510	$8,321,866
2040	24	$89	-	-	$12,145,034	$8,321,866

Calendar Year	Project Year	Reduced Travel Time Costs	Reduced Vehicle Operating Costs	Reduced Emission Costs	Avoided Accident Costs	Hurricane Resiliency Benefits
2041	25	$89	-	-	$12,145,034	$8,321,866
2042	26	$89	-	-	$12,145,034	$8,321,866
2043	27	$89	-	-	$12,145,034	$8,321,866
2044	28	$89	-	-	$12,145,034	$8,321,866
2045	29	$89	-	-	$12,145,034	$8,321,866
2046	30	$89	-	-	$12,145,034	$8,321,866
2047	31	$89	-	-	$12,145,034	$8,321,866
2048	32	$89	-	-	$12,145,034	$8,321,866
2049	33	$89	-	-	$12,145,034	$8,321,866
2050	34	$89	-	-	$12,145,034	$8,321,866
2051	35	$89	-	-	$12,145,034	$8,321,866
2052	36	$89	-	-	$12,145,034	$8,321,866
2053	37	$89	-	-	$12,145,034	$8,321,866
2054	38	$89	-	-	$12,145,034	$8,321,866
Total		$1,476	$0	$0	$293,691,269	$224,690,395

Table ES-5: Summary of Pertinent Data, Quantifiable Data

Calendar Year	Project Year	Person Hours Saved	Accidents Avoided	Fatalities Avoided	Injuries Avoided	Damaged Vehicles Avoided
2025	9	-	22	0.5	17	22
2026	10	0	23	0.5	18	23
2027	11	0	24	0.5	18	25
2028	12	0	25	0.5	19	26
2029	13	0	27	0.5	20	27
2030	14	0	28	0.6	21	28
2031	15	0	29	0.6	22	29
2032	16	0	30	0.6	23	30
2033	17	0	32	0.6	24	32
2034	18	0	33	0.7	25	33
2035	19	1	34	0.7	26	35
2036	20	1	36	0.7	27	36
2037	21	2	37	0.8	28	38
2038	22	3	39	0.8	29	39
2039	23	5	41	0.8	31	41
2040	24	8	43	0.9	32	43
2041	25	8	43	0.9	32	43

Calendar Year	Project Year	Person Hours Saved	Accidents Avoided	Fatalities Avoided	Injuries Avoided	Damaged Vehicles Avoided
2042	26	8	43	0.9	32	43
2043	27	8	43	0.9	32	43
2044	28	8	43	0.9	32	43
2045	29	8	43	0.9	32	43
2046	30	8	43	0.9	32	43
2047	31	8	43	0.9	32	43
2048	32	8	43	0.9	32	43
2049	33	8	43	0.9	32	43
2050	34	8	43	0.9	32	43
2051	35	8	43	0.9	32	43
2052	36	8	43	0.9	32	43
2053	37	8	43	0.9	32	43
2054	38	8	43	0.9	32	43
Total		127	1029	21.2	774	1035

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1 Introduction

This document provides detailed technical information on the economic analyses conducted in support of the Grant Application for the US-69 Hurricane Evacuation Corridor Improvements project.

Section 2, Methodological Framework, introduces the conceptual framework used in the Benefit-Cost Analysis. To the extent possible, and as recommended in the Notice of Funding Opportunity (NOFO), monetized benefits and costs are estimated through a Benefit-Cost Analysis (BCA) framework, which is described in this section. Section 3, Project Overview, provides an overview of the project, including a brief description of existing conditions and proposed alternatives; a summary of cost estimates and schedule; and a description of the types of effects that the US-69 Hurricane Evacuation Corridor Improvements is expected to generate. Monetized, quantified, and qualitative effects are highlighted. Section 4, General Assumptions, discusses the general assumptions used in the estimation of project costs and benefits, while estimates of travel demand and traffic growth can be found in Section 5, Demand Projections. Specific data elements and assumptions pertaining to the merit criteria are presented in Section 6, Estimation of Economic Benefits, along with associated benefit estimates. Estimates of the project's Net Present Value (NPV), its Benefit/Cost ratio (BCR) and other project evaluation metrics are introduced in Section 7, Summary of Findings and BCA Outcomes. Additional data tables are provided in Section 8, Aggregate Annual Benefits and Costs, including annual estimates of benefits and costs to assist DOT in its review of the application.[1]

2 Methodological Framework

The Benefit-Cost Analysis (BCA) conducted for this project includes the monetized benefits and costs measured using USDOT guidance on this area, as well as the quantitative and qualitative merits of the project. A BCA provides estimates of the anticipated benefits that are expected to accrue from a project over a specified period and compares them to the anticipated costs of the project. Costs include both the resources required to develop the project and the costs of maintaining the new or improved asset over time. Estimated benefits are based on the projected impacts of the project on both users and non-users of the facility, valued in monetary terms.[2]

[1] While the models and software themselves do not accompany this appendix, they are provided separately as part of the application.

[2] USDOT, Benefit-Cost Analysis Guidance for TIGER and INFRA Applications.

While BCA is just one of many tools that can be used in making decisions about infrastructure investments, USDOT believes that it provides a useful benchmark from which to evaluate and compare potential transportation investments.[3]

The specific methodology developed for this application was developed using the BCA guidance developed by USDOT and is consistent with the INFRA program guidelines. In particular, the methodology involves:

- Establishing existing and future conditions under the build and no-build scenarios;
- Assessing benefits that align with those identified in the INFRA BCA guidance;
- Measuring benefits in dollar terms, whenever possible, and expressing benefits and costs in a common unit of measurement;
- Using DOT guidance for the valuation of travel time savings, safety benefits and reductions in air emissions, while relying on industry best practice for the valuation of other effects; and
- Discounting future benefits and costs with the real discount rates recommended by the DOT (7 percent, and 3 percent for sensitivity analysis).

3 Project Overview

US 69 is a two-lane rural roadway in Southeast Texas, with sufficient capacity to serve current traffic volumes. While significant growth is expected along the US 69 corridor by 2040, the majority of the traffic is expected further south, closer to Beaumont. However, this is one of the primary north-south routes in the area and it is critical for hurricane evacuation. US 69 is designated as a primary evacuation route extending as far north as Angelina County. In addition to the northbound lanes for evacuation, the route is marked for "Evaculane", allowing for northbound traffic to travel on the shoulder and center lanes in addition to the northbound lanes. As such, it is integral to the safe movement of people and goods during emergencies. With the expected growth in Beaumont and the surrounding area, additional capacity is needed to allow for the safe and efficient movement of people and goods in times of emergency, in addition to eliminating a bottleneck during evacuations. Projects are already scheduled and let to widen US 69, south of the project location, and north of the project location in Lufkin County. This segment will begin to close the gap between the 4 lane roadways and TxDOT has future plans to completely eliminate the bottleneck. This project is critical in preventing a bottleneck at Kountze during evacuations. The expansion will allow people to get further from the shore to safety in addition to improving traffic flow during evacuations.

The corridor's needs were reviewed as a whole and prioritized from a statewide perspective in TxDOT's recent Corridor Assessment Report of the 345-mile US 69 Corridor from Port

[3] Idem.

Arthur, TX, to Denison, TX (TxDOT, March 2017). Consistent with the Texas Transportation Plan (TTP) 2040, this study considers needs for passenger and large truck vehicles over a 25-year horizon.

By the year 2040, traffic volume is expected to increase by 20% to 60% in the Beaumont area, as much as 30% in the Tyler area, and up to 20% in other areas, as shown in **Figure Error! No text of specified style in document.**.

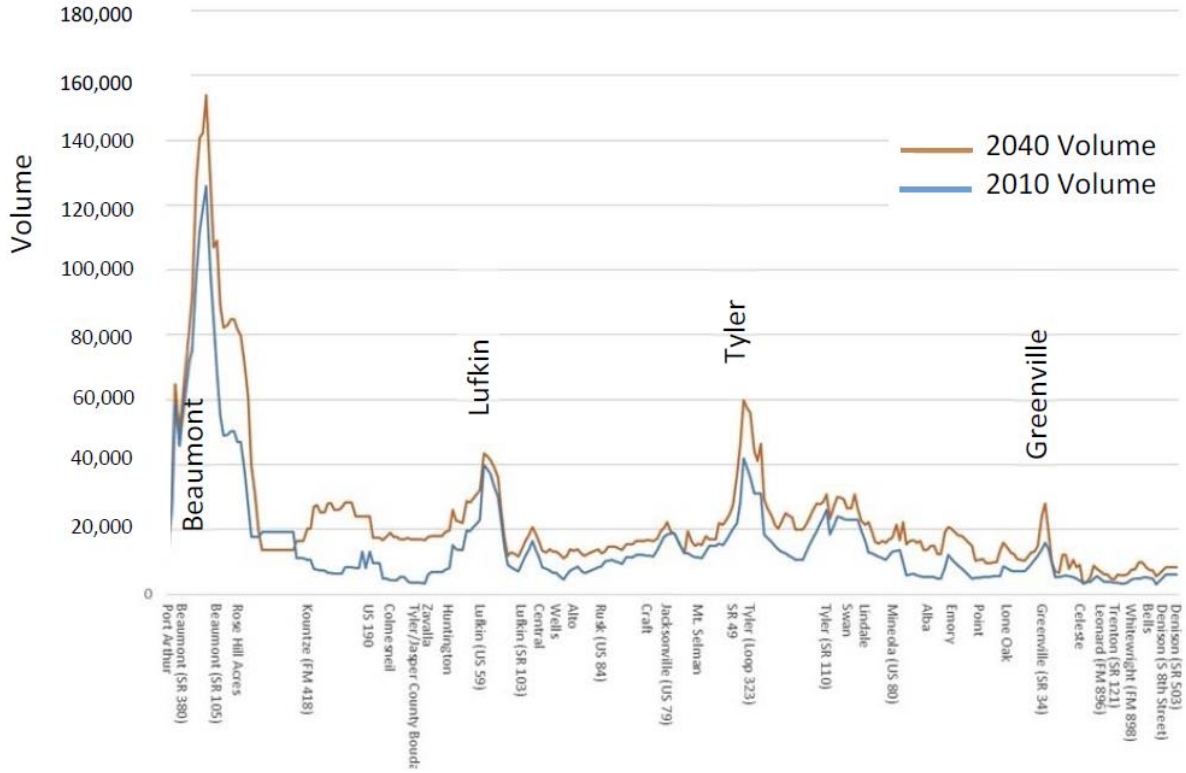

Figure Error! No text of specified style in document.: 2040/2010 Traffic Volume

This study assessed existing conditions and projected needs based on 2040 volumes on the system. While the stretch of US 69 between Kountze and Warren is expected to be able to handle the projected traffic needs in 2040, having the excess capacity will be imperative due to growth in the southern section of the corridor. As the traffic and population in the surrounding area grows, more time is required to safely evacuate the entirety of the population prior to hurricane landfall. Concerns over flooding the highway network with traffic may make officials reluctant to order mandatory evacuations and could risk exposing the population to danger once a hurricane makes landfall, as seen in Houston with Hurricane Harvey.[4] Widening US 69 will double the number of northbound evacuation lanes,

[4] Business Insider. "The crucial reason Houston officials didn't' order evacuations before Harvey made landfall." August 31, 2017. http://www.businessinsider.com/hurricane-evacuations-traffic-jam-drowning-deaths-2017-8.

in addition to any "Evaculanes" set up, from Kountze to Hillister, nearly 70 miles north of the Gulf of Mexico.

In addition to improving hurricane evacuation routes, this project also will improve safety along the network. Rural two lane, two-way highways have significantly higher crash rates than any other type of rural roadway in Texas, as seen in Table 12. Improving roadways in crash hot spots will not only reduce delays caused by accidents due to road closures, but will also improve safety in times of emergencies, preventing unwanted and unnecessary delays during evacuations. The US-69 Hurricane Evacuation Corridor Improvement project is designed to promote safety and stability during times of uncertainty.

Base Case and Alternatives

The **base case**, also referenced as the "no build" case, is defined as the status quo. The project location on US-69 will remain a two lane, two-way highway with no median barrier dividing the highway.

In the **build case**, US-69 will be widened over the 14 mile stretch to a four lane highway, with a barrier separating northbound and southbound traffic. In both cases, traffic growth is expected to be identical, as referenced in the demand projections below.

Types of Impacts

The US-69 Hurricane Evacuation Corridor Improvements project is expected to have significant impacts in accident cost benefits and hurricane resiliency benefits. Given the stretch of US-69 is in a rural location, based on the traffic projections outlined in the demand projection section, the highway has enough capacity to support normal operations, which yield negligible travel time savings, vehicle operating cost savings or emission savings. Over the lifecycle of the analysis, widening the US-69 will prevent an estimated 1,200 accidents. Accident cost savings will result from the change in roadway type, as TxDOT reports indicated over 1.5 times more crashes occur on rural two lane, two way highways than four lane divided highways, as shown in Table 12. Crash modification factors suggest fatal and injury accidents will diminish by 45%, and property damage only accidents will diminish by 31% for altering the road type.

Project Cost and Schedule[5]

The project costs are $186 million in 2016 dollars. The majority of those funds, $140 million, are allocated for the construction of the project, and the remaining $46 million is allocated for project support costs and right of way costs. Construction is expected to begin

[5] All cost estimates in this section are in undiscounted millions of dollars of 2016.

in 2021 and will take four years, completing construction in 2024. Table ES-2 outlines the distribution of spending between involved parties.

Table 1: Cost Summary Table, 2016 Dollars

Calendar Year	Capital Expenditures
2017	-
2018	$5,000,000
2019	$20,000,000
2020	$20,000,000
2021	$31,000,000
2022	$40,000,000
2023	$50,000,000
2024	$20,000,000
Total	$186,000,000

INFRA Merit Criteria

The main benefit categories associated with the project are identified in the table below and align with Criterion #1 (Support for National or Regional Economic Vitality) as stated in the INFRA program's NOFO.

Table 2: Expected Effects on Benefit Categories

Benefit or Impact Categories	Description	Monetized	Quantified	Qualitative
Travel Time Savings	Reduced delays from increased highway capacity	Yes	-	-
	Reduced delays during accidents and evacuations	-	-	Yes
Avoided Emission Cost Savings	Avoided emissions from reduced delays	Yes	-	-
Vehicle Operating Cost	Reduced fuel consumption from decreases in delays	Yes	-	-

Benefit or Impact Categories	Description	Monetized	Quantified	Qualitative
Savings				
Vehicle Operating Cost Savings	Reduced non-fuel operating costs	Yes	-	-
Accident Cost Savings	Reduced accident costs from changing highway configuration	Yes	-	-
Hurricane Resiliency Benefits	Avoided casualties during evacuations	Yes	-	-

4 General Assumptions

The BCA measures benefits against costs throughout a period of analysis beginning at the start of construction and including 30 years of operations.

The monetized benefits and costs are estimated in 2016 dollars with future dollars discounted in compliance with INFRA requirements using a 7 percent real rate, and sensitivity testing at 3 percent.

The methodology makes several important assumptions and seeks to avoid overestimation of benefits and underestimation of costs. Specifically:

- Input prices are expressed in 2016 dollars;
- The period of analysis begins in 2017 and ends in 2054. It includes project development and construction years (2018 - 2024) and 30 years of operations (2025 - 2054);
- A constant 7 percent real discount rate is assumed throughout the period of analysis. A 3 percent real discount rate is used for sensitivity analysis;
- Opening year demand is an input to the BCA and is assumed to be fully realized in 2025, the first year of operations (no ramp-up); and
- Unless specified otherwise, the results shown in this document correspond to the effects of the widening of US-69.

5 Demand Projections

Accurate demand projections are important to effectively estimate the benefits in a BCA. Demand projections for this project were estimated from a travel demand model provided by TxDOT. The model estimated average daily traffic in 2018 and 2040.

Methodology

Traffic volumes were estimated through a geometric growth pattern, using the results from the travel demand model. Average daily traffic was then split into peak and off-peak traffic using estimates from the 2009 National Household Travel Survey.

Assumptions

Based on the micro-simulation data shown in Table 4, traffic growth, measured in average daily traffic, and average daily peak traffic, was calculated and assumed to be growing annually at a rate of 4.38% in both the build and no build case.[6] Due to the uncertainty in years past 2040, traffic growth was assumed to be 0% to present a conservative estimate of benefits.

Table 3: Assumptions used in the Estimation of Demand

Variable Name	Unit	Value	Source
ADT Growth (2017-2040)	%	4.38%	Calculated based on travel demand model. Traffic growth in build and no build cases identical. Assumed to be 0% after 2040 due to uncertainty.
ADT Growth (2040+)	%	0.00%	Assumed to be 0% after 2040 due to uncertainty, allowing for conservative estimate of benefits.
ADT (2018)	vehicles	7,790	Provided by TxDOT from travel demand model.
ADT (2040+)	vehicles	20,000	Provided by TxDOT. Report on US-69 Corridor growth 2020-2040. Report indicates stretch of highway is expected to have 20,001-30,000 vehicles.
Trucks	%	11.50%	TxDOT

[6] Traffic growth based on the lower bound of ADT provided in Appendix C in US-69 Corridor Assessment Report. At the higher bound, traffic growth exceeds an annual rate of 8%.

Variable Name	Unit	Value	Source
Passenger Vehicles	%	88.50%	
Segment Length	mi	14	
Alpha		0.20	Highway Capacity Manual
Beta		10.00	
Lane Capacity	vehicles / hour/ lane	2,000	
Number of Peak Hours	hours	2	Reasoned assumption given the location of project.
Percent of Travel in Peak Period	%	16.2%	Calculated based on travel demand by time of day from National Household Travel Survey, 2009.

Demand Projections

The resulting projections for average daily traffic and peak traffic are presented in the table below. The average daily traffic was then multiplied by segment length to generate vehicle miles travelled. Average speed was calculated based on highway capacity, and then used to determine the vehicle hours travelled. The project opens in 2025, however, given the current traffic levels and expected future traffic levels, the highway does not exceed capacity under normal operating conditions in the no build case. As a result, there is no significant gain in speed or reduction in vehicle hours travelled in the build case.

Table 4: Demand Projections

		In Project Opening Year	2035	2045
No Build	Average Daily Traffic	10,516	16,142	20,000
	Average Peak Daily Traffic	1,705	2,617	3,243
	Annual Vehicle Miles Travelled	53,734,281	82,486,791	102,200,000
	Annual Vehicle Hours Travelled	767,633	1,178,383	1,460,006
	Average Speed	70.00	70.00	70.00
Build	Average Daily Traffic	10,516	16,142	20,000
	Average Peak Daily Traffic	1,705	2,617	3,243

Annual Vehicle Miles Travelled	53,734,281	82,486,791	102,200,000
Annual Vehicle Hours Travelled	767,633	1,178,383	1,460,000
Average Speed	70.00	70.00	70.00

6 Estimation of Economic Benefits

Benefits Measurement, Data and Assumptions

This section describes the measurement approach used for each benefit or impact category identified in Section 3 (Types of Impacts) and provides an overview of the associated methodology, assumptions, and estimates.

List of Benefits Analyzed

The benefits assessed for the US-69 Hurricane Evacuation Corridor Improvements project are the following:

- Travel Time Savings: captures the reduced travel time for automobiles and trucks under the build scenario as a result of avoiding delays at signalized intersections.
- Vehicle Operating Cost Savings: captures the reduced vehicle operating costs for automobiles and trucks under the build scenario as a result of fewer vehicle miles travelled from the construction of direct connectors.
- Emission Cost Savings: captures the reduced emissions from automobiles and trucks under the build scenario as a result of fewer vehicle miles travelled and increases in the average speed.
- Accident Cost Savings: captures the expected reduction in accident cost savings under the build scenario as a result of removing traffic from signalized intersections.
- Hurricane Resiliency Benefits: captures the avoided fatalities due to additional capacity in the build scenario, improving evacuation conditions.

Methodologies Used to Estimate Benefits

Travel time savings were calculated for motorists travelling on the segment of US-69. Changes in travel time between the build and no build case were monetized using US DOT guidance for the value of time for trucks and automobiles. Vehicle operating costs, which are calculated on a per mile basis, examine the difference in miles travelled between the build and no build case and changes in speed. Emissions costs were estimated using rates

per mile, based on vehicle speed, and monetized by applying values provided in US DOT guidance. Accident costs were calculated using US DOT guidance to determine the value of fatalities, injuries, and property damage only accidents avoided. Hurricane resiliency was calculated based on the requirement for the project to break even using the value of statistical life and used the probability of severe hurricanes to adjust the required stream of benefits into expected benefits.

Assumptions Used to estimate economic benefits

The assumptions used in the estimation of economic benefits for the US-69 Hurricane Evacuation Corridor Improvements project are summarized in the tables below.

Table 5: Assumptions used in the Estimation of Economic Benefits

Variable Name	Unit	Year	Value	Source
Discount Rate	%	2017-2054	7.00%	US DOT Guidance 2017
Days/Year	days	2017-2054	365	Known
Construction Begins	year		2021	TxDOT
Project Opens	year		2028	
Percent Trucks	%	2017-2054	11.50%	
Percent Automobiles	%	2017-2054	88.50%	
Segment Length	mi	2017-2054	14	
Alpha		2017-2054	0.2	Highway Capacity Manual
Beta		2017-2054	10	
Lane Capacity	vehicles/hr/lane	2017-2054	2,000	

Methodologies Used to Estimate Travel Time Benefits

Travel time savings are calculated based on the vehicle hours travelled as determined by calculations using results from the travel demand model. Average daily traffic was broken out to peak and off-peak vehicles to calculate actual speeds during these two periods based

on the highway capacity. Annual vehicle miles were determined based on the daily ADT and the segment length; vehicle hours travelled were generated by dividing the VMT by the average speed. Annual vehicle hours were broken out to truck hours and automobile hours to account for the differences in the value of time for the different types of vehicles. The vehicle hours travelled were then converted to person hours, based on the vehicle occupancy recommended in the US DOT guidance. These person hours were then monetized using the US DOT guidance for the value of time.

Assumptions Used to Estimate Travel Time Benefits

In addition to the economic variables listed above, the following assumptions were used in the estimation of travel time benefits.

Table 6: Assumptions used in the Estimation of Travel Time Benefits

Variable Name	Unit	Year	Value	Source
Average Vehicle Occupancy - Auto	people/vehicle	2017-2054	1.39	Federal Highway Administration Highway Statistics 2015, Table VM1
Average Vehicle Occupancy - Truck	people/vehicle	2017-2054	1.00	
Value of Time - Auto	$/hr	2017-2054	$14.10	Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis https://www.transportation.gov/officepolicy/transportation-policy/reviseddepartmental-guidance-valuationtravel-time-economic
Value of Time - Truck	$/hr	2017-2054	$27.20	

Travel Time Benefit Estimates

The table below shows the benefit estimates calculated over the life cycle of the project, due to widening US-69 to four lanes. At a 7% discount rate, travel time benefits are negligible over the project lifecycle. The road currently has the capacity to handle the expected traffic growth in normal conditions. However, benefits will be experienced during periods of unusually high demand, as shorter delays will persist during evacuations. Given the complexity and uncertainty associated with modelling these events and determining evacuation traffic flows, travel time benefits were not attempted to be monetized from hurricane evacuations.

Table 7: Estimates of Travel Time Benefits, 2016 Dollars

	Over the Project Lifecycle

	In Constant Dollars	Discounted at 7 Percent	Discounted at 3 Percent
Travel Time Benefits	$1,476	$205	$614

Methodologies Used to Estimate Vehicle Operating Cost Benefits

Vehicle operating cost savings were broken out to fuel and non-fuel cost savings. Fuel savings were calculated based on the breakout of annual vehicle miles by truck and automobiles. Given the average speed in the build and no build cases, fuel consumption rates were applied using estimates from the State of California, determined to be a comparable location. The values were then multiplied by the retail price of diesel and gasoline as provided by the EIA in the Annual Energy Outlook 2017, less taxes to determine annual fuel costs. Non-fuel costs were estimated through US DOT guidance, less fuel costs. These costs were applied to the vehicle miles travelled to capture the differences between the build and no build case.

Assumptions Used to Estimate Vehicle Operating Cost Benefits

The following assumptions were used to estimate the vehicle operating cost benefits.

Table 8: Assumptions used in the Estimation of Vehicle Operating Cost Benefits

Variable Name	Unit	Year	Value	Source
Non-Fuel Operating Cost - Auto	$/mi	2017-2054	0.33	US DOT Guidance 2017, AAA Your Driving Costs value of $0.40/mile less fuel costs. Fuel costs net of taxes calculated separately.
Non-Fuel Operating Cost - Truck	$/mi	2017-2054	0.56	US DOT Guidance 2017, American Transportation Research Institute value of $0.96/mile less fuel costs. Fuel costs net of taxes calculated separately. Value inflated from 2015 $ to 2016 $.
Gasoline Retail Price	2016 $/gallon	2017	1.89	EIA Annual Energy Outlook Forecast 2017, net price of fuel less taxes. Gasoline prices are assumed constant past 2050 due to uncertainty and to allow
		2018	1.85	
		2019	2.07	
		2020	2.19	
		2021	2.31	

Variable Name	Unit	Year	Value	Source
		2022	2.42	estimates to be made conservatively.
		2023	2.46	
		2024	2.48	
		2025	2.53	
		2026	2.57	
		2027	2.58	
		2028	2.57	
		2029	2.60	
		2030	2.64	
		2031	2.69	
		2032	2.73	
		2033	2.73	
		2034	2.76	
		2035	2.78	
		2036	2.84	
		2037	2.85	
		2038	2.87	
		2039	2.91	
		2040	2.94	
		2041	2.96	
		2042	2.96	
		2043	2.98	
		2044	2.99	
		2045	3.00	
		2046	3.02	
		2047	3.04	
		2048	3.02	
		2049	3.04	
		2050	3.08	

Variable Name	Unit	Year	Value	Source
Diesel Retail Price	2016 $/gallon	2017	2.14	EIA Annual Energy Outlook Forecast 2017, net price of fuel less taxes. Diesel prices are assumed constant past 2050 due to uncertainty and to allow estimates to be made conservatively.
		2018	2.41	
		2019	2.60	
		2020	2.72	
		2021	2.80	
		2022	2.91	
		2023	2.96	
		2024	3.00	
		2025	3.09	
		2026	3.14	
		2027	3.19	
		2028	3.20	
		2029	3.25	
		2030	3.31	
		2031	3.37	
		2032	3.44	
		2033	3.44	
		2034	3.49	
		2035	3.51	
		2036	3.58	
		2037	3.59	
		2038	3.61	
		2039	3.65	
		2040	3.67	
		2041	3.68	
		2042	3.68	
		2043	3.68	
		2044	3.69	
		2045	3.71	

Variable Name	Unit	Year	Value	Source
		2046	3.73	
		2047	3.78	
		2048	3.79	
		2049	3.82	
		2050	3.86	
Gasoline Consumption	gallons/mi	2017-2054	0.04	California Department of Transportation, determined to be comparable to project location. Gasoline consumption is dependent on speed, with the variables referring to a 70 mph speed.
Diesel Consumption	gallons/mi	2017-2054	0.09	California Department of Transportation, determined to be comparable to project location. Diesel consumption is dependent on speed, with the variables referring to a 70 mph speed.

Vehicle Operating Cost Benefit Estimates

The table below shows the benefit estimates calculated over the life cycle of the project, broken out by fuel and non-fuel cost savings. At a 7% discount rate, vehicle operating cost benefits are negligible over the project lifecycle. Under normal operating conditions, the addition of two lanes, one in each direction, do not provide vehicle operating cost benefits as the roadway was previously under capacity. However, the addition of a second lane provides opportunities to pass slower moving vehicles and will allow for cost savings when unusually high demand on the roadway persists. Due to the uncertainty of events generating significant demand and the uncertainty of parameters surrounding the demand, these benefits were not monetized.

Table 9: Estimates of Vehicle Operating Cost Benefits, 2016 Dollars

	Over the Project Lifecycle		
	In Constant Dollars	Discounted at 7 Percent	Discounted at 3 Percent
Fuel Cost Savings	$336	$0	$0

	Over the Project Lifecycle		
	In Constant Dollars	Discounted at 7 Percent	Discounted at 3 Percent
Non Fuel Cost Savings	$0	$0	$0
Total	$336	$0	$0

Methodologies Used to Estimate Emission Cost Benefits

Emission cost savings were calculated based on speeds in the build and no build case. These emission factors for carbon dioxide, nitrogen oxides, fine particulate matter, sulfur oxides, and volatile organic compounds were applied to the vehicle miles travelled, broken out by automobile and truck, to determine the metric tons produced in each case. The value of each greenhouse gas was then applied based on the US DOT guidance, converted from dollars per short ton to dollars per metric ton.

Assumptions Used to Estimate Emission Cost Benefits

The following assumptions were used to estimate the emission cost benefits.

Table 10: Assumptions used in the Estimation of Emission Reduction Benefits

Variable Name	Unit	Year	Value	Source
Grams/Metric ton	grams/ metric ton	2017-2054	1,000,000	Known
Volatile Organic Compounds (VOC)	$/metric ton	2017-2054	2,063.53	Corporate Average Fuel Economy for MY2017-MY2025 Passenger Cars and Light Trucks (August 2012), page 922, Table VIII16, "Economic Values Used for Benefits Computations (2010 dollars)" http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FRIA_2017-2025.pdf, converted values to $/metric ton.
Nitrogen Oxides (NOx)	$/metric ton	2017-2054	8,131.75	
Fine Particulate Matter (PM)	$/metric ton	2017-2054	371,984.89	
Sulfur Dioxide (SO2)	$/metric ton	2017-2054	48,060.78	
Carbon Dioxide	%	2017-2054	24.6%	Calculated based on US proportion of World GDP based

Variable Name	Unit	Year	Value	Source
Domestic Adjustment				on World Bank values from 2016.
CO2 Emission Rate - Auto	g/mi	2017-2054	388.24	California Department of Transportation, determined to be comparable to project location. Emission rate is dependent on speed, with the variables referring to a 70 mph speed. Based on 2016 model fleet.
NOx Emission Rate - Auto	g/mi	2017-2054	0.17	
PM Emission Rate - Auto	g/mi	2017-2054	0.002	
SOx Emission Rate - Auto	g/mi	2017-2054	0.004	
VOC Emission Rate - Auto	g/mi	2017-2054	0.06	
CO2 Emission Rate - Truck	g/mi	2017-2054	930.87	
NOx Emission Rate - Truck	g/mi	2017-2054	0.00	
PM Emission Rate - Truck	g/mi	2017-2054	0.02	
SOx Emission Rate - Truck	g/mi	2017-2054	0.01	
VOC Emission Rate - Truck	g/mi	2017-2054	0.08	
Carbon Dioxide Price	2016 $/ton	2017	10.98	Interagency on the Social Working Cost of Capital, 2013. Values adjusted using carbon dioxide domestic adjustment to account for domestic value only. Domestic adjustment created by taking US proportion of World GDP. Prices assumed constant past 2050 to account for benefits conservatively.
		2018	11.26	
		2019	11.54	
		2020	11.82	
		2021	11.82	
		2022	12.10	
		2023	12.38	
		2024	12.66	
		2025	12.95	

Variable Name	Unit	Year	Value	Source
		2026	13.23	
		2027	13.51	
		2028	13.79	
		2029	13.79	
		2030	14.07	
		2031	14.35	
		2032	14.63	
		2033	14.92	
		2034	15.20	
		2035	15.48	
		2036	15.76	
		2037	16.04	
		2038	16.32	
		2039	16.60	
		2040	16.88	
		2041	17.17	
		2042	17.17	
		2043	17.45	
		2044	17.73	
		2045	18.01	
		2046	18.29	
		2047	18.57	
		2048	18.85	
		2049	19.14	
		2050+	19.42	

Emission Cost Benefit Estimates

The table below shows the benefit estimates calculated over the life cycle of the project, broken out by emission type. Emission cost savings were negligible. Under normal operating

conditions, the proposed improvements did not provide any change in speed, distance, or time travelled. However, during periods of unusually high demand, emission cost benefits can be realized due to shorter delays. However, given the uncertainty surrounding periods of unusually high demand, these benefits were not monetized.

Table 11: Estimates of Emission Cost Benefits, 2016 Dollars

	Over the Project Lifecycle		
	In Constant Dollars	Discounted at 7 Percent	Discounted at 3 Percent
Volatile Organic Compounds (VOC)	$0	$0	$0
Nitrogen Oxides (NOx)	$0	$0	$0
Fine Particulate Matter (PM)	$0	$0	$0
Sulfur Dioxide (SO2)	$0	$0	$0
Carbon Dioxide (CO2)	$0	$0	$0
Total	$0	$0	$0

Methodologies Used to Estimate Accident Cost Benefits

Accident costs are reduced in the build case as crash rates on two lane, two direction highways are significantly greater than the proposed four lane divided highway. Table 12 shows the crash rates in Texas based on the type of highway.

Table 12: Traffic Crashes per 100 Million Vehicle Miles by Road Type, 2016

	Traffic Crashes per 100 million vehicle miles	
	Rural	Urban
2 lane, 2 way	101.18	268.33
4 or more lanes, divided	62.81	193.14
4 or more lanes, undivided	111.36	377.59
Source: TxDOT Statewide Traffic Crash Rates by Road Type, 2016		

Crash data for the project location along US-69 was collected from between 2014 and 2016 from TxDOT's Crash Records Information System (C.R.I.S.) to calculate the crash rates per million vehicle miles in the no build case. For the build case, accident rates were calculated to have decreased through the use of crash modification factors from CMF Clearinghouse. Crash data was also used to estimate the average number of fatalities and injuries based on the type of crash. These were applied to the estimated number of accidents to create the estimated number of injuries and fatalities. These were then monetized through values provided by U.S. DOT.

Assumptions Used to Estimate Accident Cost Benefits

The following assumptions were used to estimate the accident cost benefits.

Table 13: Assumptions used in the Estimation of Accident Cost Benefits

Variable Name	Unit	Year	Value	Source
Crash Modification Factor - Fatalities		2017-2054	0.5491	CMF Clearinghouse, converting 2 lane, 2-way highway to 4 lane divided highway; CMF 7571
Crash Modification Factor - Injuries		2017-2054	0.5491	
Crash Modification Factor - PDO		2017-2054	0.691	CMF Clearinghouse, converting 2 lane, 2-way highway to 4 lane divided highway; CMF 7570
Average Fatalities per Fatal Accident	events/ accident	2017-2054	1.0	Calculated based on accident data collected by TxDOT at project location
Average Injuries per Injury Accident	events/ accident	2017-2054	1.53	
Average Injuries per Fatal Accident	events/ accident	2017-2054	2.0	
Average Vehicles Damaged per PDO	events/ accident	2017-2054	1.95	State of California average vehicles involved per PDO accident
Cost of a Fatality	$/ accident	2017-2054	9,600,000	Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses (2016) https://www.transportation.gov/officepolicy/transportation-policy/reviseddepartmental-guidance-on-valuation-of-astatistical-life-in-economic-analysis

Variable Name	Unit	Year	Value	Source
Cost of an Injury	$/ accident	2017-2054	110,663	Calculated weighted average of injuries based on US DOT Guidance 2017 values for injuries. Distribution of injuries gathered from 2014 Traffic Safety Facts, FARS/GES Annual Report, Publication #812139, Table 54 on page 106.
Cost of a PDO	$/ accident	2017-2054	4,252	The Economic and Societal Impact of Motor Vehicle Crashes, 2010
Fatal Accident Rate - No Build	accidents /Million VMT	2017-2054	0.02	Calculated based on crash data collected by TxDOT at the project location
Injury Accident Rate - No Build	accidents /Million VMT	2017-2054	0.43	
Property Damage Only Accident Rate - No Build	accidents /Million VMT	2017-2054	0.69	
Fatal Accident Rate - No Build	accidents /Million VMT	2017-2054	0.01	
Injury Accident Rate - No Build	accidents /Million VMT	2017-2054	0.24	
Property Damage Only Accident Rate - No Build	accidents /Million VMT	2017-2054	0.48	

Accident Cost Benefit Estimates

The table below shows the benefit estimates calculated over the life cycle of the project, broken out by accident type. Accident cost savings were a result of lower crash rates from converting the two way, two lane highway to a four lane divided highway. At a 7% discount rate, accident cost benefits total $67.4 million over the project lifecycle.

Table 14: Estimates of Accident Cost Benefits, 2016 Dollars

	Over the Project Lifecycle		
	In Constant Dollars	Discounted at 7 Percent	Discounted at 3 Percent
Fatalities Savings	$200,650,430	$46,717,233	$106,887,280
Injuries Savings	$84,423,801	$19,656,307	$44,972,894
PDO Savings	$4,334,788	$1,009,264	$2,309,159
Total	$289,409,018	$67,382,804	$154,169,333

Methodologies Used to Estimate Hurricane Resiliency Benefits

Hurricane resiliency benefits were calculated to determine the benefits required for the project to breakeven. From the above benefit estimates, the net present value of the project was -$60.1 million, at a 7% discount rate, shown in Table 19. In order for the project to breakeven, an annuity calculation was made to determine the benefits needed for each year of the study period achieve a net present value of $0. The breakeven benefits were then adjusted for the probability of a hurricane resulting in an evacuation.[7]

Assumptions Used to Estimate Hurricane Resiliency Benefits

The following table contains assumptions used to estimate hurricane resiliency benefits.

Table 15: Assumptions used in the Estimation of Accident Cost Benefits

Variable Name	Unit	Year	Value	Source
Hurricane Resiliency Benefits				
Cumulative Annual Probability of Hurricane Event	%	2017-2054	3.3%	Calculated from probability of a once in a 50 year storm, once in a 100 year storm, once in a 500 year storm and once in a 1000 year storm occurring in a given year
Cost of Fatality	$/fatality	2017-2054	$9,600,000	Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses (2016) https://www.transportation.gov/officepolicy/transportation-policy/reviseddepartmental-guidance-on-valuation-of-astatistical-life-in-economic-analysis

[7] Probabilities were constructed for a once in a 50-year hurricane, once in a 100-year hurricane, once in a 500-year hurricane and once in a 1000-year hurricane.

Variable Name	Unit	Year	Value	Source
Minimum Evacuation Time (Not Monetized)				
Number of Vehicles per Capita	vehicles	2017-2054	0.80	Texas Average Vehicles per Capita, calculated based on motor vehicle registrations and state population in 2015. Sources: FHWA, US Census
Population of Cities Surrounding Evacuation Corridor	people	2017-2054	533,650	2016 US Census for population of select cities in Jefferson and Hardin counties, south of project segment end.
Population Growth Rate, Hardin County	%	2017-2040	0.5%	Calculated from US Census data for Hardin County, between 2010 and 2016. After 2040, population growth rate assumed to be 0%.
Population Growth Rate, Jefferson County	%	2017-2040	0.1%	Calculated from US Census data for Jefferson County, between 2010 and 2016. After 2040, population growth rate assumed to be 0%.
Percent of Hardin Population Evacuating on US-69	%	2017-2054	95.0%	Reasoned assumption since all cities examined are directly on the hurricane evacuation route. Assumed a minimal percentage will not evacuate based on evidence in paper, "Is it Time to Go yet? Understanding Household Hurricane Evacuation Decisions from a Dynamic Perspective"
Percent of Jefferson Population Evacuating on US-69	%	2017-2054	30.0%	Reasoned assumption since there are 3 major evacuation routes for residents to take.

Hurricane Resiliency Benefit Estimates

Hurricane resiliency benefit estimates are shown below, based on a breakeven analysis at a 7% discount rate. The probability adjusted values indicate that 0.87 fatalities need to be avoided each year over the study period for the project to breakeven. At a 7% discount rate, hurricane resiliency benefits total $60.1 million over the project lifecycle. Additionally, with twice the capacity on the road, evacuations can occur twice as fast. Beaumont residents have three primary evacuation routes: US-96, US-69, and SH-105. Combined with cities and towns directly on US-69 in Hardin County, it is assumed at least 55,000 cars will be on US-69 as nearly 225,000 people will need to evacuate. In the event of an evacuation with the assumed parameters, the average minimum time required for evacuation is nearly 4 hours in the no build case, compared to 2 hours in the build case.

Table 16: Estimates of Hurricane Resiliency Benefits, 2016 Dollars

	Over the Project Lifecycle		
	In Constant Dollars	Discounted at 7 Percent	Discounted at 3 Percent
Hurricane Resiliency Benefits	$249,655,994	$60,101,976	$128,762,321

Aggregation of Benefit Estimates

The table below identifies the values of monetized benefits, based on the assumptions presented above. The project is estimated to produce benefits valued at $127.5 million at a 7% discount factor over the project lifecycle. Accident savings are by far the largest and most significant benefit, accounting for over half of the monetized benefits. Benefits for travel time savings, vehicle operating cost savings and emission cost savings were negligible in normal conditions, however, benefits could be realized during periods of evacuation.

Table 17: Estimates of Economic Benefits, 2016 Dollars

	Over the Project Lifecycle	
	In Constant Dollars	Discounted at 7 Percent
Travel Time Savings	$1,476	$205
Emission Cost Savings	-	-
Vehicle Operating Cost Savings	-	-
Accident Cost Savings	$313,699,086	$67,382,804
Hurricane Resiliency Benefits	$249,655,994	$60,101,976
Total	$563,356,556	$127,484,985

Comparison of Benefits and Costs

The monetized benefits of the project are significantly greater than the costs. It is estimated that every dollar spent on this project will generate $1 in benefits, at the 7% discount rate. Significant reliability benefits would be realized with the installation of the project, with benefits resulting from shorter delays in periods of evacuation. As a primary hurricane evacuation route for Beaumont, US-69 will provide significant benefits during periods of evacuation. Faster evacuations will result in fewer delays and ensure residents are able to move to a safe destination, avoiding harm caused from natural disasters.

7 Summary of Findings and BCA Outcomes

The tables below summarize the BCA findings. Annual costs and benefits are computed over the lifecycle of the project (38 years). As stated earlier, construction is expected to be completed by 2025. Benefits accrue during the full operation of the project.

Table 18: Overall Results of the Benefit Cost Analysis, Millions of 2016 Dollars*

Project Evaluation Metric	7% Discount Rate	3% Discount Rate
Total Discounted Benefits	$127.5	$282.9
Total Discounted Costs	$127.5	$157.5
Net Present Value	$0.0	$125.5
Benefit / Cost Ratio	1.0	1.80
Internal Rate of Return (%)	7.0%	
Discounted Payback Period (years)	30.00	
** Unless Specified Otherwise*		

Considering only monetized benefits and costs, the estimated internal rate of return of the project is 7.0% percent. With a 7 percent real discount rate, the project is expected to breakeven.

With a 3 percent real discount rate, the Net Present Value of the project would increase to $125.5 million, for a Benefit/Cost ratio of 1.80. Results for the project excluding the hurricane resiliency benefits are shown in the table below.

Table 19: Overall Results of the Benefit Cost Analysis, Excluding Hurricane Resiliency Benefits, Millions of 2016 Dollars*

Project Evaluation Metric	7% Discount Rate	3% Discount Rate
Total Discounted Benefits	$67.4	$154.2
Total Discounted Costs	$127.5	$157.5
Net Present Value	-$60.1	-$3.3
Benefit / Cost Ratio	0.53	0.98
Internal Rate of Return (%)	2.9%	
Discounted Payback Period (years)	N/A	

Table 20: Benefit Estimates for the Full Build Alternative

Benefit Categories	7% Discount Rate	3% Discount Rate
Travel Time Savings and Reliability Benefits	$205	$614
Vehicle Operating Cost Savings	-	-
Emissions Reduction Benefits	-	-
Accident Benefits	$67,382,804	$154,169,333
Hurricane Resiliency Benefits	$60,101,976	$128,762,321
Total Benefit Estimates	$127,484,985	$282,932,268

8 Aggregate Annual Benefits and Costs

This section reports annual, aggregate benefits and costs associated with the US-69 Hurricane Evacuation Corridor Improvements and an annual breakdown of benefits by category. Detailed information and calculations by benefit category are provided in the spreadsheet used to conduct this BCA.

Table 211: Annual Monetized Estimates of Total Project Benefits and Costs

Calendar Year	Project Year	Total Benefits ($2016)	Total Costs ($2016)	Undiscounted Net Benefits ($2016)	Discounted Net Benefits at 7%	Discounted Net Benefits at 3%
2017	1	-	-	-	-	-
2018	2	-	$5,000,000	-$5,000,000	-$4,367,194	-$4,712,980
2019	3	-	$20,000,000	-$20,000,000	-$16,325,958	-$18,302,833
2020	4	-	$20,000,000	-$20,000,000	-$15,257,904	-$17,769,741
2021	5	-	$31,000,000	-$31,000,000	-$22,102,572	-$26,740,872
2022	6	-	$40,000,000	-$40,000,000	-$26,653,689	-$33,499,370
2023	7	-	$50,000,000	-$50,000,000	-$31,137,487	-$40,654,576
2024	8	-	$20,000,000	-$20,000,000	-$11,640,182	-$15,788,185
2025	9	$14,707,431	-	$14,707,431	$7,999,868	$11,272,021
2026	10	$14,987,057	-	$14,987,057	$7,618,660	$11,151,778
2027	11	$15,278,929	-	$15,278,929	$7,258,909	$11,037,823
2028	12	$15,583,581	-	$15,583,581	$6,919,296	$10,930,010
2029	13	$15,901,575	-	$15,901,575	$6,598,588	$10,828,199
2030	14	$16,233,493	-	$16,233,493	$6,295,629	$10,732,252
2031	15	$16,579,947	-	$16,579,947	$6,009,336	$10,642,037
2032	16	$16,941,573	-	$16,941,573	$5,738,697	$10,557,428
2033	17	$17,319,034	-	$17,319,034	$5,482,763	$10,478,300

Calendar Year	Project Year	Total Benefits ($2016)	Total Costs ($2016)	Undiscounted Net Benefits ($2016)	Discounted Net Benefits at 7%	Discounted Net Benefits at 3%
2034	18	$17,713,025	-	$17,713,025	$5,240,645	$10,404,536
2035	19	$18,124,271	-	$18,124,271	$5,011,512	$10,336,018
2036	20	$18,553,527	-	$18,553,527	$4,794,584	$10,272,638
2037	21	$19,001,583	-	$19,001,583	$4,589,131	$10,214,287
2038	22	$19,469,264	-	$19,469,264	$4,394,469	$10,160,863
2039	23	$19,957,432	-	$19,957,432	$4,209,958	$10,112,266
2040	24	$20,466,989	-	$20,466,989	$4,034,998	$10,068,402
2041	25	$20,466,989	-	$20,466,989	$3,771,026	$9,775,148
2042	26	$20,466,989	-	$20,466,989	$3,524,323	$9,490,435
2043	27	$20,466,989	-	$20,466,989	$3,293,760	$9,214,014
2044	28	$20,466,989	-	$20,466,989	$3,078,280	$8,945,645
2045	29	$20,466,989	-	$20,466,989	$2,876,898	$8,685,092
2046	30	$20,466,989	-	$20,466,989	$2,688,689	$8,432,128
2047	31	$20,466,989	-	$20,466,989	$2,512,794	$8,186,532
2048	32	$20,466,989	-	$20,466,989	$2,348,405	$7,948,090
2049	33	$20,466,989	-	$20,466,989	$2,194,771	$7,716,592
2050	34	$20,466,989	-	$20,466,989	$2,051,188	$7,491,837
2051	35	$20,466,989	-	$20,466,989	$1,916,998	$7,273,628

Calendar Year	Project Year	Total Benefits ($2016)	Total Costs ($2016)	Undiscounted Net Benefits ($2016)	Discounted Net Benefits at 7%	Discounted Net Benefits at 3%
2052	36	$20,466,989	-	$20,466,989	$1,791,587	$7,061,775
2053	37	$20,466,989	-	$20,466,989	$1,674,381	$6,856,092
2054	38	$20,466,989	-	$20,466,989	$1,564,842	$6,656,400
Total		$563,356,556	$186,000,000	$377,356,556	$0	$125,463,712

Table 22: Annual Monetized Estimates of Total Project Benefits by Category, Undiscounted 2016 Dollars

Calendar Year	Project Year	Travel Time Savings Benefits	Vehicle Operating Costs Benefits	Accident Cost Benefits	Emissions Reduction Benefits	Hurricane Resiliency Benefits	Total Benefits
2025	9	-	-	$6,385,564	-	$8,321,866	$14,707,431
2026	10	$0	-	$6,665,191	-	$8,321,866	$14,987,057
2027	11	$0	-	$6,957,062	-	$8,321,866	$15,278,929
2028	12	$0	-	$7,261,714	-	$8,321,866	$15,583,581
2029	13	$0	-	$7,579,708	-	$8,321,866	$15,901,575
2030	14	$1	-	$7,911,626	-	$8,321,866	$16,233,493
2031	15	$1	-	$8,258,079	-	$8,321,866	$16,579,947
2032	16	$2	-	$8,619,704	-	$8,321,866	$16,941,573
2033	17	$3	-	$8,997,164	-	$8,321,866	$17,319,034
2034	18	$5	-	$9,391,154	-	$8,321,866	$17,713,025
2035	19	$8	-	$9,802,396	-	$8,321,866	$18,124,271
2036	20	$13	-	$10,231,647	-	$8,321,866	$18,553,527
2037	21	$22	-	$10,679,695	-	$8,321,866	$19,001,583
2038	22	$35	-	$11,147,363	-	$8,321,866	$19,469,264
2039	23	$55	-	$11,635,510	-	$8,321,866	$19,957,432
2040	24	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2041	25	$89	-	$12,145,034	-	$8,321,866	$20,466,989

Calendar Year	Project Year	Travel Time Savings Benefits	Vehicle Operating Costs Benefits	Accident Cost Benefits	Emissions Reduction Benefits	Hurricane Resiliency Benefits	Total Benefits
2042	26	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2043	27	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2044	28	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2045	29	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2046	30	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2047	31	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2048	32	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2049	33	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2050	34	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2051	35	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2052	36	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2053	37	$89	-	$12,145,034	-	$8,321,866	$20,466,989
2054	38	$89	-	$12,145,034	-	$8,321,866	$20,466,989
Total		$1,476	$0	$313,699,086	$0	$249,655,994	$563,356,556

Table 23: Annual Demand Projections (1 of 2)

Calendar Year	Project Year	VMT No Build	VHT No Build	Speed No Build	VMT Build	VHT Build	Speed Build
2017	1	38,136,871	544,812	70.0	38,136,871	544,812	70.0
2018	2	39,806,900	568,670	70.0	39,806,900	568,670	70.0
2019	3	41,550,060	593,572	70.0	41,550,060	593,572	70.0
2020	4	43,369,554	619,565	70.0	43,369,554	619,565	70.0
2021	5	45,268,724	646,696	70.0	45,268,724	646,696	70.0
2022	6	47,251,059	675,015	70.0	47,251,059	675,015	70.0
2023	7	49,320,202	704,574	70.0	49,320,202	704,574	70.0
2024	8	51,479,953	735,428	70.0	51,479,953	735,428	70.0
2025	9	53,734,281	767,633	70.0	53,734,281	767,633	70.0
2026	10	56,087,326	801,248	70.0	56,087,326	801,248	70.0
2027	11	58,543,412	836,334	70.0	58,543,412	836,334	70.0
2028	12	61,107,052	872,958	70.0	61,107,052	872,958	70.0
2029	13	63,782,954	911,185	70.0	63,782,954	911,185	70.0
2030	14	66,576,035	951,086	70.0	66,576,035	951,086	70.0
2031	15	69,491,426	992,735	70.0	69,491,426	992,735	70.0
2032	16	72,534,483	1,036,207	70.0	72,534,483	1,036,207	70.0
2033	17	75,710,797	1,081,583	70.0	75,710,797	1,081,583	70.0

Calendar Year	Project Year	VMT No Build	VHT No Build	Speed No Build	VMT Build	VHT Build	Speed Build
2034	18	79,026,202	1,128,946	70.0	79,026,202	1,128,946	70.0
2035	19	82,486,791	1,178,383	70.0	82,486,791	1,178,383	70.0
2036	20	86,098,921	1,229,985	70.0	86,098,921	1,229,985	70.0
2037	21	89,869,227	1,283,847	70.0	89,869,227	1,283,846	70.0
2038	22	93,804,636	1,340,068	70.0	93,804,636	1,340,066	70.0
2039	23	97,912,378	1,398,752	70.0	97,912,378	1,398,748	70.0
2040	24	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2041	25	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2042	26	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2043	27	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2044	28	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2045	29	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2046	30	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2047	31	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2048	32	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2049	33	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2050	34	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2051	35	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0

Calendar Year	Project Year	VMT No Build	VHT No Build	Speed No Build	VMT Build	VHT Build	Speed Build
2052	36	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2053	37	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
2054	38	102,200,000	1,460,006	70.0	102,200,000	1,460,000	70.0
Total		2,791,549,240	39,879,358		2,791,549,240	39,879,275	

Table 24: Annual Demand Projections (2 of 2)

Calendar Year	Project Year	Average Daily Traffic No Build	Average Peak Daily Traffic No Build	Average Daily Traffic Build	Average Peak Daily Traffic Build
2017	1	7,463	1,210	7,463	1,210
2018	2	7,790	1,263	7,790	1,263
2019	3	8,131	1,318	8,131	1,318
2020	4	8,487	1,376	8,487	1,376
2021	5	8,859	1,436	8,859	1,436
2022	6	9,247	1,499	9,247	1,499
2023	7	9,652	1,565	9,652	1,565
2024	8	10,074	1,633	10,074	1,633
2025	9	10,516	1,705	10,516	1,705
2026	10	10,976	1,780	10,976	1,780
2027	11	11,457	1,858	11,457	1,858
2028	12	11,958	1,939	11,958	1,939
2029	13	12,482	2,024	12,482	2,024
2030	14	13,029	2,112	13,029	2,112
2031	15	13,599	2,205	13,599	2,205
2032	16	14,195	2,301	14,195	2,301
2033	17	14,816	2,402	14,816	2,402

Calendar Year	Project Year	Average Daily Traffic No Build	Average Peak Daily Traffic No Build	Average Daily Traffic Build	Average Peak Daily Traffic Build
2034	18	15,465	2,507	15,465	2,507
2035	19	16,142	2,617	16,142	2,617
2036	20	16,849	2,732	16,849	2,732
2037	21	17,587	2,851	17,587	2,851
2038	22	18,357	2,976	18,357	2,976
2039	23	19,161	3,107	19,161	3,107
2040	24	20,000	3,243	20,000	3,243
2041	25	20,000	3,243	20,000	3,243
2042	26	20,000	3,243	20,000	3,243
2043	27	20,000	3,243	20,000	3,243
2044	28	20,000	3,243	20,000	3,243
2045	29	20,000	3,243	20,000	3,243
2046	30	20,000	3,243	20,000	3,243
2047	31	20,000	3,243	20,000	3,243
2048	32	20,000	3,243	20,000	3,243
2049	33	20,000	3,243	20,000	3,243
2050	34	20,000	3,243	20,000	3,243
2051	35	20,000	3,243	20,000	3,243

Calendar Year	Project Year	Average Daily Traffic No Build	Average Peak Daily Traffic No Build	Average Daily Traffic Build	Average Peak Daily Traffic Build
2052	36	20,000	3,243	20,000	3,243
2053	37	20,000	3,243	20,000	3,243
2054	38	20,000	3,243	20,000	3,243
Total		546,291	88,574	546,291	88,574

Table 25: Pertinent Quantifiable Impacts (1 of 2)

Calendar Year	Project Year	Person Hours Saved	Gasoline Consumption Avoided	Diesel Consumption Avoided	Accidents Avoided	Fatalities Avoided	Injuries Avoided	Damaged Vehicles Avoided
2025	9	-	-	-	22.4	0.5	16.8	22.5
2026	10	0	-	-	23.4	0.5	17.6	23.5
2027	11	0	-	-	24.4	0.5	18.3	24.5
2028	12	0	-	-	25.4	0.5	19.1	25.6
2029	13	0	-	-	26.6	0.5	20.0	26.7
2030	14	0	-	-	27.7	0.6	20.9	27.9
2031	15	0	-	-	28.9	0.6	21.8	29.1
2032	16	0	-	-	30.2	0.6	22.7	30.4
2033	17	0	-	-	31.5	0.6	23.7	31.7
2034	18	0	-	-	32.9	0.7	24.8	33.1
2035	19	1	-	-	34.3	0.7	25.8	34.5
2036	20	1	-	-	35.8	0.7	27.0	36.0
2037	21	2	-	-	37.4	0.8	28.2	37.6
2038	22	3	-	-	39.1	0.8	29.4	39.3
2039	23	5	-	-	40.8	0.8	30.7	41.0
2040	24	8	-	-	42.6	0.9	32.0	42.8
2041	25	8	-	-	42.6	0.9	32.0	42.8

Calendar Year	Project Year	Person Hours Saved	Gasoline Consumption Avoided	Diesel Consumption Avoided	Accidents Avoided	Fatalities Avoided	Injuries Avoided	Damaged Vehicles Avoided
2042	26	8	-	-	42.6	0.9	32.0	42.8
2043	27	8	-	-	42.6	0.9	32.0	42.8
2044	28	8	-	-	42.6	0.9	32.0	42.8
2045	29	8	-	-	42.6	0.9	32.0	42.8
2046	30	8	-	-	42.6	0.9	32.0	42.8
2047	31	8	-	-	42.6	0.9	32.0	42.8
2048	32	8	-	-	42.6	0.9	32.0	42.8
2049	33	8	-	-	42.6	0.9	32.0	42.8
2050	34	8	-	-	42.6	0.9	32.0	42.8
2051	35	8	-	-	42.6	0.9	32.0	42.8
2052	36	8	-	-	42.6	0.9	32.0	42.8
2053	37	8	-	-	42.6	0.9	32.0	42.8
2054	38	8	-	-	42.6	0.9	32.0	42.8
Total		127	0	0	1,099.1	22.7	826.9	1,105.0

Table 26: Pertinent Quantifiable Impacts (2 of 2)

Calendar Year	Project Year	Annual Emissions Avoided - VOC (tonnes)	Annual Emissions Avoided - NOx (tonnes)	Annual Emissions Avoided - PM (tonnes)	Annual Emissions Avoided - SO_2 (tonnes)	Annual Emissions Avoided - CO_2 (tonnes)	Vehicle Hours Saved
2025	9	-	-	-	-	-	-
2026	10	-	-	-	-	-	0.0
2027	11	-	-	-	-	-	0.0
2028	12	-	-	-	-	-	0.0
2029	13	-	-	-	-	-	0.0
2030	14	-	-	-	-	-	0.1
2031	15	-	-	-	-	-	0.1
2032	16	-	-	-	-	-	0.1
2033	17	-	-	-	-	-	0.2
2034	18	-	-	-	-	-	0.3
2035	19	-	-	-	-	-	0.5
2036	20	-	-	-	-	-	0.9
2037	21	-	-	-	-	-	1.4
2038	22	-	-	-	-	-	2.2
2039	23	-	-	-	-	-	3.5
2040	24	-	-	-	-	-	5.7

Calendar Year	Project Year	Annual Emissions Avoided - VOC (tonnes)	Annual Emissions Avoided - NOx (tonnes)	Annual Emissions Avoided - PM (tonnes)	Annual Emissions Avoided - SO_2 (tonnes)	Annual Emissions Avoided - CO_2 (tonnes)	Vehicle Hours Saved
2041	25	-	-	-	-	-	5.7
2042	26	-	-	-	-	-	5.7
2043	27	-	-	-	-	-	5.7
2044	28	-	-	-	-	-	5.7
2045	29	-	-	-	-	-	5.7
2046	30	-	-	-	-	-	5.7
2047	31	-	-	-	-	-	5.7
2048	32	-	-	-	-	-	5.7
2049	33	-	-	-	-	-	5.7
2050	34	-	-	-	-	-	5.7
2051	35	-	-	-	-	-	5.7
2052	36	-	-	-	-	-	5.7
2053	37	-	-	-	-	-	5.7
2054	38	-	-	-	-	-	5.7
Total		0.0	0.0	0.0	0.0	0.0	95

Table 27: Travel Time Savings and Pertinent Quantifiable Impacts

Calendar Year	Project Year	Vehicle Hours Saved	Person Hours Saved	Travel Time Savings (Undiscounted)	Travel Time Savings (Discounted 7%)	Travel Time Savings (Discounted 3%)
2025	9	-	-	-	-	-
2026	10	0	0	$0	$0	$0
2027	11	0	0	$0	$0	$0
2028	12	0	0	$0	$0	$0
2029	13	0	0	$0	$0	$0
2030	14	0	0	$1	$0	$1
2031	15	0	0	$1	$0	$1
2032	16	0	0	$2	$1	$1
2033	17	0	0	$3	$1	$2
2034	18	0	0	$5	$2	$3
2035	19	1	1	$8	$2	$5
2036	20	1	1	$13	$3	$7
2037	21	1	2	$22	$5	$12
2038	22	2	3	$35	$8	$18
2039	23	4	5	$55	$12	$28
2040	24	6	8	$89	$17	$44
2041	25	6	8	$89	$16	$42
2042	26	6	8	$89	$15	$41

Calendar Year	Project Year	Vehicle Hours Saved	Person Hours Saved	Travel Time Savings (Undiscounted)	Travel Time Savings (Discounted 7%)	Travel Time Savings (Discounted 3%)
2043	27	6	8	$89	$14	$40
2044	28	6	8	$89	$13	$39
2045	29	6	8	$89	$12	$38
2046	30	6	8	$89	$12	$37
2047	31	6	8	$89	$11	$35
2048	32	6	8	$89	$10	$34
2049	33	6	8	$89	$10	$33
2050	34	6	8	$89	$9	$32
2051	35	6	8	$89	$8	$31
2052	36	6	8	$89	$8	$31
2053	37	6	8	$89	$7	$30
2054	38	6	8	$89	$7	$29
Total		95	127	$1,476	$205	$614

Table 28: Vehicle Operating Cost Savings and Pertinent Quantifiable Impacts

Calendar Year	Project Year	Gasoline Consumption Avoided	Diesel Consumption Avoided	Fuel Cost Savings	Non-Fuel Cost Savings	Vehicle Operating Cost Savings (undiscounted)	Vehicle Operating Cost Savings (7%)	Vehicle Operating Cost Savings (3%)
2025	9	-	-	$0	-	$0	$0	$0
2026	10	-	-	$0	-	$0	$0	$0
2027	11	-	-	$0	-	$0	$0	$0
2028	12	-	-	$0	-	$0	$0	$0
2029	13	-	-	$0	-	$0	$0	$0
2030	14	-	-	$0	-	$0	$0	$0
2031	15	-	-	$0	-	$0	$0	$0
2032	16	-	-	$1	-	$1	$0	$0
2033	17	-	-	$1	-	$1	$0	$1
2034	18	-	-	$2	-	$2	$1	$1
2035	19	-	-	$3	-	$3	$1	$2
2036	20	-	-	$5	-	$5	$1	$3
2037	21	-	-	$9	-	$9	$2	$4
2038	22	-	-	$14	-	$14	$3	$7
2039	23	-	-	$22	-	$22	$4	$11
2040	24	-	-	$23	-	$23	$4	$11

Calendar Year	Project Year	Gasoline Consumption Avoided	Diesel Consumption Avoided	Fuel Cost Savings	Non-Fuel Cost Savings	Vehicle Operating Cost Savings (undiscounted)	Vehicle Operating Cost Savings (7%)	Vehicle Operating Cost Savings (3%)
2041	25	-	-	$23	-	$23	$4	$10
2042	26	-	-	$23	-	$23	$4	$10
2043	27	-	-	$23	-	$23	$3	$10
2044	28	-	-	$23	-	$23	$3	$10
2045	29	-	-	$23	-	$23	$3	$9
2046	30	-	-	$23	-	$23	$3	$9
2047	31	-	-	$23	-	$23	$3	$9
2048	32	-	-	$23	-	$23	$2	$9
2049	33	-	-	$24	-	$24	$2	$9
2050	34	-	-	$24	-	$24	$2	$8
2051	35	-	-	$24	-	$24	$2	$8
2052	36	-	-	$24	-	$24	$2	$8
2053	37	-	-	$24	-	$24	$2	$8
2054	38	-	-	$24	-	$24	$2	$8
Total		0	0	$383	$0	$383	$53	$159

Table 29: Emission Cost Savings

Calendar Year	Project Year	Emission Cost Savings - CO_2	Emission Cost Savings - NOx	Emission Cost Savings - PM	Emission Cost Savings - SO_2	Emission Cost Savings - VOC	Emission Cost Savings (undiscounted)	Emission Cost Savings (7%)	Emission Cost Savings (3%)
2025	9	-	-	-	-	-	-	-	-
2026	10	-	-	-	-	-	-	-	-
2027	11	-	-	-	-	-	-	-	-
2028	12	-	-	-	-	-	-	-	-
2029	13	-	-	-	-	-	-	-	-
2030	14	-	-	-	-	-	-	-	-
2031	15	-	-	-	-	-	-	-	-
2032	16	-	-	-	-	-	-	-	-
2033	17	-	-	-	-	-	-	-	-
2034	18	-	-	-	-	-	-	-	-
2035	19	-	-	-	-	-	-	-	-
2036	20	-	-	-	-	-	-	-	-
2037	21	-	-	-	-	-	-	-	-
2038	22	-	-	-	-	-	-	-	-
2039	23	-	-	-	-	-	-	-	-
2040	24	-	-	-	-	-	-	-	-

Calendar Year	Project Year	Emission Cost Savings - CO_2	Emission Cost Savings - NOx	Emission Cost Savings - PM	Emission Cost Savings - SO_2	Emission Cost Savings - VOC	Emission Cost Savings (undiscounted)	Emission Cost Savings (7%)	Emission Cost Savings (3%)
2041	25	-	-	-	-	-	-	-	-
2042	26	-	-	-	-	-	-	-	-
2043	27	-	-	-	-	-	-	-	-
2044	28	-	-	-	-	-	-	-	-
2045	29	-	-	-	-	-	-	-	-
2046	30	-	-	-	-	-	-	-	-
2047	31	-	-	-	-	-	-	-	-
2048	32	-	-	-	-	-	-	-	-
2049	33	-	-	-	-	-	-	-	-
2050	34	-	-	-	-	-	-	-	-
2051	35	-	-	-	-	-	-	-	-
2052	36	-	-	-	-	-	-	-	-
2053	37	-	-	-	-	-	-	-	-
2054	38	-	-	-	-	-	-	-	-
Total		$0	$0	$0	$0	$0	$0	$0	$0

Table 22: Accident Cost Savings and Pertinent Quantifiable Impacts

Calendar Year	Project Year	Accidents Avoided	Fatality Cost Savings	Injury Cost Savings	PDO Cost Savings	Accident Cost Savings (undiscounted)	Accident Cost Savings (7%)	Accident Cost Savings (3%)
2025	9	22.37	$4,427,181	$1,862,739	$95,643	$6,385,564	$3,473,324	$4,894,003
2026	10	23.35	$4,621,049	$1,944,310	$99,832	$6,665,191	$3,388,245	$4,959,528
2027	11	24.37	$4,823,407	$2,029,452	$104,203	$6,957,062	$3,305,250	$5,025,930
2028	12	25.44	$5,034,626	$2,118,322	$108,766	$7,261,714	$3,224,288	$5,093,220
2029	13	26.56	$5,255,094	$2,211,084	$113,529	$7,579,708	$3,145,309	$5,161,412
2030	14	27.72	$5,485,217	$2,307,909	$118,501	$7,911,626	$3,068,265	$5,230,517
2031	15	28.93	$5,725,417	$2,408,973	$123,690	$8,258,079	$2,993,108	$5,300,547
2032	16	30.20	$5,976,135	$2,514,463	$129,107	$8,619,704	$2,919,792	$5,371,515
2033	17	31.52	$6,237,832	$2,624,572	$134,760	$8,997,164	$2,848,272	$5,443,432
2034	18	32.90	$6,510,989	$2,739,503	$140,661	$9,391,154	$2,778,504	$5,516,313
2035	19	34.34	$6,796,108	$2,859,467	$146,821	$9,802,396	$2,710,444	$5,590,169
2036	20	35.85	$7,093,712	$2,984,684	$153,250	$10,231,647	$2,644,052	$5,665,015
2037	21	37.42	$7,404,349	$3,115,385	$159,961	$10,679,695	$2,579,286	$5,740,862
2038	22	39.06	$7,728,588	$3,251,809	$166,966	$11,147,363	$2,516,107	$5,817,725
2039	23	40.77	$8,067,026	$3,394,207	$174,277	$11,635,510	$2,454,475	$5,895,617
2040	24	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$2,394,352	$5,974,552
2041	25	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$2,237,713	$5,800,536

Calendar Year	Project Year	Accidents Avoided	Fatality Cost Savings	Injury Cost Savings	PDO Cost Savings	Accident Cost Savings (undiscounted)	Accident Cost Savings (7%)	Accident Cost Savings (3%)
2042	26	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$2,091,320	$5,631,588
2043	27	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,954,505	$5,467,561
2044	28	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,826,640	$5,308,312
2045	29	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,707,140	$5,153,701
2046	30	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,595,458	$5,003,593
2047	31	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,491,082	$4,857,857
2048	32	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,393,535	$4,716,366
2049	33	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,302,369	$4,578,997
2050	34	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,217,167	$4,445,628
2051	35	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,137,540	$4,316,143
2052	36	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$1,063,121	$4,190,430
2053	37	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$993,571	$4,068,379
2054	38	42.55	$8,420,285	$3,542,840	$181,909	$12,145,034	$928,571	$3,949,883
Total		1,099.1	$217,490,999	$91,509,481	$4,698,606	$313,699,086	$67,382,804	$154,169,333

Table 31: Hurricane Resiliency Cost Savings and Pertinent Quantifiable Impacts (1 of 2)

Calendar Year	Project Year	Breakeven Fatalities Avoided (Assuming 7% Discount)	Hurricane Resiliency Required Benefits	Hurricane Resiliency Expected Benefits	Hurricane Resiliency Cost Savings (7%)	Minimum Evacuation Length (hrs) No Build	Minimum Evacuation Length (hrs) Build
2025	9	0.87	$252,177,772	$8,321,866	$4,526,544	4.0	2.0
2026	10	0.87	$252,177,772	$8,321,866	$4,230,415	4.0	2.0
2027	11	0.87	$252,177,772	$8,321,866	$3,953,659	4.0	2.0
2028	12	0.87	$252,177,772	$8,321,866	$3,695,008	4.0	2.0
2029	13	0.87	$252,177,772	$8,321,866	$3,453,279	4.0	2.0
2030	14	0.87	$252,177,772	$8,321,866	$3,227,363	4.0	2.0
2031	15	0.87	$252,177,772	$8,321,866	$3,016,227	4.0	2.0
2032	16	0.87	$252,177,772	$8,321,866	$2,818,904	4.0	2.0
2033	17	0.87	$252,177,772	$8,321,866	$2,634,490	4.0	2.0
2034	18	0.87	$252,177,772	$8,321,866	$2,462,140	4.0	2.0
2035	19	0.87	$252,177,772	$8,321,866	$2,301,065	4.0	2.0
2036	20	0.87	$252,177,772	$8,321,866	$2,150,528	4.0	2.0
2037	21	0.87	$252,177,772	$8,321,866	$2,009,840	4.1	2.0
2038	22	0.87	$252,177,772	$8,321,866	$1,878,355	4.1	2.0
2039	23	0.87	$252,177,772	$8,321,866	$1,755,472	4.1	2.0
2040	24	0.87	$252,177,772	$8,321,866	$1,640,628	4.1	2.0

Calendar Year	Project Year	Breakeven Fatalities Avoided (Assuming 7% Discount)	Hurricane Resiliency Required Benefits	Hurricane Resiliency Expected Benefits	Hurricane Resiliency Cost Savings (7%)	Minimum Evacuation Length (hrs) No Build	Minimum Evacuation Length (hrs) Build
2041	25	0.87	$252,177,772	$8,321,866	$1,533,297	4.1	2.0
2042	26	0.87	$252,177,772	$8,321,866	$1,432,988	4.1	2.0
2043	27	0.87	$252,177,772	$8,321,866	$1,339,241	4.1	2.0
2044	28	0.87	$252,177,772	$8,321,866	$1,251,627	4.1	2.0
2045	29	0.87	$252,177,772	$8,321,866	$1,169,745	4.1	2.0
2046	30	0.87	$252,177,772	$8,321,866	$1,093,220	4.1	2.0
2047	31	0.87	$252,177,772	$8,321,866	$1,021,701	4.1	2.0
2048	32	0.87	$252,177,772	$8,321,866	$954,860	4.1	2.0
2049	33	0.87	$252,177,772	$8,321,866	$892,393	4.1	2.0
2050	34	0.87	$252,177,772	$8,321,866	$834,012	4.1	2.0
2051	35	0.87	$252,177,772	$8,321,866	$779,450	4.1	2.0
2052	36	0.87	$252,177,772	$8,321,866	$728,458	4.1	2.0
2053	37	0.87	$252,177,772	$8,321,866	$680,802	4.1	2.0
2054	38	0.87	$252,177,772	$8,321,866	$636,264	4.1	2.0
Total		26.01	$7,565,333,161	$249,655,994	$60,101,976		

Appendix A. Letters of Support

JOHN CORNYN
TEXAS

United States Senate

WASHINGTON, DC 20510–4305

September 25, 2017

The Honorable Elaine Chao
Secretary
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590

Dear Secretary Chao:

I am writing to express my support for the U.S. Highway 69 Hurricane Evacuation Corridor Widening Project INFRA application submitted to the U.S. Department of Transportation by the Texas Department of Transportation (TxDOT).

As you and your staff review the proposal, I trust you will give full consideration to the many strengths of this application. As you may know, U.S. 69 functions as an important north-south route through east Texas and is a critical hurricane evacuation corridor. Currently, the portion of U.S. 69 that runs through Tyler and Hardin counties is a two-lane, undivided rural roadway that quickly becomes overwhelmed in emergencies, as recently witnessed in Hurricane Harvey. This grant, if awarded, would enable TxDOT to widen a highly traveled portion of U.S. 69 from two lanes to a four lane, divided facility. This widening is necessary to provide the residents of southeast Texas safe passage during extreme weather events and emergencies.

I would appreciate your efforts to ensure that I am kept informed of the progress of this application. Please contact Andrea McGee (Andrea_McGee@cornyn.senate.gov), my Grants Coordinator, with any developments regarding this proposal as soon as they are available.

Thank you for your assistance and consideration.

Sincerely,

John Cornyn

JOHN CORNYN
United States Senator

BRIAN BABIN
36TH DISTRICT, TEXAS

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
CHAIRMAN, SUBCOMMITTEE ON SPACE
SUBCOMMITTEE ON ENVIRONMENT

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
SUBCOMMITTEE ON HIGHWAYS AND TRANSIT
SUBCOMMITTEE ON RAILROADS, PIPELINES, AND HAZARDOUS MATERIALS
SUBCOMMITTEE ON WATER RESOURCES AND ENVIRONMENT

Congress of the United States
House of Representatives
Washington, DC 20515–4336

316 CANNON HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-1555

203 IVY AVENUE, SUITE 600
DEER PARK, TX 77536
(832) 780-0966

420 GREEN AVENUE
ORANGE, TX 77630
(409) 883-8075

SATELLITE OFFICES:
WOODVILLE, TX
CLEVELAND, TX

CONGRESSIONAL AEROSPACE CAUCUS
CONGRESSIONAL SPORTSMEN'S CAUCUS
CONGRESSIONAL REFINERY CAUCUS
CONGRESSIONAL PRO-LIFE CAUCUS
MILITARY VETS CAUCUS

October 27, 2017

The Honorable Elaine Chao
Secretary of Transportation
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590

Dear Secretary Chao,

I would like to express my support for the Texas Department of Transportation's INFRA Grant application for the United States Highway 69 Hurricane Evacuation Corridor Widening Project in Tyler County and Hardin County, Texas.

The US 69 corridor functions as an important north-south route through east Texas and is a critical hurricane evacuation corridor for southeast Texas. Additional capacity to provide safe passage during extreme weather events and emergencies must be provided. US 69 serves major Texas cities such as Beaumont, Lufkin, Tyler and Denison; connects I-10, I-69 and future I-14 with the Port of Beaumont and is heavily utilized by the Texas timber industry, making the highway a significant regional freight corridor.

US 69 through Tyler and Hardin Counties is currently a two-lane, undivided rural roadway. INFRA grant funding of $111 million would be used to widen a segment from Warren to north of Kountze, Texas from two lanes to a four lane divided facility. As this project will require numerous federal permits, selection for an INFRA grant will allow TxDOT to utilize USDOT's offer to coordinate with other federal agencies to ensure timely permit determinations. Streamlining the review process will result in time savings, allowing this critical safety project to advance more quickly.

I emphasize my support of this rural safety project and thank you for your consideration and hopeful selection of the US 69 Hurricane Evacuation Corridor Widening Project for the INFRA program.

Sincerely,

Brian Babin, D.D.S.
Member of Congress

CAPITOL OFFICE
P.O. Box 12068
Austin, Texas 78711
(512) 463-0103
FAX: (512) 463-1526
Dial 711 for Relay Calls

COMMITTEES:
Transportation, Chair
Finance
Intergovernmental Relations
Natural Resources & Economic Development

ROBERT L. NICHOLS
STATE SENATOR

October 11, 2017

The Honorable Elaine Chao
Secretary
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590

RE: TxDOT's FY2017-2018 INFRA application for US 69 in Tyler and Hardin Counties, Texas

Dear Secretary Chao,

I, Senator Nichols, would like to express my support for the Texas Department of Transportation's INFRA Grant application for the United States Highway 69 Hurricane Evacuation Corridor Widening Project in Tyler County and Hardin County, Texas.

The US 69 corridor functions as an important north-south route through east Texas and is a critical hurricane evacuation corridor for southeast Texas. Additional capacity to provide safe passage during extreme weather events and emergencies must be provided. US 69 serves major Texas cities such as Beaumont, Lufkin, Tyler and Denison; connects I-10, I-69 and future I-14 with the Port of Beaumont and is heavily utilized by the Texas timber industry, making the highway a significant regional freight corridor. It is also a critical hurricane evacuation route, as demonstrated by Hurricane Harvey.

US 69 through Tyler and Hardin Counties is currently a two-lane, undivided rural roadway. INFRA grant funding of $111 million would be used to widen a segment from Warren to north of Kountze, Texas from two lanes to a four lane divided facility. As this project will require numerous federal permits, selection for an INFRA grant will allow TxDOT to utilize USDOT's offer to coordinate with other federal and state agencies to ensure timely permit determinations. These coordination challenges make the project uniquely situated to take advantage of USDOT's interest in using INFRA Grant applicant projects as potential models for future environmental review and permitting improvements. Streamlining the review process will result in time savings, allowing this critical safety project to advance more quickly.

JACKSONVILLE OFFICE
329 Neches Street
Jacksonville, Texas 75766
(903) 589-3003
FAX: (903) 589-0203

NACOGDOCHES OFFICE
202 E. Pilar Street, Ste. 309
Nacogdoches, Texas 75961
(936) 564-4252
FAX: (936) 564-4276

LUFKIN OFFICE
2915 Atkinson Drive
Lufkin, Texas 75901
(936) 699-4988
FAX: (936) 699-4991

CONROE OFFICE
15260 Hwy. 105 W., Ste. 230-H, Box 5
Montgomery, Texas 77356
(936) 588-7391
FAX: (936) 588-1713

Senate District 3
E-mail: robert.nichols@senate.texas.gov

I emphasize my support of this rural safety project and thank you for your consideration and hopeful selection of the US 69 Hurricane Evacuation Corridor Widening Project for the INFRA program.

Sincerely,

Robert Nichols
State Senator

cc: RLN/al

STATE REPRESENTATIVE
JAMES WHITE

CORRECTIONS - CHAIR
INTERNATIONAL TRADE &
INTERGOVERNMENTAL AFFAIRS

DISTRICT 19
HARDIN, JASPER
NEWTON, POLK, TYLER

October 5, 2017

The Honorable Elaine Chao
Secretary
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590

RE: TxDOT's FY2017-2018 INFRA application for US 69 in Tyler and Hardin Counties, Texas

Dear Secretary Chao,

I would like to express my support for the Texas Department of Transportation's INFRA Grant application for the United States Highway 69 Hurricane Evacuation Corridor Widening Project in Tyler County and Hardin County, Texas.

The US 69 corridor functions as an important north-south route through east Texas and is a critical hurricane evacuation corridor for southeast Texas. Additional capacity to provide safe passage during extreme weather events and emergencies must be provided. US 69 serves major Texas cities such as Beaumont, Lufkin, Tyler and Denison; connects I-10, I-69 and future I-14 with the Port of Beaumont and is heavily utilized by the Texas timber industry, making the highway a significant regional freight corridor.

US 69 through Tyler and Hardin Counties is currently a two-lane, undivided rural roadway. INFRA grant funding of $111 million would be used to widen a segment from Warren to north of Kountze, Texas from two lanes to a four lane divided facility. As this project will require numerous federal permits, selection for an INFRA grant will allow TxDOT to utilize USDOT's offer to coordinate with other federal agencies to ensure timely permit determinations. Streamlining the review process will result in time savings, allowing this critical safety project to advance more quickly.

I emphasize my support of this rural safety project and thank you for your consideration and hopeful selection of the US 69 Hurricane Evacuation Corridor Widening Project for the INFRA program.

For God & Texas,

James White
State Representative
House District 19

CAPITOL: P.O. BOX 2910 • AUSTIN, TEXAS 78768-2910 • (512) 463-0490 • FAX (512) 463-9059
DISTRICT: P.O. BOX 395 • WOODVILLE, TEXAS 75979 • (409) 283-3700 • FAX (409) 283-3702
JAMES.WHITE@HOUSE.TEXAS.GOV

Wayne McDaniel
COUNTY JUDGE

300 West Monroe Street
Kountze, Texas 77625
(409) 246-5120
Wayne.McDaniel@Co.Hardin.TX.US

October 11, 2017

The Honorable Elaine Chao, Secretary
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590

RE: TxDOT's FY2017-2018 INFRA application for US 69 in Tyler and Hardin Counties

Dear Secretary Chao,

I am writing to express my full support for the Texas Department of Transportation's INFRA Grant application for the United States Highway 69 Hurricane Evacuation Corridor Widening Project in Tyler County and Hardin County, Texas.

The US 69 corridor functions as an important north-south route through East Texas and is a critical hurricane evacuation corridor for Southeast Texans. Additional capacity to provide safe passage during extreme weather events and emergencies is vital and must be expedited. US 69 serves major Texas cities such as Beaumont, Lufkin, Tyler and Denison; it connects I-10, I-69 and future I-14 with the Port of Beaumont and is heavily utilized by the Texas timber industry, making the highway a significant regional freight corridor.

US 69 through Tyler and Hardin Counties is currently a two-lane, undivided rural roadway. INFRA grant funding in the amount of $111 Million would be used to widen a segment from north of Kountze, in Hardin County, north to Warren, Texas from two lanes to a four lane divided facility. As this project will require numerous federal permits, selection for an INFRA grant will allow TxDOT to utilize USDOT's offer to coordinate with other federal agencies to ensure timely permit determinations. Streamlining the review process will result in valuable time savings, allowing this critical safety project to advance more rapidly.

Again, I emphasize my support of this rural safety project and appreciate your consideration, and hopeful selection of the US 69 Hurricane Evacuation Corridor Widening Project for the INFRA program.

Respectfully submitted,

Wayne McDaniel
COUNTY JUDGE

cc: Hardin County Commissioners Court