



# FARM TO MARKET AND BACK

*Revitalizing the Chocolate Bayou Bridge*

February 2024

Bridge Investment Program Grant Application



# Contact Information

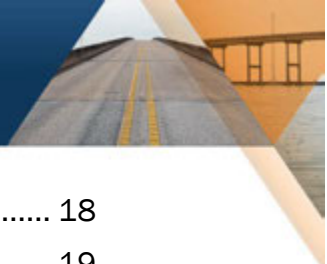
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# 1. Basic Project Information—Project Description, Location, and Parties

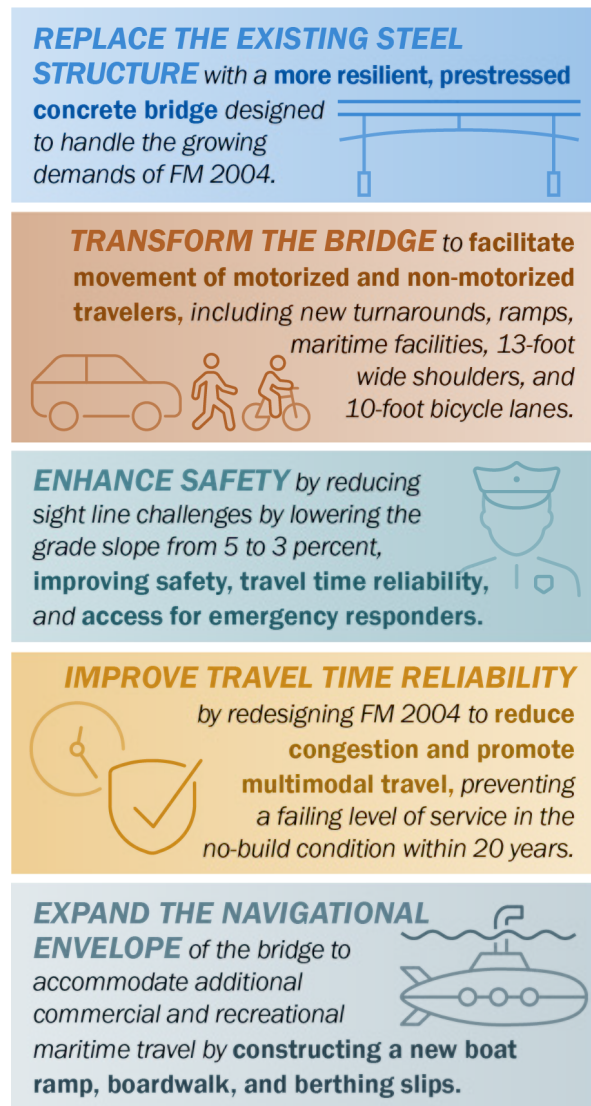
## 1.1 Project Description

The Texas Department of Transportation (TxDOT) is pleased to submit this application for the reconstruction of the Farm-to-Market (FM) 2004 bridge at Chocolate Bayou, located in Brazoria County, Texas. This application requests **\$79,763,916** of Bridge Investment Program (BIP) funding to reconstruct this bridge, which is currently in poor condition. The *Farm to Market and Back: Revitalizing the Chocolate Bayou Bridge* (the Project) will improve the structural integrity, mobility, and safety of the FM 2004 bridge. This project is designed to tackle **three key transportation challenges:**

1. The current bridge is in **Poor** condition according to the National Bridge Inventory (NBI). The main span is steel, requiring frequent painting and repairs to reduce corrosion.
2. The bridge is a choke point on FM 2004, lacking shoulders for roadside emergencies and safe bicycle or pedestrian travel.
3. Brazoria County is **growing**. TxDOT projects an 81% increase in Average Annual Daily Traffic (AADT) by 2044, and the Texas State Demographer projects a population increase from 373,031 in 2020 to 438,208 in 2044, a **17.8%** increase. TxDOT is widening FM 2004 to a four-lane highway, which the existing structure is underbuilt to support.

This Project will address all three challenges by constructing a new bridge made of more resilient materials, including Tx54 prestressed concrete I-girders and trapezoidal steel box girders supporting a 630-foot unit span over the channel. *Farm to Market and Back* supports the expanding South Texas economy: FM 2004 will need to grow, and replacing this bridge will facilitate that process by constructing resilient infrastructure capable of accommodating emergency responders and multimodal travel.

Figure 1-1 | Key Project Features



This project is a bridge replacement focused on **servicing and bettering the community**. As a step toward the eventual expansion of FM 2004 into a four-lane highway, this bridge is being built to the future width planned for the corridor. While that full build-out to a four-lane highway is years away, in the meantime the extra bridge width can be used to create ample bicycle facilities along with a robust emergency lane. In the near term, that will convert the Chocolate Bayou bridge from a barrier for bicyclists (high speeds without any shoulder or bike lane) into a safe, comfortable connection for rural riders. In addition, this bridge replacement will include:

- Expansion of an existing public boat ramp and parking lot for recreational fishing;
- A new timber boardwalk, dual launch, and two-vessel berthing slip; and
- A breakwater to shield launch ramps from passing vessels' wakes.

The new boat ramp will meet requirements for the Americans with Disabilities Act (ADA) and encourage additional investments in maritime recreation nearby.

## 1.2 Project Location

This project will replace the FM 2004 Bridge Over the Chocolate Bayou (NBI Structure Number 120200252302011). The Project Area is located on the southeastern coast of Texas, entirely within Brazoria County. Originally constructed in 1952 to connect State Highway 3 to FM 1765, FM 2004 stretches 47 miles between SH 36/FM 2611 and SH 3/Galveston Road as shown on the next page in **Figure 1-2**. The limits of this project are near the midpoint of the route.

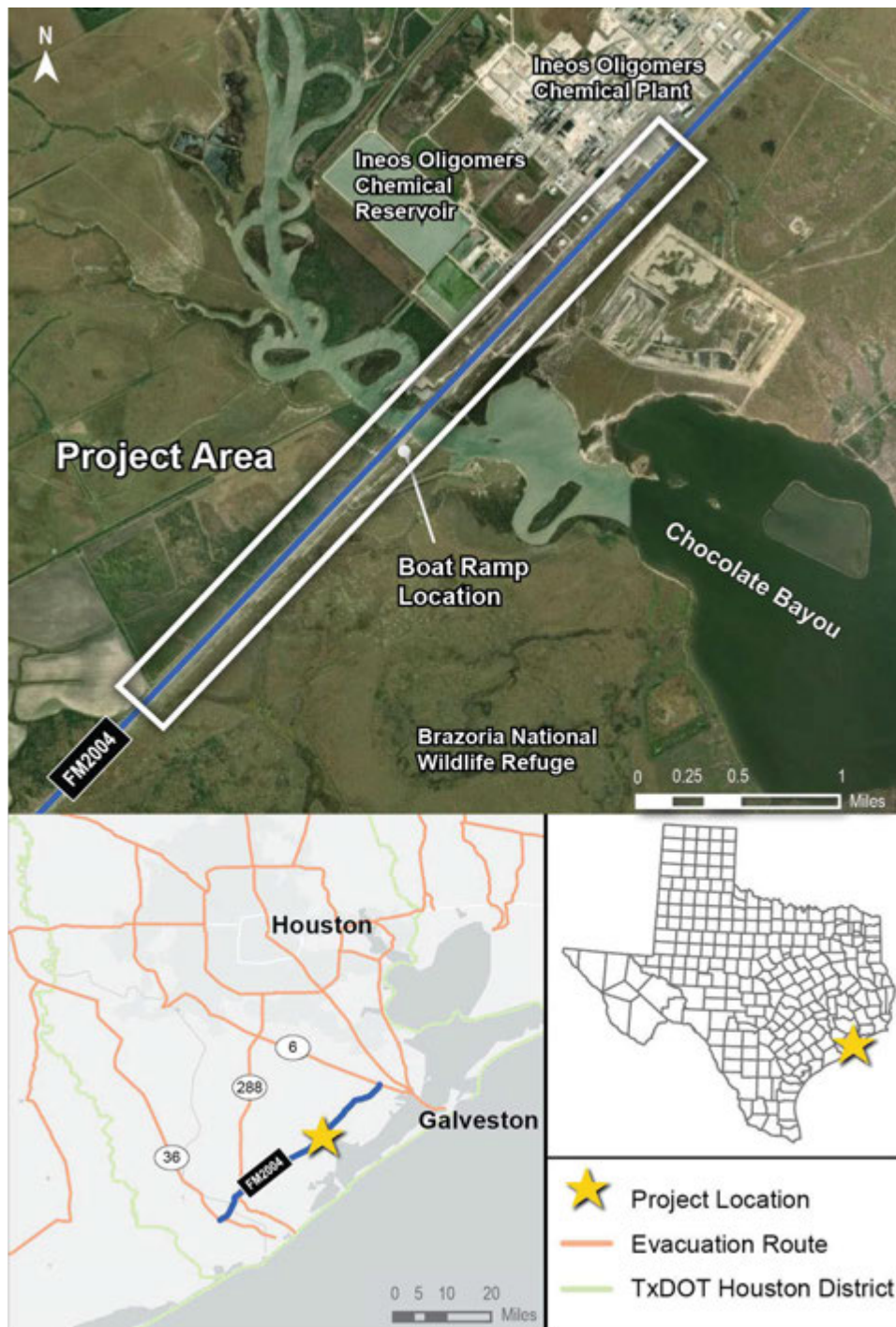
The limits fall within Census Tract 6617 for both the 2020 and 2010 census. The project location is not in a Historically Disadvantaged Community (HDC) or in an Area of Persistent Poverty (APP), per U.S. DOT criteria. However, a cluster of 16 census tracts to the south and west of the project location, including the census tract adjacent to the project site to the south, are HDC census tracts. This cluster of tracts lines the Gulf Coast to the south of the project location, and another cluster of HDC tracts lines the Gulf Coast to the northeast of the project location. Improving the mobility and bolstering the economic development of this area will provide benefits for residents and businesses in these areas.

The project is in a **rural area**, located entirely **outside** the boundary of a 2020 Census-designated urban area. Nearby cities include Galveston 32 miles to the northeast, Freeport 23 miles to the southwest, and Houston 50 miles north.

### *Contributing to the Functioning and Growth of the Economy*

This section of FM 2004 is approximately 3.5 miles southwest of FM 2917 and serves as a direct connection for Texas evacuation routes on SH 6 and SH 288, making the bridge over Chocolate Bayou an essential part of State safety and resiliency planning. FM 2004 is a critical part of the Texas Freight Network. East of the bridge, major employers include manufacturing plants for INEOS Chemical and Ascend Performance, chemical manufacturers which rely on timely delivery of raw materials and distribution of finished products. This bridge is one of the only ways to transport heavy freight across the region, especially across the Chocolate Bayou.

Figure 1-2 | Project Area Map



In the event of a failure, closure, weight limit posting, or other limitation on this bridge, the next-closest crossing is located more than seven miles due north. Bridge users—and particularly heavy freight operators—would be forced to use a 40+-mile detour across the bayou, severely limiting overland access to the businesses, distribution centers, and recreational facilities near the project area. In addition, Amazon shipping facilities have



recently expanded nearby, which will increase freight traffic as the population increases and the demands on the distribution network continue to grow. For this bridge, that will mean accelerated deterioration of the existing structure, exacerbating the need for replacement.

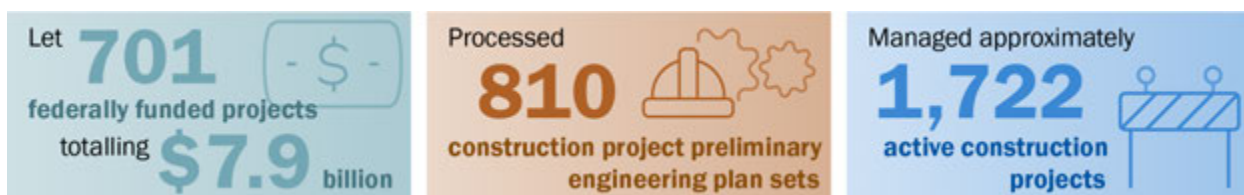
Figure 1-3 | Project Area Freight Network Map



### 1.3 Lead Applicant

As a grantee of the 2022 Bridge Investment Program for the Goliad County U.S. 59 San Antonio River Bridge Replacement Project, TxDOT has previous experience successfully receiving and administering funds from this specific Federal Highway Administration grant program as recently as a year ago. TxDOT works closely with the FHWA on an ongoing basis and they have partnered together in a Stewardship and Oversight Agreement. **Figure 1-4** below summarizes Texas' record of Federal project and program delivery reported annually [from the most recent available report](#) (2022).

Figure 1-4 | TxDOT's Record of Project Delivery





TxDOT's successful management of billions of dollars' worth of Federally funded projects, as well as successful partnership with FHWA-TX, is indicative of TxDOT's experience with the receipt and expenditure of Federal-aid Highway Program funds. TxDOT's excellence in asset management of its extensive transportation network reflects TxDOT's ability to receive and administer funds from FHWA.

## 1.4 Other Public and Private Parties

Brazoria County will be a partner in the financing of this project as well as the long-term operations and maintenance of the recreational facility components. The County has committed to providing \$1,000,000 to support construction, which will include upgrades to the community boat ramp facilities beneath the existing bridge. Following completion, the County will maintain the boat ramp and nearby recreational facilities.

## 1.5 Additional Eligibility Requirements

This bridge will be maintained by TxDOT's Houston District pursuant to the principles, objectives, and guidance outlined in TxDOT's [2022 Transportation Asset Management Plan \(TAMP\)](#). This plan sets strategies to maintain bridges in a state of good repair to prevent unexpected cases of deterioration and make asset conditions more predictable for rural communities and the freight industry. This project fits squarely into the overarching strategy outlined in the TAMP, and replacing this structure before it fails will help to reduce maintenance costs over time.

The project will adhere to a maintenance plan which conforms to TxDOT bridge inspection standards and the 2022 update to the Nation Bridge Inspection Standards. TxDOT is among the Nation's leaders in bridge inspection frequency and preparedness. In addition to the Federally required biannual NBI inspection cycle, this bridge will also be inspected by TxDOT engineers on all "off" years for NBI inspections, staggered to ensure the bridge is inspected every year. The new bridge will also have the following maintenance advantages:

- The bridge design will follow TxDOT's newer bridge design standards that utilize continuous decks over interior bent caps.
- The new bridge will have longer and fewer spans, reducing the number of substructure elements in the channel and the number of deck joints to maintain.
- The reduction of substructure elements will catch less bayou debris, reduce debris removal needs, and significantly reduce the number of deck joints that maintenance crews or maintenance contractors would need to clean and maintain.

This project will create safe accommodations for cyclists which do not exist on the current structure. The proposed construction will include establishment of a 10-foot-wide, separated bike-accessible shoulder lane adjacent to the travel lane. That bikeable shoulder lane will also be separate from dedicated interior shoulders for each travel lane as shown in [Figure 4-2](#), ensuring that both motorists and cyclists will be able to travel safely across the bridge and access the boat ramp and recreational facilities nearby.

## 2. National Bridge Inventory Data

According to the National Bridge Inventory, the FM 2004 bridge across the Chocolate Bayou (Structure Number 120200252302011) is currently in Poor condition (as of 2023). The deck rating is in Poor condition, noting advanced section loss, deterioration, and spalling. This bridge spans the tidal portion of the Chocolate Bayou, subjecting the piers in the water to the impacts of scour. More detailed National Bridge Inventory information can be found in the Project Application Template submitted with this application.

## 3. Project Budget—Grant Funds, Sources, and Uses of All Project Funding

The total future eligible cost of this project is estimated to be **\$99,704,895**. That estimate includes the completion of all environmental assessments and mitigation, permitting, design, utility coordination, construction of the new bridge, and demolition of the old structure.

### 3.1 Funding Sources

TxDOT is requesting **\$79,763,916** in Bridge Investment Program funding to support construction of this replacement bridge. Brazoria County will contribute **\$1,000,000** in local match, and TxDOT will allocate an additional **\$18,940,979** from other non-Federal funding sources, **specifically 100% State funds derived from TxDOT Unified Transportation Program (UTP) Category 6 funds, which support Structures Replacement for Bridges**. A breakdown of funding by source can be found in [Table 3-1](#).

The State of Texas is a stable and reliable funding partner committed to maintaining the existing system and building new infrastructure to encourage economic growth. A broad range of State funding sources leverage Federal funding support and are dedicated by the Texas Constitution to fund public roadway projects, including:

- State motor vehicle fuels tax;
- State vehicle registration fees;
- Oil and gas severance taxes (Proposition 1); and
- General sales and use tax, motor vehicles sales, and rental tax (Proposition 7).

Should this project be awarded, TxDOT will commit **\$18,940,979** in matching non-Federal funding, in addition to **\$1,000,000** from Brazoria County, for a total non-federal commitment of **\$19,940,979**. This project has not been previously submitted for U.S. DOT discretionary grant funding. The funding source for future maintenance and operations of this structure will be **Category 1** funds, identified in the [TxDOT Unified Transportation Program](#) (UTP) for Preventative Maintenance and Rehabilitation.

Table 3-1 | Project Budget by Funding Source

Funding Source	Funding Amount	Cost Share
BIP Funds	\$79,763,916	80%
Other Federal Funds	\$0.00	0%
Non-Federal Funds	\$19,940,979	20%
<b>Total Project Cost</b>	<b>\$99,704,895</b>	<b>100.00%</b>

### 3.2 Satisfying Federal Requirements

This project satisfies the BIP statutory maximum Federal involvement requirements. If awarded, BIP funds will support just under 80% of the project budget, with other Federal funds making up 0% and non-Federal covering the remaining 20%. **If this project receives the requested BIP funding, this project will meet the share requirements in 23 U.S.C. 120 limiting total Federal share to 80%, or 90% for off-system bridges.**

TxDOT has budgeted **\$11,449,167**, about 15% of the estimated construction cost and 11% of the overall budget, to cover unanticipated cost increases. TxDOT has determined this amount is sufficient to cover unanticipated cost increases based on the current level of design. Projects of similar size and scope have succeeded with proportionate contingency funds set aside, which are most often used to account for change orders, incentives, disincentives, force account work, and other miscellaneous expenses that arise.

In the unlikely event that the project budget evolves to exceed planned expenditures and contingency amounts, TxDOT has developed a **Plan to Address Potential Cost Overruns**.

- 1. Value Engineering** | TxDOT includes a Value Engineering (VE) study as a standard part of its project development process. [TxDOT policy](#) requires that each VE study include and document seven unique phases, including Information Gathering, Function Analysis, Creative, Evaluation, Development, Presentation, and Resolution. If future budget estimates for this project indicate an increase in price, the VE will help to eliminate lower-priority spending and ensure that all required functions of the project are met at the lowest overall cost, as efficiently as possible.
- 2. Prioritizing Investments** | The [2024 Texas Unified Transportation Program](#) provides a framework for allocating funds to address cost overruns for projects ready for letting. Each TxDOT district receives a minimum of \$2.5 million in discretionary funds each year, with additional funding distributed through an allocation formula. **In the unlikely event this project budget exceeds current estimates**, the Texas Transportation Commission may supplement the funds allocated to cover project cost overruns.
- 3. Pursuing Additional Funding** | TxDOT has developed a tested strategy for securing additional funds, including recent grants for the Texas Active Transportation Network (\$25 million) and the U.S. 59 San Antonio River Bridge (\$14.04 million). In the event of a major cost overrun that could not be resolved through the preceding steps, TxDOT would entertain all avenues to make the project whole and to secure sufficient financing.



### 3.3 How All Project Funds May Be Used

This grant application is seeking \$79.76 million in BIP funds to support construction costs only. Total future eligible construction costs, including structures, grading and paving, traffic control, mobilization, and overhead are estimated to total \$99.704 million.

**Table 3-2 | Project Budget by Activity Type**

Activity	Estimated Cost
Design Hours (Remaining)	\$577,559
Preliminary Engineering	\$3,850,391
Environmental Mitigation	\$7,500,000
Construction	\$76,327,778
Contingencies	\$11,449,167
<b>TOTAL</b>	<b>\$99,704,895</b>

**Table 3-3** below provides a breakdown of costs for each cost classification used on the Standard Form 424C as required on pages 29 and 35 of the BIP NOFO.

**Table 3-3 | Costs by Standard Form 424C Classification**

Field Item	Field Name	Total Cost	Costs Not Allowable	Allowable Costs
1	Administrative and Legal	\$0	\$0	\$0
2	Land, Structures, Rights-of-Way, Appraisals, etc.	\$0	\$0	\$0
3	Relocation Expenses and Payments	\$0	\$0	\$0
4	Architectural and Engineering Fees	\$3,850,391	\$0	\$3,850,391
5	Other Architectural and Engineering Fees	\$577,559	\$0	\$577,559
6	Project Inspection Fees	\$0	\$0	\$0
7	Site Work	\$0	\$0	\$0
8	Demolition and Removal	\$6,952,000	\$0	\$6,952,000
9	Construction	\$69,375,778	\$0	\$69,375,778
10	Equipment	\$0	\$0	\$0
11	Miscellaneous	\$7,500,000	\$0	\$7,500,000
<b>12</b>	<b>SUBTOTAL (Lines 1-11)</b>	<b>\$88,255,729</b>	<b>\$0</b>	<b>\$88,255,729</b>
13	Contingencies	\$11,449,167	\$0	\$11,449,167
<b>14</b>	<b>SUBTOTAL</b>	<b>\$99,704,895</b>	<b>\$0</b>	<b>\$99,704,895</b>
15	Project (Program) Income	\$0	\$0	\$0
<b>16</b>	<b>TOTAL PROJECT COSTS</b>	<b>\$99,704,895</b>	<b>\$0</b>	<b>\$99,704,895</b>

The budget information provided in this section is based on the most recently available estimates and assumptions at the time of submission. Absent the requested BIP grant, there is no guarantee that the project can be completed as scoped.



## 4. Merit Criteria

### 4.1 State of Good Repair

#### *Bridge Condition*

The Chocolate Bayou Bridge is currently in Poor condition. The existing structure is a 29-span bridge consisting of three continuous steel plate girder spans and 26 simple prestressed concrete I-beam spans. The deck has been in Poor condition since at least 2018, when an inspection report noted that the top of the deck had widespread minor scaling, transverse cracks up to 1/16" wide, and spalls up to 2 feet wide. Along the underside, transverse cracking with efflorescence was noted on 8 of the 29 spans. The superstructure and substructure are currently rated a 5 (Low-Fair condition) with widespread paint failures, vertical cracking on abutment caps and backwalls, moderate scaling on the columns, and exposed rebar. Along the embankments, steady erosion has undermined riprap along the bridge's corners, with voids more than a foot deep in several locations. **Figure 4-1** shows advanced corrosion on the underside of the steel girder portion of the superstructure, which is deteriorated due to brackish water exposure despite regular maintenance and painting.

Figure 4-1 | Underside of the Superstructure

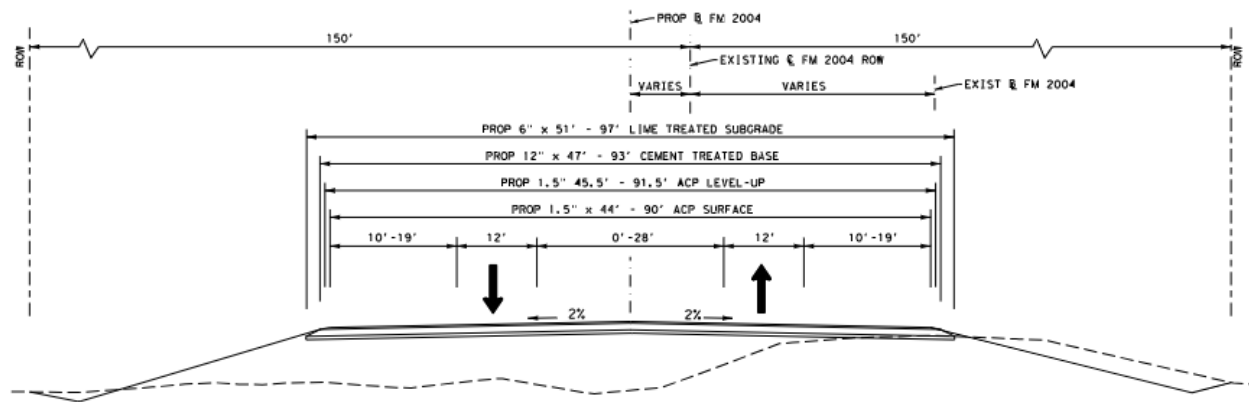


Since 2000, the population of Brazoria County has increased more than 50%. **Regardless of whether this bridge is replaced, the person-miles traveled over the Chocolate Bayou are rapidly increasing, putting an increased strain on the existing structure.** To accommodate this rapid growth and development, [TxDOT plans to expand FM 2004 to a four-lane highway within the next decade](#). **This bridge would be a major chokepoint in that expansion project because its narrow width will create a bottleneck for traffic moving in both directions.** This project offers a practical solution to that problem: construct a new, wider bridge, now, before the old one fails completely. At a new width over 90 feet, the proposed bridge will have the capacity to support the expansion of FM 2004 and Brazoria County. In the meantime, the additional width will be used to provide a separated bikeable shoulder, providing essential bicycle and pedestrian access in an area where none currently exists.

## Improving Compliance with Current Design Standards

The current design of this bridge does not adhere to modern standards of safety. The lack of updates to the structure create several safety, capacity, and freight movement problems.

Figure 4-2 | Proposed Cross Section



First, the existing bridge over Chocolate Bayou is inadequate to meet current traffic volumes. Demand exceeds or approaches capacity during morning and evening peak commute periods. Competing uses of FM 2004 create volumes that tax this stretch of highway, resulting in congestion, reduced mobility, increased collisions, and a Level of Service E or F (unstable or breakdown flows) at several intersections in the study area.

Second, the bridge was never intended to support the kind of heavy loads it needs to carry on a regular basis today. Designed for an H-20-44 truck load rating, the bridge currently has an Operating Rating of HS-60.0 and an Inventory Rating of HS-20. Typically under these conditions, coupled with the fact that the deck is in Poor condition, TxDOT would restrict any trucks carrying overweight loads from accessing the bridge. However, **TxDOT has determined that because this bridge will be replaced imminently, it may remain open to heavy trucks on the condition that the structure is regularly monitored, at least quarterly, to identify any signs of worsening deterioration. If TxDOT were to place a formal weight restriction on the structure, it would render 41% of potential truck travel unable to use the bridge.** That weight limit would force heavy vehicles into circuitous detours adding 40 miles in each direction. **This project could prevent \$37 million in emissions by replacing the bridge before TxDOT is forced to impose a restriction.**

Third, the bridge is far too narrow for pedestrians, cyclists, or emergency personnel to safely access the bridge, particularly in cases of a crash on the bridge. At just 30 feet across, the bridge is barely wide enough for two travel lanes and 3-foot shoulders, let alone safe passage for nonmotorized users or expansion of travel lanes in the future. Bridge railings are inadequate to comply with MASH standards as well.

## Reducing Congestion

The existing bridge is inadequate to meet future traffic volumes. Projected year 2025 demands exceed capacity during peak hour periods, and the projected Level of Service grade for FM 2004 in 2025 is Serious/Severe (a grade of E or F). The TxDOT Traffic

**Monitoring Branch** samples traffic data, and future traffic data is calculated. Future AADT incorporates 10 years of AADT history from the traffic count location, and this is used to analyze a linear regression-based growth rate for each traffic count location. A traffic increase of 73% is expected along this segment of FM 2004 over 20 years. **This project anticipates that growth, building a new structure with the width to handle future capacity expansion.**

### *Improving Resiliency*

A key flaw in the design of the existing structure is the use of steel girder construction on the superstructure elements spanning the navigable portion of the Chocolate Bayou. The 26 outer spans of the bridge (13 on either side of the three in the center) are entirely prestressed concrete, but the portion which crosses the brackish water of the bayou is made of steel that rusts and corrodes with exposure to moisture. Despite ongoing TxDOT efforts to inspect, maintain, and preserve the bridge, paint failure and corrosion is widespread on the middle spans. The proposed design recognizes and avoids this problem altogether, deploying a prestressed concrete design that will eliminate painting costs and significantly reduce recurring maintenance needs. **TxDOT estimates that annual maintenance costs will fall from a projected \$437,367 per year in the no-build condition to \$90,367 per year in the build condition (2023 \$).** These savings and efficiencies will help to ensure that a structure which supports an Emergency Evacuation Route and a key part of the Freight Network in South Texas can remain stable, reliable, and open for business.

## 4.2 Safety and Mobility

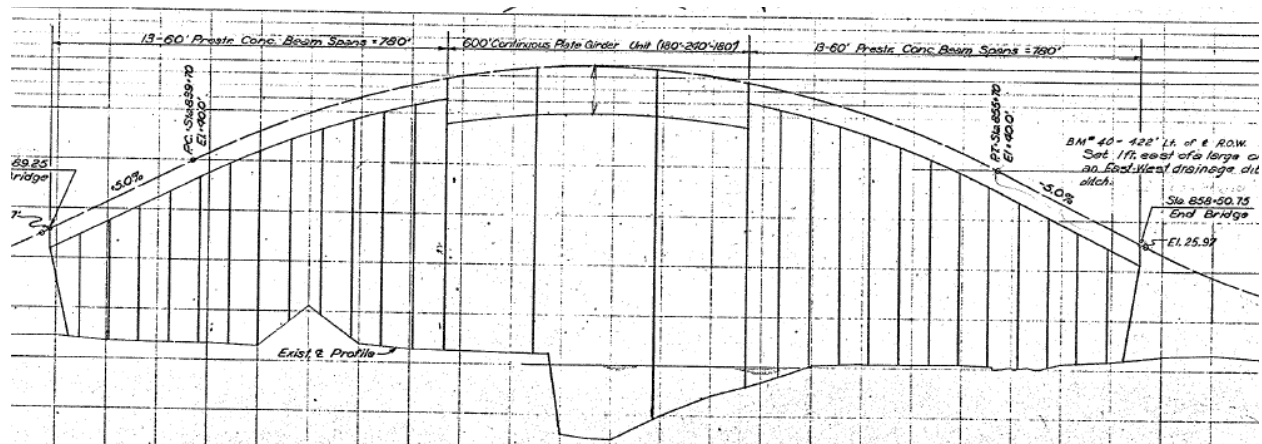
The reconstruction project of the existing FM 2004 bridge will help address documented safety concerns of the existing FM 2004 bridge. This project will address or impact:

- One (1) structure (NBI #120200252302011);
- An estimated 4,173 person-miles traveled each day;
- An estimated 6,293 Average Annual Daily Traffic (AADT); and
- An estimated 664 trucks every day.

Due to the projected economic and population growth of this region, PMT, AADT, and truck AADT are all expected to increase over the life of this project. As stated in Section 4.1, this project will prevent implementation of a costly and lengthy detour. It will also prevent the creation of a bottleneck on the bridge, and expand mobility access for freight carriers, emergency personnel, and nonmotorized users. Over the last six years, there have been **three crashes involving five individuals**. Notably, the bridge does not contain a shoulder for roadside emergencies, posing a continued danger within its design. To improve the safety of the bridge for future users, the following design elements have been incorporated:

1. Addition of 10-foot-wide bike-accessible outside shoulders
2. Addition of a 2-foot-wide raised concrete barrier
3. Reduced grade from 5% to 3%

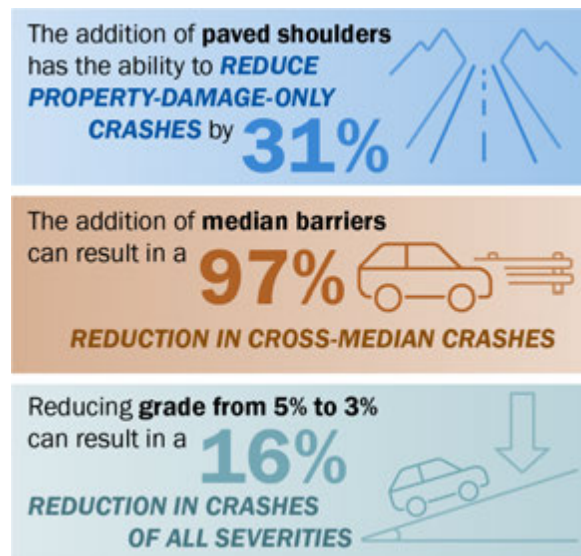
Figure 4-3 | Excerpt from 1964 As-Built Showing Bridge in Profile



Originally completed in 1964, this bridge is known for its steep grade. At 2,160 feet long, the bridge has a vertical clearance of 77.6 feet above the Chocolate Bayou. As drivers approach from either side of the structure, grade change is clearly evident, but the crest of the bridge (and road hazards on the far side of the bridge) may not be clearly visible, especially in poor weather conditions. **Figure 4-3** shows an excerpt of the bridge’s 1964 as-built demonstrating the steep grade change.

This project will involve the addition of two separate sets of 10-foot-wide shoulders, one of which will be accessible to bicyclists, and the other to motorists. The bike-accessible shoulders will create safer accommodations for cyclists, as the [FHWA Bikeway Selection Guide](#) notes that in rural areas with greater than 10,000 AADT, the preferred bicycle facility is a shoulder with a minimum width of 10 feet. Since the bridge does not currently contain a shoulder, the construction of these outside shoulders will provide critical space for use in case of roadside emergencies. Additionally, the construction of the 2-foot-wide raised concrete barrier will provide safety benefits by adding physical separation between opposing directions of traffic, thereby reducing the chance of head-on collisions from passing attempts or other errant driving behavior.

Figure 4-4 | Key Safety Features and Benefits



Finally, the reconstructed bridge will feature a reduced grade—from 5% to 3%—improving safety on the bridge by improving sightlines for road users and increasing visibility. details quantitative estimates of crash reduction potentials of the various safety improvements, obtained through the [Crash Modification Factor \(CMF\) Clearinghouse](#).



## 4.3 Economic Competitiveness and Opportunity

### National and Regional Economic Benefits

This project will improve freight and passenger mobility and safety for the immediate area and the wider regional freight system, bolstering economic competitiveness and opportunity both locally and regionally. This section of FM 2004 has been designated part of the Texas Highway Freight Network in the [Texas Delivers 2050](#) freight and mobility plan. This designation is assigned based on the stated plan criteria “measuring the role of the roadway in supporting four key factors: economic competitiveness, goods movement, strategic supply chain and market access and connectivity,” motivating this route’s designation as a freight corridor in the area.

Without replacement, the existing bridge will need to be weight restricted by 2029, and heavy freight that would have used the bridge at Chocolate Bayou will have to take a detour 44.1 miles long. This detour will cause **\$153 million in discounted 2022 dollars** in wasted travel time and vehicle operating costs for trucks, decreasing the economic efficiency of this route and damaging the economic competitiveness and supply chain efficiency of this area. This project will prevent this economic waste, **providing a positive economic benefit for the region and Nation.**

Brazoria County, where the project is located, is a global petrochemical center with over 25 companies and 9,000+ petrochemical employees, as reported by the [Economic Development Alliance for Brazoria County](#). Per the Alliance, over \$30 billion has recently been invested in new petrochemical plant construction within the County. This robust and growing industry requires a safe and reliable freight network to continue to grow. Shipping and freight in nearby ports is growing—nearby Port Freeport is currently planning to deepen their channel from 46 feet deep to over 50 feet to expand their shipping capacity. Economic growth in the State broadly is strong, and the [Federal Reserve Bank of Dallas](#) reports that job growth in recent history has consistently outpaced the national rate; Brazoria County, where the project is located, is no exception. As an important piece of the local freight network, a safe bridge on FM 2004 at Chocolate Bayou is necessary to support the growing industry in the area.

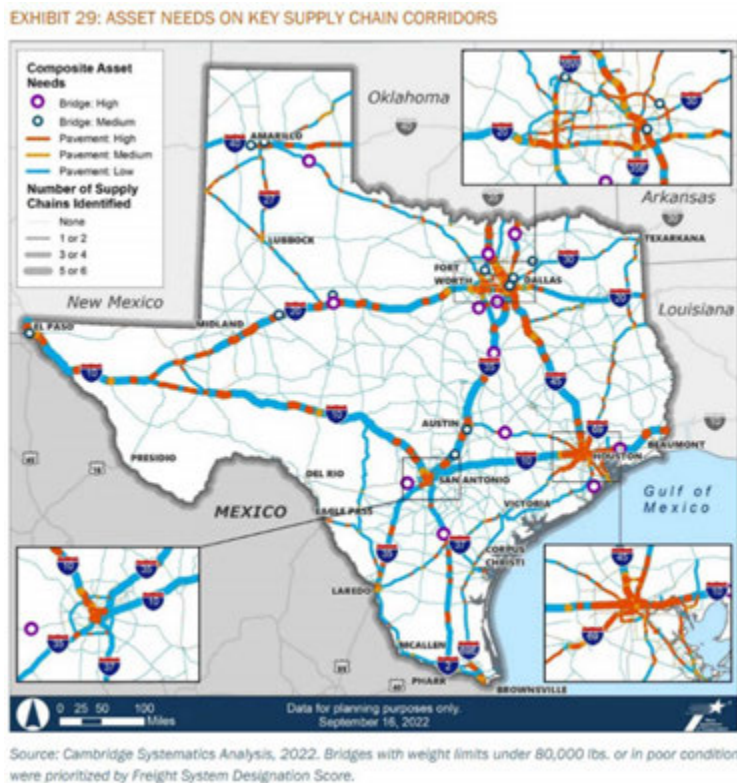
Figure 4-5 | Key Economic Benefits



### Verifiable Data on Positive Supply Chain Impact

The [Texas Demographic Center](#) reports the population of Brazoria County, where the project is located, is estimated to grow by between 24% and 48% between 2020 and 2060, and

Figure 4-6 | Asset Needs on Key Supply Chain Corridors



this new population growth will bring increased economic activity in the area. In a recent example, a new Amazon warehouse in the area is contributing to increased freight traffic. Replacing this bridge before it is weight posted will **prevent the negative impact a detour would have on supply chains** that currently rely on this freight route.

Industry and freight are growing in this area and ports are adding capacity, necessitating a reliable surrounding freight highway network. A rail spur to the chemical plant immediately adjacent to the bridge at Chocolate Bayou makes the project location a multimodal freight node. If this bridge is posted and freight traffic is forced to take a 44.1-mile detour instead of using FM 2004, rail and port mobility and all supply chains relying on this infrastructure network will also be affected.

FM 2004 is an important part of Texas' multimodal freight network. FM 2004 southwest of the project connects directly with State Highway 288, which runs to the Freeport seaport. FM 2004 northeast of the project connects with State Highway 6, which is a direct route to the Galveston and Texas City seaports. FM 2004 is a highway connection route to and between three maritime ports. **For additional data on the supply chain impacts of this project, see sections 4.1 and 4.2.**

### *Data on Improving Job Access and Employment Equity*

Located immediately to the east of the FM 2004 bridge at Chocolate Bayou is the INEOS Oligomers chemical plant. A second chemical plant is also planned to open adjacent to the existing INEOS plant, which will increase the volume of freight on this route. If FM 2004 was no longer open to freight vehicles, the required detour could damage these businesses economically.

Chemical plant jobs are an economic benefit for the residents of this region. Chemical plant and system operators earn an average wage of \$93,260 in the State of Texas, per the [U.S. Bureau of Labor and Statistics](#). By contrast, the average annual pay in Brazoria County is \$65,572. A safe and durable bridge at FM 2004 is crucial to supporting local economic interests and **ensuring job access and employment equity** by supporting freight and commuter mobility.

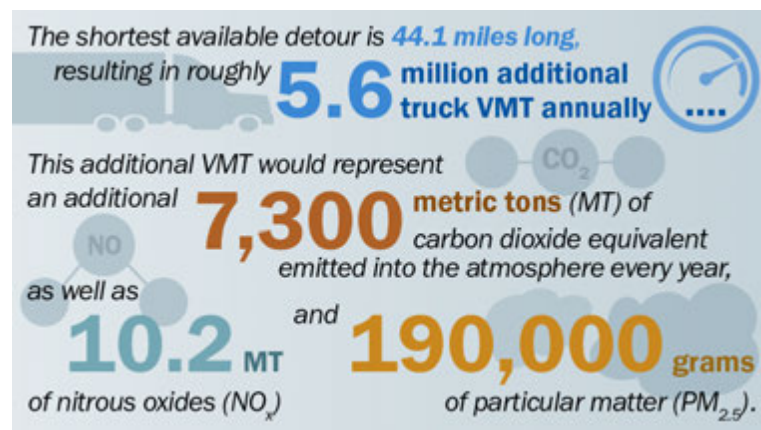
## Verifiable Impact on Development

Since 2000, the population of Brazoria County has grown from approximately 241,000 residents to more than 388,000. Because this bridge is one of the only methods of crossing the Chocolate Bayou in the region, it will continue to bear the brunt of increasing AADT, freight loads, and person-miles traveled regardless of whether it is replaced or not. TxDOT understands that this upward pressure on the transportation network will exacerbate congestion issues, which is why [work is already underway](#) on a section not far from the bridge. TxDOT is in the process of expanding FM 2004 into a “super-two” highway, expanding 20 miles of FM 2004 to improve traffic flows and travel time reliability. Replacing this bridge with a wider, safer structure will ensure that the road can continue to be expanded, providing efficient connectivity and mobility benefits for travelers between Brazoria and Galveston counties.

## 4.4 Climate Change, Sustainability, Resiliency, and the Environment

The reconstruction of the FM 2004 bridge will lead to lower tailpipe emissions by reducing vehicle-miles traveled (VMT) from detoured traffic that is already in use for heavy trucks and would be forced into use for all vehicles if the current bridge were to fail or close. Without replacement, the bridge is already restricted to 5.44-metric-ton operating loads. **Figure 4-7** summarizes the estimated air quality benefits of this project.

**Figure 4-7 | Air Quality Benefits**



The reconstruction and design of the new FM 2004 bridge will also support **increased resiliency to environmental hazards**. The bridge is in a FEMA-designated 100-year floodplain. Notably, the current bridge was built in 1966 and features steel plate girders, which are subject to corrosion. However, the replacement bridge will feature prestressed beams which are **more resilient** in the coastal environment because they do not require the same level of painting and repair.

Additionally, the bridge design will feature a smaller footprint in the water, thereby minimizing burdens to the habitat surrounding the project area. Specifically, the interior piers of the bridge will be removed to create longer spans, thereby reducing the level of environmental and habitat disturbance for the aquatic wildlife in the region. Finally, the reconstruction of the bridge will help mitigate environmental harms to vulnerable populations by avoiding detour truck traffic and the associated air pollution in the project’s areas disadvantaged communities.



## 4.5 Equity and Quality of Life

The bridge reconstruction project has taken steps to ensure quality of life concerns are addressed in its processes and outcomes. First, the project will result in minimal economic and regional impacts during the construction process by constructing the new bridge off alignment, which will permit through traffic during the construction period.

TxDOT conducted thorough public engagement, mailing English and Spanish flyers to agency stakeholders, utility contacts, and 40 nearby property owners, and provided opportunity to comment on the project. No concerns or negative feedback were expressed regarding the bridge reconstruction project.

Figure 4-8 | Public Outreach



The reconstructed bridge furthers quality of life goals by incorporating nonvehicular transportation into the design. The existing bridge is far too narrow for cyclists or pedestrians to comfortably traverse the bayou and currently lacks a usable shoulder. The bridge effectively serves as a barrier because FM 2004 on either end of the bridge has ample shoulders which would otherwise allow for safe travel by bike or on foot. In addition, TxDOT is currently in the process of planning an expansion of FM 2004, which will add additional travel lanes to both the new bridge and its approaches. TxDOT's proposed design for this project anticipates this future investment by replacing a 40-foot-wide structure with one over 90 feet wide. But this additional space will not go unutilized in the near term; the bridge is planned to have 10-foot-wide bike-accessible shoulders, allowing ample space for active transportation modes which are affordable and help decrease car dependence.

Additionally, the project will expand the boat ramp which helps to facilitate marine alternatives to car travel for both commercial and recreational purposes. Nearby refineries are known to utilize the canal for transporting workers using a small vessel to streamline facility access. Residents also travel recreationally on the canal, especially for fishing.

Finally, the reconstruction of the Chocolate Bayou bridge will ensure safe and reliable access to jobs, as the bridge is in direct proximity to the INEOS Oligomers chemical plant, with a second chemical plant planned to open adjacent to the existing INEOS plant. It will also improve access to daily destinations, such as the Kroger grocery store and Concentra Urgent Care center in Freeport, several schools and churches in Freemont and Texas City, and major attractions such as the Brazoria National Wildlife Refuge.

## 4.6 Innovation

The reconstruction of the Chocolate Bayou Bridge displays important innovation features in the planning and construction process.

As discussed in the Project Description and Economic Competitiveness and Opportunity sections, the bridge was designed to accommodate future roadway expansions. Rather



than becoming a chokepoint in the future, this bridge has been designed to incorporate future volume considerations of the surrounding area. As such, the planning process incorporated a proactive lens towards design, rather than a reactive one.

This project also represents a **financing partnership** between TxDOT and Brazoria County, which offers an innovative and repeatable model for developing and maintaining community and recreational infrastructure. Because TxDOT already needs to replace the bridge, the additional boat ramp features can be more easily constructed by the contractor replacing the bridge. Brazoria County, meanwhile, will contribute funds to support construction of the elements they will maintain, and then commit to a maintenance agreement with TxDOT. This type of partnership offers an innovative financing avenue for TxDOT to make similar investments throughout the State.

Additionally, the reconstructed bridge will be built off alignment, allowing the existing bridge structure and roadway to remain in place and thereby minimize travel impacts and disruptions during the construction period.

## 5. Benefit-Cost Analysis

This benefit-cost analysis (BCA) was conducted in accordance with the benefit-cost methodology as outlined by U.S. DOT in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs, released in December 2023. **The period of analysis corresponds to 32 years and includes 2 years of construction and 30 years of benefits after operations (replacement bridge) begin.** This application requests BIP funding to reconstruct the bridge carrying FM 2004 over the Chocolate Bayou, which is currently in poor condition. The capital cost for this Project (2023-dollar estimate) is expected to be **\$99.7 million**. At a 3.1% discount rate, the discounted capital costs are **\$82.7 million** in 2022 dollars.

The quantified benefits (beyond the O&M cost savings and residual value of the bridge) are derived from avoiding bridge closure to trucks requiring truck traffic to detour 44.1 miles around the bridge. These benefits include Vehicle Operating Costs (VOC), Travel Time (TT) Costs, reduced crash exposure, reduced CO<sub>2</sub> and other emissions, and other environmental benefits. In total, the replacement bridge will eliminate the need for trucks to detour, thus saving **\$966.9 million** discounted to 2022 dollars in detour-related costs.

Because the proposed project will be constructed off-alignment, leaving the existing structure open during construction, there are no other capital costs associated with the project, which is not expected to create delays, detours, or other challenges. In addition, the proposed project is estimated to reduce future operations and maintenance costs by \$5.7 million, and produce a new bridge with a residual value of \$19.5 million at the end of the analysis period.

Using a 3.1% discount rate (2% for carbon emissions) leads to an overall discounted Net Present Value (including residual value of assets) of **\$909.5 million** and a Benefit-Cost Ratio (BCR) of **12.0:1**. The overall project benefit and costs are presented in **Table 5-1**.

**Table 5-1 | Benefit-Cost Analysis Summary**

Benefits and Costs	Discounted Value (2022\$)
Travel Time Savings (Avoided Detours)	\$270,100,752
Vehicle Operating Cost Savings (Avoided Detours)	\$504,264,957
Safety Crash Cost Savings (Avoided Crashes)	\$651,991
CO2 Emissions Cost Reduction	\$158,879,714
Non-CO2 Emissions Cost Reduction	\$31,624,835
Other Environmental Benefits	\$1,413,421
Residual Asset Value	\$19,541,397
O&M Cost Savings	\$5,650,742
<b>Total Benefits</b>	<b>\$992,127,810</b>
Capital Costs	\$82,650,264
<b>Benefit-Cost Ratio</b>	<b>12.0</b>
<b>Net Present Value</b>	<b>\$909,477,546</b>

A complete technical memorandum summarizing the benefit-cost analysis process and results is included as an appendix to this application.



## 6. Project Readiness and Environmental Risk

### 6.1 Technical Feasibility and Technical Competency

The engineering and design studies and activities conducted to date include:

- Development and publication of a Community Impacts Assessment Technical Report, completed in 2020;
- Development, submission, and approval of a Hazardous Materials Initial Site Assessment (ISA);
- Scoping, cost estimation, and approval of Environmental Mitigation plans, completed in 2021;
- Initiation of the National Environmental Policy Act (NEPA) documentation and coordination process, expected to be complete in April 2024; and
- Application for a United States Army Corps of Engineers (USACE) Standard Individual Permit, submitted in April 2023 with anticipated completion in October 2025.

TxDOT has determined that this project will qualify for a Categorical Exclusion (CE). The draft CE is complete, and TxDOT is in the process of finalizing a Biological Evaluation for submission to U.S. Fish and Wildlife (USFWS). Final CE approval is expected in April 2024.

**Table 6-1** below provides a summary of the status of planning activities as of the date of submission.

**Table 6-1 | Status of Project Development Activities**

Item	Status
Environmental Assessments	Ongoing. NEPA expected completion April 2024. Other Federal environmental approvals from USACE and USCG anticipated by October 2025
Topographic Surveys	Complete
Metes and Bounds Surveys	Complete
Geotechnical Investigations	Complete
Hydrologic Analysis	Complete
Utility Engineering	Ongoing, Complete by February 2025
Traffic Studies	Complete
Financial Plans	Complete
Revenue Estimates	N/A
Hazardous Materials Assessments	Complete
General Estimates of Types and Quantities of Materials	Complete
Other Work Needed to Establish the Parameters of Final Design	Complete

TxDOT’s successful management of billions of dollars’ worth of Federally funded projects, as well as a successful partnership with the Texas Division of the FHWA, reflects TxDOT’s experience with the receipt and expenditure of Federal-aid Highway Program funds. Should funding be awarded for construction, TxDOT is confident that it will be ready for work initiation and completion within the guidelines established in the Notice of Funding Opportunity. Specifically, this project will proceed to the next phase of Project Delivery within 12 months of CE determination and can begin quickly upon obligation of grant funds.

## 6.2 Project Schedule

The schedule presented in **Table 6-2** demonstrates that this project will meet all required milestones in the 2024 BIP NOFO. Specifically:

- All necessary activities will be complete to allow BIP funds to be obligated by the obligation deadline of **September 30, 2026**. This will allow sufficient time for unexpected delays, ensuring no funding is at risk of expiring before it is obligated.
- The project will secure NEPA approval as a CE by April 30, 2024; and
- The project can begin construction within 18 months of obligation.

TxDOT has sought community input through early coordination with local stakeholders, including Brazoria County, the U.S. Coast Guard, and the Army Corps of Engineers. **NEPA is nearly complete, design is already underway, and this project will move quickly.**

**Table 6-2 | Project Schedule**

Milestone	Start Date	End Date
State and Local Planning Approvals	9/1/2014	8/31/2015
NEPA	3/1/2021	4/30/2024
Other Federal Environmental Approvals	4/1/2023	10/31/2025
Permitting	4/1/2023	10/31/2025
Preliminary Design	6/1/2015	3/31/2023
Design Completion	4/1/2023	2/1/2025
Right-of-Way Acquisition	N/A	N/A
Plans, Specifications, and Estimates	2/1/2025	6/30/2025
Project Grant Agreement	9/30/2024	5/1/2025
Funding Obligation	5/1/2025	6/1/2025
Procurement	10/1/2025	3/1/2026
Project Partnership and Implementation Agreements	5/1/2024	2/1/2025
Railroad Coordination	N/A	N/A
Construction	6/1/2026	2/1/2029
Substantial Completion	2/1/2029	5/1/2029
Punchlist and Closeout	5/1/2029	8/31/2029



## 6.3 Required Approvals

### *Environmental Permits and Reviews*

The environmental review, consultation and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9, 2019, and executed by FHWA and TxDOT.

All work to be conducted will be within the existing right-of-way (ROW) on FM 2004 at Chocolate Bayou. No additional ROW is required, and no residential or nonresidential structures would be displaced.

TxDOT has determined that this project qualifies for a CE. NEPA documentation has been under development since 2021, and is expected to be complete by April 2024. TxDOT will confirm the validity and accuracy of all NEPA documentation prior to proceeding with this project. TxDOT is one of the few States with the delegated authority from FHWA known as “NEPA Assignment.” This power streamlines the Federal environmental review process by eliminating Federal Highway Administration project-specific review and approval and provides a participating State-specific review and approval authority. NEPA assignment is subject to a Memorandum of Understanding that is renewable every five years. TxDOT officially entered the program on December 16, 2014. On December 9, 2019, FHWA signed a first renewed MOU extending TxDOT’s participation in the NEPA Assignment program for an additional five years.

This project will require permits from the USACE and the United States Coast Guard. TxDOT has already initiated coordination with both bodies, and the project is currently under review by the USACE.

### *State and Local Approvals*

TxDOT does not anticipate a need for any additional State or local approvals to initiate this project.

### *Federal Transportation Requirements Affecting State and Local Planning*

**Texas Delivers 2050**, the Statewide Freight Plan, prioritized bridge asset needs on key supply chain corridors based on bridge condition, load restrictions, and oversize/overweight vehicle permits. This analysis found the FM 2004 bridge at Chocolate Bayou to be in the highest-level category for maintenance priority.

This project is included in the **Texas Unified Transportation Program (UTP)**. It will be included in the Houston-Galveston area Transportation Improvement Program (TIP) and **Texas Statewide Transportation Improvement Program (STIP)** project lists as funding is awarded and the letting date enters the window of time included in those project lists.

TxDOT submitted its latest [Transportation Asset Management Plan \(TAMP\) in June 2022](#), and this project will support advancement of the goals, objectives, and performance targets identified in the TAMP. This project will fulfill goals of U.S. DOT’s National Roadway Safety

Strategy. While the **TAMP** does not include specific infrastructure replacement plans, it does include detailed bridge conditions evaluation practices. The TAMP indicates that less than 1% of the bridges are in poor condition and plans to reconstruct this bridge are in line with the TAMP’s general goal of continuing to keep the percentage of bridges in poor condition to a minimum. The Project will be programmed into the STIP upon award of funding. Bridge conditions affect the overall efficiency of freight operations by limiting the route options for certain trucks, particularly those transporting oversized and overweight loads. This requires vehicles to travel on alternate routes with longer distances to avoid conflicting with a low-clearance bridge or a bridge with a load restriction.

### *Assessment of Project Risks and Mitigation Strategies*

The risks associated with this project are well understood and clearly defined. TxDOT will ensure that every major risk factor is carefully mitigated as early in the project planning process as possible. **Table 6-3** below summarizes the primary project risks and mitigation strategies associated with the replacement of the Chocolate Bayou Bridge.

**Table 6-3 | Project Risks and Mitigation Strategies**

Risk	Mitigation Strategy
Closure or failure of the existing bridge would create significant delays.	The new bridge will be constructed off alignment, allowing the existing structure to remain open throughout construction.
Environmental Review by the Army Corps of Engineers and United States Coast Guard has been known to delay projects for months or even years.	TxDOT has already begun coordination with both the USACE and USCG. The TxDOT Team will encourage both partner agencies to utilize concurrent reviews to expedite the project delivery timeline.
Underground pipeline utilities are present within the project area.	TxDOT is prioritizing the identification of all utilities and developing plans to avoid conflicts during construction. TxDOT is familiar with the type of utility relocation that may be required to drive new piles or establish new footings for the proposed structure. The U.S. Department of Energy will also have a representative on site to monitor vibrations during construction near the pipeline.

## 7. Administration Priorities and Departmental Strategic Plan Goals

### 7.1 Safety

Replacing the current bridge in the “Build” scenario incorporates many modern design elements making the new bridge a much safer facility. Crash modification benefits are not quantified in this BCA given the relatively low number of historical crashes on the bridge. In addition, avoiding truck detours would reduce exposure to crashes. A historically low crash rate along the detour makes potential crash reduction benefits minimal and not able to be quantified within the BIP-BCA spreadsheet.

The project is expected to improve the safety of the traveling public using this route. The current safety risks that the project intends to correct, as outlined in Section 4.2, are:

- The bridge is too narrow for nonmotorized users and emergency personnel to access or cross it safely;
- The current load rating forces heavy vehicles to use a 44-mile detour which significantly increases VMT and emissions; and
- The bridge is not prepared to handle rapidly growing traffic volumes.

The improved safety features, which will include 10-foot bike-accessible shoulders, concrete barriers to separate travel lanes, MASH-compliant bridge railings, and 10-foot interior shoulders will ameliorate these existing issues if the project is constructed. This project aligns well with the Administration’s goals to “significantly reduce serious and fatal injuries on the Nation’s roadways,” as stated in the National Roadway Safety Strategy.

### 7.2 Climate Change and Sustainability

Without completion of this project, the FM 2004 bridge at Chocolate Bayou will be posted in 2029 and freight over **5.44 metric tons** will be subject to a 44.1-mile detour around the bridge. As stated in section 4.4, this will create roughly an additional 5.6 million truck VMT annually, resulting in an additional 7,300 metric tons (MT) of carbon dioxide equivalent emitted into the atmosphere every year, as well as 10.2 MT of nitrous oxides (NO<sub>x</sub>) and 190,000 grams of particulate matter (PM<sub>2.5</sub>). This project will have a direct impact on reducing emissions by preventing this increase in VMT.

This project will also create a more durable bridge, improving resiliency in Brazoria County and the Texas freight network. As stated in section 4.4, the project location is in a FEMA-designated 100-year floodplain. The current bridge, built in 1966, features steel plate girders, which are subject to corrosion. However, the replacement bridge will feature prestressed beams which are more resilient in a coastal environment. Another important factor is FM 2004’s role as an evacuation route for the State of Texas. Improving safety and ensuring mobility on an evacuation route will bolster resilience as well. The project overall will bolster resilience in the State and region.

### 7.3 Equity

The project area has a small residential population and is largely rural. TxDOT has conducted public engagement to inform and engage all impacted property owners and have received a positive reception to the project proposal. The impacts of the project will be minor, since through-traffic will still be permitted during most of the construction period.

The benefits of the project, including the prevention of the detour and resulting increased emissions, will benefit residents and businesses in the area as well as residents from nearby HDC areas traveling through the corridor. Additionally, the project will result in an expanded and more accessible boat ramp, recreation opportunities for the area available to all. As described in Sections 1.2, 4.3, and 4.5, **this project will enhance connectivity between rural communities, including HDCs along the Gulf Coast, encourage economic development, including creation of high-paying jobs, and expand access to nonmotorized travel.**

### 7.4 Workforce Development, Job Quality, and Wealth Creation

As was outlined in Section 4.3, located adjacent to the FM 2004 bridge at Chocolate Bayou is the INEOS Oligomers chemical plant. A second chemical plant is also planned to open adjacent to the existing INEOS plant. Chemical plant jobs are also a benefit for the residents of this region. A safe and durable bridge at FM 2004 is crucial to supporting local economic interests and **ensuring job access and employment equity.**

The funding for this project itself will generate jobs through construction employment. Two TxDOT programs help prioritize hiring of historically disadvantaged populations for TxDOT projects. The first is the ConnectU2Jobs program, operated by the TxDOT Civil Rights Division in conjunction with FHWA. CU2J includes several community partners to connect community members to good-paying construction jobs, including justice-involved young adults.

CU2J also partners with organizations that represent people of color and other historically disadvantaged communities. The second is the Texas Unified Certification Program. This program certifies [Disadvantaged Business Enterprises \(DBE\) and Historically Underutilized Businesses \(HUB\)](#). Many projects have DBE and HUB spending goals, so these programs promote hiring members of historically disadvantaged and historically underrepresented communities in the development and construction of projects.

This project is a significant construction project for the region which will provide good-paying jobs. If this project receives the requested BIP funds, TxDOT has prepared a complete appendix that directly addresses all FHWA Considerations to Support Good Paying Jobs and Strong Labor Standards. **Table 7-1** below provides a summary of [Appendix A](#).





Table 7-1 | Supporting Good-Paying Jobs and Strong Labor Standards Summary

Consideration	Strategy
Project labor agreements	The 2019 Neutrality in State Government Contracting Act which ensures all of Texas' skilled construction workforce can compete on a level playing field for public works contracts to build projects utilizing State funding or credit.
Local and economic hiring preferences	Not anticipated.
Registered apprenticeships	Coordinated through contractors and the Texas Workforce Commission.
Training and placement programs	Leverage TxDOT's On-the-Job Training (OJT) Program.
Free and fair choice to join a union	Texas is a right-to-work State.
Supportive services and cash assistance to address systemic barriers to employment	Cash assistance programs are coordinated through the Texas Health and Human Services Commission.
Workforce programs that serve underrepresented groups.	Will be administered in accordance with Texas Unified Certification Program-certified Disadvantaged Business Enterprises (DBE) and Historically Underutilized Businesses (HUB) policies and programs.
Comprehensive plan to promote equal opportunity	Will be implemented in accordance with Texas Equal Employment Opportunity (EEO) and Affirmative Action Program (AAP) policies.
Create good-paying jobs	Encourage creation of construction and manufacturing roles with strong pay.

## 8. DOT Priority Selection Considerations

This project meets the criteria set forth as U.S. DOT priorities:

- The FM 2004 bridge at Chocolate Bayou is currently in poor condition. TxDOT will not be able to complete this bridge project without BIP funding.
- TxDOT owns and maintains this bridge.
- NEPA review is underway for this project. TxDOT is in the process of finalizing a biological report on endangered species in the area, after which point NEPA documentation can be submitted and finalized. This project will not meet one or more of the constraints listed under 23 CFR 771.117 (e) because it will require permits from both the USACE and USCG. TxDOT has already initiated coordination with both bodies, and the project is currently under review by the USACE. Once the project receives NEPA approval, it will move expeditiously through the next stages of project delivery.
- The design for this project features 10-foot bicycle lanes, while the current bridge structure has no bicycle infrastructure.



## 9. Appendices

### 9.1 Appendix A: Considerations to Support Good-Paying Jobs and Strong Labor Standards

Table 9-1 | Considerations to Support Good-Paying Jobs and Strong Labor Standards

Consideration	Strategy
<p>The applicant has adopted or intends to adopt the use of project labor agreements in the overall delivery and implementation of the project. <i>(Summary should identify the relevant agreements and describe the scope of activities they cover.)</i></p>	<p>In 2019, Texas passed the Neutrality in State Government Contracting bill (HB 985), which ensures all of Texas’ skilled construction workforce can compete on a level playing field for public works contracts to build projects utilizing State funding or credit.</p>
<p>The applicant has adopted or intends to adopt the use of local and economic hiring preferences in the overall delivery and implementation of the project, subject to all applicable State and local laws, policies, and procedures. <i>(Summary should describe the relevant provisions.)</i></p>	<p>TxDOT is committed to following state guidelines regarding hiring preferences.</p>
<p>The applicant has adopted or intends to adopt the use of registered apprenticeships in the overall delivery and implementation of the project. <i>(Summary should describe the use of registered apprenticeships.)</i></p>	<p>TxDOT allows contractors to delineate their own parameters for the use of apprenticeships. <a href="#">The Texas Workforce Commission</a> offers a variety of incentives for employers offering apprenticeship opportunities to skilled laborers.</p>
<p>The applicant will provide training and placement programs for underrepresented workers in the overall delivery and implementation of the project. <i>(Summary should describe the training programs.)</i></p>	<p>TxDOT complies with the Federal <a href="#">On-the-Job Training (OJT) Program</a>, which was established to comply with U.S. DOT regulations 23 CFR Part 230, Subpart A, Equal Employment Opportunity on Federal and Federal-aid Construction Contracts. The Federal OJT program targets women, minorities, and disadvantaged individuals for participation, both to build a competent workforce for construction as well as to address historic under-representation in the construction industry. Training goals are assigned by TxDOT through contractor-based and project-specific OJT programs.</p>



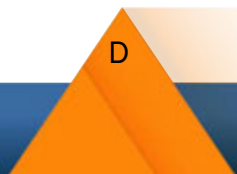
Consideration	Strategy
<p>The applicant will support free and fair choice to join a union in the overall delivery and implementation of the project by investing in workforce development services offered by labor-management training partnerships or setting expectations for contractors to develop labor-management training programs. <i>(Summary should describe the workforce development services offered by labor-management training partnerships.)</i></p>	<p>Texas is a right-to-work State. Under Texas Labor Code, a person cannot be denied employment because of membership or non-membership in a labor union or organization. TxDOT encourages the use of apprenticeship and labor management training programs for both vendors and their own staff through the use of training courses like Leadership One, which “is designed to develop the skills of motivated, emerging leaders and empower them to address the challenges of TxDOT’s ever-changing environment.</p>
<p>The applicant will provide supportive services and cash assistance to address systemic barriers to employment to be able to participate and thrive in training and employment, including childcare, emergency cash assistance for items such as tools, work clothing, application fees and other costs of apprenticeship or required pre-employment training, transportation and travel to training and work sites, and services aimed at helping to retain underrepresented groups such as mentoring, support groups, and peer networking. <i>(Summary should describe the supportive services and/or cash assistance provided to trainees and employees.)</i></p>	<p>Texas’ cash assistance programs are administered through the State’s Health and Human Services Commission. <a href="#">Key programs include TANF and the Repatriation Program.</a></p>
<p>The applicant has documented agreements or ordinances in place to hire from certain workforce programs that serve underrepresented groups. <i>(Summary should identify the relevant agreements and describe the scope of activities they cover.)</i></p>	<p>The Texas Unified Certification Program certifies Disadvantaged Business Enterprises (DBE) and Historically Underutilized Businesses (HUB). Many projects have DBE and HUB spending goals, so these programs promote hiring members of historically disadvantaged and historically underrepresented communities as workers on TxDOT construction projects. TxDOT also is a partner in the Connect U 2 Jobs program (CU2J), which connects justice-involved youth to construction jobs.</p>

Consideration	Strategy
<p>The applicant participates in a State/regional/local comprehensive plan to promote equal opportunity, including removing barriers to hire and preventing harassment on work sites, and that plan demonstrates action to create an inclusive environment with a commitment to equal opportunity, including:</p> <ul style="list-style-type: none"> <li>a. Affirmative efforts to remove barriers to equal employment opportunity (EEO) above and beyond complying with Federal law;</li> <li>b. Proactive partnerships with the U.S. Department of Labor’s (DOL) Office of Federal Contract Compliance Programs (OFCCP) to promote compliance with E.O. 11246 EEO requirements;</li> <li>c. No discriminatory use of criminal background screens and affirmative steps to recruit and include those with former justice involvement, in accordance with the Fair Chance Act and equal opportunity requirements;</li> <li>d. Efforts to prevent harassment based on race, color, religion, sex, sexual orientation, gender identity, and national origin;</li> <li>e. Training on anti-harassment and third-party reporting procedures covering employees and contractors; and</li> <li>f. Maintaining robust anti-retaliation measures covering employees and contractors.</li> </ul>	<p>TxDOT has an <a href="#">Equal Employment Opportunity (EEO) policy as well as an Affirmative Action Program (AAP)</a>. Per the EEO Policy Statement, TxDOT “stands as an equal employment opportunity (EEO) employer and is committed to providing fair and equal treatment of all employees without regard to race, color, religion, sex, national origin, pregnancy, genetic information, disability, military status, age, or any other characteristic protected by Federal or State law. Applicants for employment, vendors, contractors and their employees, customers, and the public also are recipients of this same commitment. The Department strives to ensure full compliance with all EEO requirements, laws, and regulations, while attracting and hiring qualified individuals who are part of the available workforce and who reflect the State’s unique diversity.”</p> <p>TxDOT’s AAP is a plan to ensure the TxDOT workforce is reflective of the available labor market. The plan includes strategies to maintain parity in training and employment.</p> <p>TxDOT has a Discrimination and Harassment Policy to ensure a workplace free of discrimination and harassment based on race, color, religion, sex, national origin, genetic information, disability, military status, or age. The policy also includes a complaint filing process for employees to report harassment and discrimination.</p>
<p>The applicant has taken or intends to take other actions related to the project to create good-paying jobs with the free and fair choice to join a union and incorporate strong labor standards. <i>(Summary should describe those actions.)</i></p>	<p>As stated in the Economic Competitiveness and Opportunity section, this project is expected to encourage the creation of high-paying jobs, in excess of the current median wage for the area, both during and after construction.</p>





Consideration	Strategy
<p>The applicant has not yet taken actions related to the project to create good-paying jobs with the free and fair choice to join a union and incorporate strong labor standards but will do so before beginning construction of the project. <i>(Summary should describe why actions to improve good-paying jobs and strong labor standards have not been considered yet, such as stage of project development.)</i></p>	N/A
<p>The applicant has not taken actions related to the project to improving good-paying jobs and strong labor standards and will not take those actions under this award. <i>(Summary should describe why actions to improve good-paying jobs and strong labor standards will not be taken related to the Project.)</i></p>	N/A



## 9.2 Appendix B: Benefit-Cost Analysis Technical Memorandum

### 1. Executive Summary

*Farm to Market and Back* (the Project) will improve the bridge's structural integrity, mobility, and safety, bringing it to current design standards and will tackle three key transportation challenges:

- The current bridge's condition is rated as Poor according to the National Bridge Inventory (NBI). The main span is steel, requiring frequent painting to reduce corrosion.
- FM 2004 currently lacks a shoulder for roadside emergencies over the 3,500-foot bridge, resulting in a failure to meet current bridge safety design standards.
- Brazoria County is growing, and with its economic development, TxDOT projects a 2.7% increase in AADT over the next 20 years, increasing congestion to a critical point.

If not reconstructed, TxDOT expects the bridge would need significant remediation work to keep the existing structure serviceable or be fully closed to commercial vehicle (truck) traffic no later than 2029. Closing the bridge would require trucks to detour 44.1 miles, incurring significant time and cost.

The capital cost for this Project (2023-dollar estimate) is expected to be **\$99.7 million**. At a 3.1% discount rate, the discounted capital costs are **\$82.7 million** in 2022 dollars. With a service life of 60 years, at the end of 30 years, the assets will retain 50% of their original value with a residual value of **\$48.9 million** in undiscounted dollars and **\$16.3 million** in 2022 discounted dollars. The residual value is added to the total benefits of the project as per U.S. DOT guidance.

Savings in Operations and Maintenance costs if the Project is built versus maintaining the current bridge is expected to be \$340,196 per year on average in 2022 dollars and totaling **\$3.4 million** over 30 years, or **\$5.7 million** discounted to 2022.

The quantified benefits (beyond the O&M cost savings and residual value of the bridge) are derived from avoiding requiring trucks to detour by closing the bridge. The cost savings are:

- Vehicle Operating Costs (VOC) of \$504.3 million;
- Travel Time (TT) Costs of \$270 million;
- Crash exposure reduction benefits of \$0.7 million;
- CO<sub>2</sub> Emissions Cost Savings of \$158.9 million;
- Non-CO<sub>2</sub> Emission Cost Savings of \$31.6 million; and
- Other Environmental Benefits of \$1.4 million.

In total, the replacement bridge will eliminate the need for trucks to detour, thus saving **\$1,546.1 million in discounted 2022 dollars in detour-related costs**. Using a 3.1% discount rate (2% for carbon emissions), this leads to an overall discounted Net Present Value

(including residual value of assets) of **\$909.5 million**, and a Benefit-Cost Ratio (BCR) of **12.0:1**. The overall project benefit and costs are presented in **Table 9-2**.

**Table 9-2 | Summary of Project Benefits and Costs**

<b>Benefits and Costs</b>	<b>Discounted Value (2022\$)</b>
Travel Time Savings (Avoided Detours)	\$270,100,752
Vehicle Operating Cost Savings (Avoided Detours)	\$504,264,957
Safety Crash Cost Savings (Avoided Crashes)	\$651,991
CO <sub>2</sub> Emissions Cost Reduction	\$158,879,714
Non-CO <sub>2</sub> Emissions Cost Reduction	\$31,624,835
Other Environmental Benefits	\$1,413,421
Residual Asset Value	\$19,541,397
O&M Cost Savings	\$5,650,742
<b>Total Benefits</b>	<b>\$992,127,810</b>
Capital Costs	\$82,650,264
<b>Benefit-Cost Ratio</b>	<b>12.0</b>
<b>Net Present Value</b>	<b>\$909,477,546</b>

Source: Cambridge Systematics, Inc.

This benefit-cost analysis (BCA) was conducted as a requirement of the U.S. Department of Transportation (U.S. DOT) FY2024 Bridge Investment Program (BIP) discretionary grant application. The analysis was conducted in accordance with the benefit-cost methodology as outlined by U.S. DOT in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs, released in December 2023. The period of analysis corresponds to 32 years and includes 2 years of construction as well as 30 years of benefits after operations from the replacement bridge which would begin in 2028.

## *2. Project Description*

*Farm to Market and Back* (the Project) will improve the structural integrity, mobility, and safety of the Chocolate Bayou bridge crossing, bringing it to current design standards. The \$99.7 million bridge project is designed to tackle three key transportation challenges:

- The current bridge’s condition is rated as Poor according to the National Bridge Inventory (NBI). The main span is steel, requiring frequent painting to reduce corrosion.
- FM 2004 currently lacks a shoulder for roadside emergencies over the 3,500-foot bridge, resulting in a failure to meet current bridge safety design standards.
- Brazoria County is growing, and with its economic development, TxDOT projects a 2.7% increase in AADT over the next 20 years, increasing congestion to a critical point.

If not reconstructed, TxDOT expects the bridge would need significant remediation work to keep the existing structure serviceable or be fully closed to commercial vehicle (truck) traffic no later than 2029. Closing the bridge would require trucks to detour and incur significant time and cost to do so. The replacement bridge will be constructed off the alignment of the existing bridge, and construction-related detours are not expected.

### **3. Benefit-Cost Analysis Framework**

The BCA provides an evaluation framework to assess the economic advantages (benefits) and disadvantages (costs) of a potential infrastructure project. Project benefits and costs are broadly defined and quantified in monetary terms to the extent possible. The BCA aims to assess whether the project's expected benefits justify costs from a national perspective. The BCA framework attempts to capture the net welfare change created by the project, including cost savings and increases in welfare (benefits), as well as disbenefits where costs can be identified (e.g., project capital costs).

The BCA framework involves defining a Base or "No Build" scenario to compare to the "Build" scenario to assess the incremental difference between the "Build" scenario (reconstructing the bridge) and the "No Build" scenario (not reconstructing the bridge). The "No Build" scenario would require the bridge to be closed and trucks to detour which represents the net change in welfare. BCAs are forward-looking exercises seeking to assess the incremental change in welfare over a project life-cycle. The importance of future changes is determined through discounting to reflect the time value of money.

### **4. Current Baseline**

#### **"Build" and "No Build" Scenarios**

The analysis of the Project compares the "Build" and the "No-Build" scenarios to assess how balancing costs and benefits from replacing the bridge would result in long-term benefits to users and society.

The "Build" scenario replaces the bridge carrying FM 2004 over the Chocolate Bayou to:

- Replace a low, narrow bridge built in the 1960s to traverse the Chocolate Bayou with a safer, wider, taller structure, reducing the incidence of bridge strikes and crashes on and below the bridge.
- Increase resiliency and reduce maintenance costs for TxDOT by replacing an at-risk steel structure with a safer, wider-span, prestressed concrete construction.

The "No-Build" scenario assumes the current bridge is not replaced and would be closed to commercial traffic by 2029. While staying open to passenger vehicles, significant maintenance would be required on the bridge and fender system to remain safe to noncommercial traffic. Given the bridge's age, build specifications, and condition, TxDOT considers replacing the bridge less expensive and more practical than attempting the significant restoration work required to bring the existing bridge up to modern specifications.





## 5. Sources of Data and Evaluation Measures

### Data Sources

All data utilized in this benefit-cost analysis was compiled from the following sources:

- TxDOT project cost estimates and design documents;
- TxDOT traffic counts and crash data; and
- Crash Modification Factor (CMF) Clearinghouse.

### Evaluation Measures

The BCA converts potential gains (benefits) and losses (costs) from the Project into comparable monetary units, and the following common benefit-cost evaluation measures are included in the BCA:

- **Net Present Value (NPV):** NPV compares the net benefits (benefits minus costs) after being discounted to present values using an assumed real discount rate. The NPV provides a perspective on the overall dollar magnitude of cash flows over time in today's dollar terms.
- **Benefit-Cost Ratio (BCR):** The present value of incremental benefits is divided by the present value of incremental costs to yield the BCR. The BCR expresses the relation of discounted benefits to discounted costs to measure to what extent a project's benefits either exceed or fall short of costs.

## 6. Methodology

The Project BCA is conducted in accordance with the benefit-cost methodology recommended by the U.S. DOT and includes the following key components:

- Defining existing and future conditions under the “No Build” (Base) scenario and the “Build” scenario;
- Assessing Project benefits over 30 years of operations beyond Project completion as benefits are accrued, and using U.S. DOT recommended values to monetize changes in travel time, vehicle operating costs, and traffic crashes by severity while relying on best practices to monetize other benefits or disbenefits;
- Estimating Project capital costs during construction as well as regular operation and maintenance over the 30 years of operations after completion; and
- Discounting Project benefits and costs using a real discount rate of 3.1% (2% for CO<sub>2</sub> emissions costs) consistent with U.S. DOT guidance (December 2023).

## 7. Assumptions and Key Input Parameters

Assessing the Project benefits and costs involved the following key assumptions:

- The evaluation period includes spending capital costs during design, engineering, and construction as well as 30 years of operations beyond the Project completion when ongoing Project benefits and costs are also evaluated.
- The preconstruction and construction phase of the Project is assumed to begin in 2027 and end in 2028 at which point the Project will be deemed complete.
- The Project will be opened to the public in 2029, and the 30-year operational period will conclude in 2058. Project benefits begin in the calendar year immediately following final construction.
- The reconstructed bridge will have a service life of 75 years, per FHWA's Service Life Design Reference Guide. Therefore, the bridge will have a 60% residual value of bridge costs in the year 2058.
- All Project benefits and costs are conservatively assumed to occur at the end of each calendar year for purposes of present value discounting.
- Monetary values of Project costs and benefits are expressed in constant, year-end 2022 dollars.

## *8. Baseline Challenges, Proposed Changes, and Impacts*

This project is designed to tackle **three key transportation challenges**:

1. The current bridge is in **Poor** condition according to the National Bridge Inventory (NBI). The main span is steel, requiring frequent painting and repairs to reduce corrosion.
2. The bridge is a choke point on FM 2004, lacking shoulders for roadside emergencies and safe bicycle or pedestrian travel.
3. Brazoria County is **growing**. TxDOT projects an 81% increase in AADT by 2044, and the State has long-term plans to widen FM 2004 to a four-lane highway, which the existing structure is too narrow and underbuilt to support.

This Project will address all three challenges by constructing a new bridge made of resilient materials, including TX 54 prestressed concrete I-girders and trapezoidal steel box girders supporting a 630-foot unit span over the channel. ***Farm to Market and Back* supports the expanding South Texas economy: FM 2004 will need to grow, and replacing this bridge will facilitate that process by constructing resilient infrastructure capable of accommodating emergency, multimodal, and nonmotorized travelers.**

**Table 9-4** below summarizes several of the current baseline issues and describes how they will be addressed by the proposed project.



Table 9-3 | Baseline Challenges and Impacts Summary

Baseline / Current Status and Problem to be Addressed	Change to Baseline / Proposed Project to Address Problem	Example Impacts
The existing bridge is in Poor Condition	The proposed bridge will completely replace the existing structure using more resilient materials and modern design standards	More frequent, larger, heavier trucks will be able to use the bridge
The existing bridge is a choke point for FM 2004, lacking shoulders	The proposed bridge will be wider than the existing one, accommodating two travel lanes, two shoulders, and two bicycle lanes	The likelihood of forced detours will decrease, reducing harmful emissions and lowering vehicle operating costs.
Brazoria County is growing, and TxDOT needs to widen FM 2004	The proposed design will be wide enough to accommodate the planned widening of FM 2004 without needing to reconstruct the bridge again.	Travel time delays will be mitigated for future projects.

## 9. Project Benefits

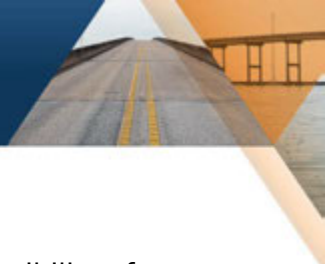
### Economic Competitiveness

The Project would contribute to increasing the region’s economic competitiveness by improving overall mobility of people and goods. Cost-avoidance benefits are measured by assessing economic competitiveness, including detour-related travel time savings and vehicle operating cost savings for commercial vehicles.

Reduced time traveling and vehicle-miles traveled enables trucks to deliver more goods more efficiently at lower cost, impacting neighboring, regional, and national economic industries. The Project will improve systemwide operations for more reliable travel times as well as improved freight and passenger vehicle mobility by keeping the bridge open and traffic moving. Replacing the bridge reduces the chances of a full bridge shutdown from a barge strike.

### Safety Benefits (Crash Cost Reduction)

Replacing the current bridge in the “Build” scenario incorporates many modern design elements making the new bridge a much safer facility. Crash modification benefits are not quantified in this BCA given the relatively low number of historical crashes on the bridge. In addition, avoiding truck detours would reduce exposure to crashes. A historically low crash rate along the detour makes potential crash reduction benefits minimal and not able to be quantified within the BIP-BCA spreadsheet.



## Travel Time and Vehicle Operating Cost Savings

The replacement of the current deficient bridge (BUILD) would eliminate the possibility of load posting and truck traffic to detour 44.1 miles around the bridge.

**Travel time savings** include in-vehicle travel time savings for drivers and passengers. Travel time is considered a cost to users, and its value depends on the disutility that travelers attribute to time spent traveling. A reduction in travel time translates into more time available for work, leisure, or other activities.

Travel time savings in this BCA is calculated by multiplying the number of truck drivers (Truck occupancy of 1.0 is assumed) by the corresponding driver value of travel time (VoTT) and the changes in Vehicle Hours of Travel (VHT) between the “Build” (zero hours) and the “No Build” (50 minutes per detour). The VoTT is time cost for trucks. Per the BIP-BCA model, it is \$33.50 per vehicle hour.

**Vehicle operating costs (VOC)** comprise fuel costs and all the necessary replacement items on the vehicle and regular maintenance (e.g., oil and fluid changes, tire rotations, tire replacements, and wiper replacement) as well as truck/trailer lease or purchase payments, permits and licenses, and other related costs to owners of commercial vehicles. In addition, the BIP-BCA model includes noise and congestion externalities in the vehicle operating costs.

The estimation of these benefits is based on the detour VMT for trucks under the “Build” scenario (zero miles detour) relative to the “No Build” (44.1 miles detour). The detour VMT for trucks in the “No Build” scenario is multiplied by the corresponding VOC per mile of \$1.32 per mile.

The aforementioned factors were applied to the estimated detour Vehicle Miles Traveled (VMT) and hours of travel based on data available from TxDOT. The TxDOT Houston District provided the following recent and projected traffic data for FM2004 over the Chocolate Bayou Bridge:

- 2020 AADT of 6,263 vehicles, 664 of which are trucks.
- 2034 AADT of 6,620 vehicles, 702 of which are trucks.
- 2044 AADT of 11,334 vehicles, 1,201 of which are trucks.

The TxDOT provided data also shows a 0.46% compound annual growth rate in truck AADT (2022-2034) and a 5.52% compound annual growth rate in truck AADT (2034-2044). Therefore, annual VMT for the analysis period (2029-2058) is based on interpolation/extrapolation of these growth rates for the truck-detoured miles. Assuming a travel speed of 53 miles per hours, the estimated VMT and travel time for the first and last years of the analysis are:

- 2029: 11,042,199 Truck VMT and 208,343 hours of travel.
- 2058: 41,054,034 Truck VMT and 774,604 hours of travel



## Travel Time Savings

Travel time savings include in-vehicle travel time savings for drivers and passengers. Travel time is considered a cost to users, and its value depends on useful time travelers lose while traveling. Less time traveling brings more time for work, leisure, or other activities.

The BCA calculated travel time savings by multiplying the number of truck drivers (Truck occupancy of 1.0 is assumed) by corresponding driver value of travel time (VoTT) and changes in Vehicle-Hours of Travel (VHT) between the “Build” (zero hours) and the “No Build” (50 minutes per detour). The VoTT is time cost for trucks, and per the BIP-BCA model, VoTT is \$33.50 per vehicle hour.

## Vehicle Operating Cost Savings

Vehicle operating costs (VOCs) are fuel costs, costs to replace necessary parts on vehicles, and regular maintenance costs (e.g., oil and fluid changes, tire rotations, tire replacements, and wiper replacement) as well as truck/trailer lease or purchase payments, permits and licenses, and other related costs to commercial vehicle owners. In addition, the BIP-BCA model includes noise and congestion externalities in VOCs.

Estimating benefits is based on trucks avoiding a detour and extra VMT under the “Build” scenario (zero miles detour) relative to the “No Build” (44.1-mile detour) option. The detour VMT for trucks in the “No Build” scenario is multiplied by the corresponding VOC per mile of \$1.32 per mile.

The forementioned factors were applied to the estimated VMT required by a detour and hours of travel based on TxDOT’s available data. The TxDOT Houston District provided recent and projected traffic data for FM 2004 over the Chocolate Bayou Bridge:

- 2020 AADT of 6,263 vehicles, 664 of which are trucks.
- 2034 AADT of 6,620 vehicles, 702 of which are trucks.
- 2044 AADT of 11,334 vehicles, 1,201 of which are trucks.

TxDOT’s data also shows a 0.46% compound annual growth rate in truck AADT (2022–2034) and a 5.52% compound annual growth rate in truck AADT (2034–2044). Therefore, annual VMT for the analysis (2029–2058) is based on interpolation/extrapolation of these growth rates for the truck-detoured miles. Assuming a 53-mph travel speed, estimated VMT and travel time for the first (2029) and last (2058) year of the analysis are:

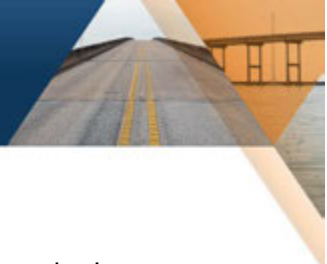
- 2029: 11,042,199 Truck VMT and 208,343 hours of travel.
- 2058: 41,054,034 Truck VMT and 774,604 hours of travel.

The annual VOC and travel time cost savings of the “Build” (no detour) scenario relative to the “No-Build” (detour) scenario are presented in **Table 9-6** below. The “Build” scenario avoids **\$774.4 million** of costs discounted to 2022 dollars which are added to Project benefits.

Table 9-4 | Project Vehicle Operating Costs and Travel Time Benefits

Year	Discounted Travel Time Cost Savings	Discounted Vehicle Operating Cost Savings	Total Detour TT & VOC Cost Savings (Discounted 2022\$)
2029	\$6,302,526	\$11,766,509	\$18,069,035
2030	\$6,686,290	\$12,482,978	\$19,169,268
2031	\$7,041,278	\$13,145,723	\$20,187,001
2032	\$7,368,873	\$13,757,327	\$21,126,200
2033	\$7,670,402	\$14,320,268	\$21,990,670
2034	\$7,947,137	\$14,836,918	\$22,784,055
2035	\$8,200,295	\$15,309,552	\$23,509,847
2036	\$8,431,045	\$15,740,350	\$24,171,395
2037	\$8,640,504	\$16,131,401	\$24,771,905
2038	\$8,829,746	\$16,484,705	\$25,314,451
2039	\$8,999,795	\$16,802,179	\$25,801,974
2040	\$9,151,635	\$17,085,658	\$26,237,293
2041	\$9,286,208	\$17,336,899	\$26,623,107
2042	\$9,404,415	\$17,557,585	\$26,962,000
2043	\$9,507,117	\$17,749,325	\$27,256,442
2044	\$9,595,142	\$17,913,662	\$27,508,804
2045	\$9,669,277	\$18,052,070	\$27,721,347
2046	\$9,730,280	\$18,165,959	\$27,896,239
2047	\$9,778,872	\$18,256,678	\$28,035,550
2048	\$9,815,746	\$18,325,519	\$28,141,265
2049	\$9,841,561	\$18,373,715	\$28,215,276
2050	\$9,856,949	\$18,402,444	\$28,259,393
2051	\$9,862,515	\$18,412,835	\$28,275,350
2052	\$9,858,834	\$18,405,963	\$28,264,797
2053	\$9,846,458	\$18,382,858	\$28,229,316
2054	\$9,825,913	\$18,344,502	\$28,170,415
2055	\$9,797,702	\$18,291,833	\$28,089,535
2056	\$9,762,304	\$18,225,747	\$27,988,051
2057	\$9,720,177	\$18,147,097	\$27,867,274
2058	\$9,671,757	\$18,056,699	\$27,728,456
<b>Total</b>	<b>\$270,100,752</b>	<b>\$504,264,957</b>	<b>\$774,365,709</b>

Source: Cambridge Systematics, Inc.



### Safety Benefits (Crash Cost Reduction)

The replacement of the current deficient bridge (BUILD will incorporate many design elements, which will make the proposed bridge a safer facility than what is currently in place. Given the relatively low number of crashes on the bridge historically, the crash modification benefits are not quantified in this BCA. In addition, avoiding truck detour miles would reduce exposure to crashes. There is a historically low crash rate along the detour route, therefore, potential crash reduction benefits are estimated to total **\$0.7 million** in discounted 2022 dollars.

### Environmental Sustainability Benefits

This analysis examined the potential automotive emissions associated with the “No-Build” detour that would be avoided if the Bridge Replacement Project is built. Similar to the safety benefits, USDOT provides monetized values per VMT for CO<sub>2</sub> and Non-CO<sub>2</sub> emissions. These are provided as defaults in the BIP-BCA spreadsheet. Multiplying these values by the avoided detour-related VMT, provides the emissions reduction benefits of the Project. Over 30 years, the Project reduces CO<sub>2</sub> costs by **\$158.9 million** discounted to 2022 and Non-CO<sub>2</sub> emissions by **\$31.6 million** discounted to 2022.

Table 9-5 | Project Vehicle Emissions Benefits

Year	Discounted CO <sub>2</sub> Emissions Cost Reductions	Discounted Non-CO <sub>2</sub> Emissions Cost Reductions	Total Emissions Cost Reductions (Discounted 2022\$)
2029	\$3,050,237	\$3,304,204	\$6,354,441
2030	\$2,962,456	\$1,188,821	\$4,151,277
2031	\$3,214,733	\$1,251,937	\$4,466,670
2032	\$3,439,518	\$1,310,184	\$4,749,702
2033	\$3,687,152	\$1,363,795	\$5,050,947
2034	\$3,918,582	\$1,412,999	\$5,331,581
2035	\$4,146,679	\$1,458,010	\$5,604,689
2036	\$4,371,345	\$1,499,038	\$5,870,383
2037	\$4,608,548	\$1,536,279	\$6,144,827
2038	\$4,810,030	\$1,569,926	\$6,379,956
2039	\$5,023,889	\$1,600,161	\$6,624,050
2040	\$4,750,379	\$730,127	\$5,480,506
2041	\$4,937,395	\$740,863	\$5,678,258
2042	\$5,137,571	\$750,294	\$5,887,865
2043	\$5,317,864	\$758,487	\$6,076,351
2044	\$5,511,921	\$765,510	\$6,277,431
2045	\$5,685,253	\$771,425	\$6,456,678
2046	\$5,872,895	\$776,291	\$6,649,186

Year	Discounted CO <sub>2</sub> Emissions Cost Reductions	Discounted Non-CO <sub>2</sub> Emissions Cost Reductions	Total Emissions Cost Reductions (Discounted 2022\$)
2047	\$6,057,376	\$780,168	\$6,837,544
2048	\$6,238,624	\$783,110	\$7,021,734
2049	\$6,397,756	\$785,170	\$7,182,926
2050	\$6,224,546	\$725,061	\$6,949,607
2051	\$6,368,214	\$725,470	\$7,093,684
2052	\$6,508,236	\$725,199	\$7,233,435
2053	\$6,644,615	\$724,289	\$7,368,904
2054	\$6,702,259	\$722,778	\$7,425,037
2055	\$6,755,087	\$720,703	\$7,475,790
2056	\$6,803,268	\$718,099	\$7,521,367
2057	\$6,846,962	\$715,000	\$7,561,962
2058	\$6,886,326	\$711,438	\$7,597,764
<b>Total</b>	<b>\$158,879,714</b>	<b>\$31,624,835</b>	<b>\$190,504,549</b>

Source: Cambridge Systematics, Inc.

The BIP model also calculates “Other Environmental Benefits” as a result of avoiding detours, primarily noise reduction benefits. This is a relatively small value benefit amounting to **\$1.4 million** discounted to 2022.

### State of Good Repair (SOGR) Benefits

Repair and maintenance costs continue to increase as structures age, and upgrading infrastructure on aging assets will lower TxDOT’s long-term maintenance burdens. Upgrading the bridge will help TxDOT continue improving pavement and bridge conditions across Texas. The State of Good Repair (SOGR) benefit category focuses on reducing bridge maintenance costs because the replacement bridge will require much less annual maintenance.

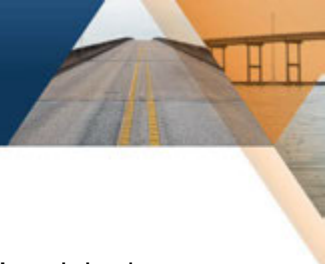
### Reduced Bridge Maintenance Cost Benefits

According to TxDOT, the average annual costs of maintaining the current bridge versus the replacement bridge are:

- **Current bridge:** \$428,791 average cost per year (2022 dollars).
- **Replacement bridge:** \$88,595 average cost per year (2022 dollars).

Over the analysis period, the replacement bridge would save TxDOT on average \$340,196 per year (2022 dollars) as maintenance and repair savings for the new bridge versus the current bridge total of **\$5.7 million** discounted to 2022.





### Replacement Bridge Residual Value

The Residual Value of the replacement bridge assumes the replacement bridge’s original value linearly depreciates over its service life. The replacement bridge has an expected useful life of 75 years and would thus retain half of its value after 30 years in service (the analysis period). After 30 years **\$19.5 million** (discounted to 2022) in value of the replacement bridge remains.

### Project Benefits Summary

The Project benefits include reducing existing costs alongside preventing future costs related to costs from the current bridge. **Table 9-7** shows the Project’s long-term benefits.

**Table 9-6 | Project Benefits Summary**

Benefits and Costs	Discounted Value (2022\$)
Travel Time Savings (Avoided Detours)	\$270,100,752
Vehicle Operating Cost Savings (Avoided Detours)	\$504,264,957
Safety Crash Cost Savings (Avoided Crashes)	\$651,991
CO <sub>2</sub> Emissions Cost Reduction	\$158,879,714
Non- CO <sub>2</sub> Emissions Cost Reduction	\$31,624,835
Other Environmental Benefits	\$1,413,421
Residual Asset Value	\$19,541,397
O&M Cost Savings	\$5,650,742
<b>Total Benefits</b>	<b>\$992,127,810</b>

Source: Cambridge Systematics, Inc.

## 10. Project Costs

### Capital Costs

Project capital costs (**Table 9-8**) are primarily associated with the actual construction.

**Table 9-7 | Project Schedule and Costs**

Variable	Value
Construction Start	2027
Construction End	2028
Construction Duration	2
Project Opening	2029
<b>Capital Cost</b>	<b>\$82,650,264 (2022 Dollars)</b>

## 11. Conclusions

### BCA Results

Table 9-9 presents the evaluation results from the BCA if the bridge is replaced. Results are presented in undiscounted and discounted to 2022 dollars. Benefits and costs were estimated over an evaluation period starting in 2028 after the project is completed in 2027 and extending 30 years. Total benefits from the Project improvements within the analysis period represent **\$992.1 million** discounted to 2022. Total project capital costs are calculated to be **\$82.7 million** when discounted to 2022 dollars. The difference of the discounted benefits and costs equal a NPV of **\$909.5 million**, resulting in a BCR of **12.0:1**.

Table 9-8 | Project Benefit-Cost Summary

Category	Chocolate Bayou FM 2004
Safety	\$651,991
Travel Time	\$270,100,752
VOC	\$504,264,957
CO <sub>2</sub> Emissions	\$158,879,714
Non-CO <sub>2</sub> Emissions	\$31,624,835
Other Environmental	\$1,413,421
Maintenance	\$5,650,742
Residual Value	\$19,541,397
Total Benefits	\$992,127,810
Total Discounted Costs	\$82,650,264
<b>BCR</b>	<b>12.0</b>
<b>Net Present Value (NPV)</b>	<b>\$909,477,546</b>

Source: Cambridge Systematics, Inc.

Table 9-10 summarizes the results of the BCA by year. The full spreadsheet model has been attached with the application.

Table 9-9 | Project Life-Cycle Benefit-Cost Analysis

Year	Costs Discounted 2022\$	Benefits Discounted 2022\$	Discounted Net Present Value
2027-2028	\$82,650,264	\$0	\$(82,650,264)
2029	\$0	\$24,754,925	\$24,754,925
2030	\$0	\$23,646,411	\$23,646,411
2031	\$0	\$24,973,991	\$24,973,991
2032	\$0	\$26,190,715	\$26,190,715
2033	\$0	\$27,350,965	\$27,350,965
2034	\$0	\$28,419,561	\$28,419,561
2035	\$0	\$29,413,087	\$29,413,087
2036	\$0	\$30,335,001	\$30,335,001
2037	\$0	\$31,204,680	\$31,204,680

Year	Costs Discounted 2022\$	Benefits Discounted 2022\$	Discounted Net Present Value
2038	\$0	\$31,977,130	\$31,977,130
2039	\$0	\$32,703,577	\$32,703,577
2040	\$0	\$31,990,236	\$31,990,236
2041	\$0	\$32,568,744	\$32,568,744
2042	\$0	\$33,112,242	\$33,112,242
2043	\$0	\$33,590,232	\$33,590,232
2044	\$0	\$34,038,790	\$34,038,790
2045	\$0	\$34,425,760	\$34,425,760
2046	\$0	\$34,788,400	\$34,788,400
2047	\$0	\$35,111,374	\$35,111,374
2048	\$0	\$35,396,644	\$35,396,644
2049	\$0	\$35,627,274	\$35,627,274
2050	\$0	\$35,433,566	\$35,433,566
2051	\$0	\$35,589,156	\$35,589,156
2052	\$0	\$35,713,976	\$35,713,976
2053	\$0	\$35,809,649	\$35,809,649
2054	\$0	\$35,802,630	\$35,802,630
2055	\$0	\$35,768,318	\$35,768,318
2056	\$0	\$35,708,288	\$35,708,288
2057	\$0	\$35,624,049	\$35,624,049
2058	\$0	\$55,058,439	\$55,058,439
<b>Total</b>	<b>\$82,650,264</b>	<b>\$992,127,810</b>	<b>\$909,477,546</b>

Source: Cambridge Systematics, Inc.

### Sensitivity Testing

Sensitivity analyses are often used to pinpoint which variables have the greatest impact on the BCA results. Tests can be used to assess the strength of the BCA by estimating how changes to key variables from preferred values affect results and how sensitive results are to changes. Importantly, tests can show whether results from a preferred set of input variables are significantly different from the input variables.

First, a sensitivity was tested by decreasing the expected detour associated with the “No-Build” scenario by 50%. The resulting discounted BCR was **6.2:1**, with a NPV of **\$426.0 million**. Second, a sensitivity was tested by increasing the cost of the replacement bridge by 25%. The resulting discounted BCR was **9.6:1**, with a NPV of **\$888.8 million**.

**Table 9-10** summarizes the key variables tested for sensitivity and the results of this analysis, which shows the BCA estimates are robust, demonstrating Project feasibility under extreme assumptions.



Table 9-10 | Project Sensitivity Analysis Results

Sensitivity Variable	Sensitivity Value	New BCR (Discounted)	New NPV (Millions of Discounted \$2022)
Decrease Detour Miles	-50%	6.2:1	\$426.0
Increase Cost of Replacement Bridge	+25%	9.6:1	\$888.8

Source: Cambridge Systematics, Inc.

