US-281 (Route 66) Bridgeport Bridge
Canadian and Caddo Counties, Oklahoma

PROJECT INFORMATION	
Sponsoring Organization	Oklahoma Department of Transportation
DUNS Number	8247000740000
EIN	736017987
Name of Project	Reconstruction of US-281 Bridge over S. Canadian River
Type of Project	Bridge
Location of Project	Canadian and Caddo Counties, Oklahoma
Urban/Rural	Rural
Congressional District	3rd
BUILD Application Amount Requested	$17,156,000
BUILD Application Agency Match	$5,089,000
Primary Point of Contact	Laura Chaney Planning & Performance Manager, ODOT (405) 521-2705 lchaney@odot.org

Table of Contents

List of Figures

List of Tables

1.0 PROJECT DESCRIPTION

Figure 1 – Original Route 66 Corridor through the U.S.

No other roadway in modern history can rival the significance and impact to transportation and popular culture in the United States than the original Route 66. Officially commissioned in 1926, Route 66 traversed 2,448 miles from Chicago, Illinois to Santa Monica, California (**Figure 1).** More than 400 of those road miles ran through the state of Oklahoma. Over the last century, as our nation has continued to develop its interstate network, much of the original Route 66 has been altered and incorporated into other highway or local street networks, and the highway was officially removed from the U.S. highway system in 1985. Since the 1950's and 1960's with the construction of the interstate system, the focus of Route 66 has shifted from transportation to historic preservation, recalling the era of roadside diners, motels, and neon signs.

The Oklahoma Department of Transportation (ODOT) maintains several hundred miles of the original Route 66 road alignment along with the associated original bridge structures. In cooperation with U.S. DOT guidelines and in consultation with the Oklahoma State Historic Preservation Officer (SHPO) and other interested parties, ODOT is committed to prioritizing the historic preservation of these segments. The subject of this application involves the reconstruction of the structurally deficient (SD) multi-span pony truss bridge on current US-281 (old Route 66) over the South Canadian River between Canadian and Caddo Counties, Oklahoma. The bridge and 17.7-mile corridor of roadway on which it is located is listed on the National Register of Historic Places (NRHP). Utilizing innovative methods, ODOT wishes to address the deficient conditions of the bridge and preserve the historic integrity of this corridor. ODOT is eager to present the merits of this project for consideration and **is requesting $17,156,000 in BUILD funds** to assist with construction costs associated with this historic bridge reconstruction project.

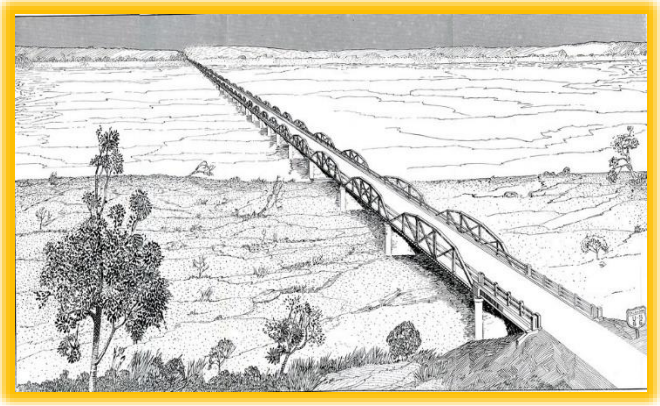


Figure 2 – Artist Concept of Bridgeport Bridge (circa 1932)

The William H. Murray Route 66 Bridge, also known as the "Bridgeport Bridge" (**Figure 2**) is located in the far northeast corner of Caddo

County, Oklahoma, and spans the South Canadian River and the associated floodplain (see Project Location Map at Rt 66 BUILD and Section 2.0).

1.1 Existing Conditions

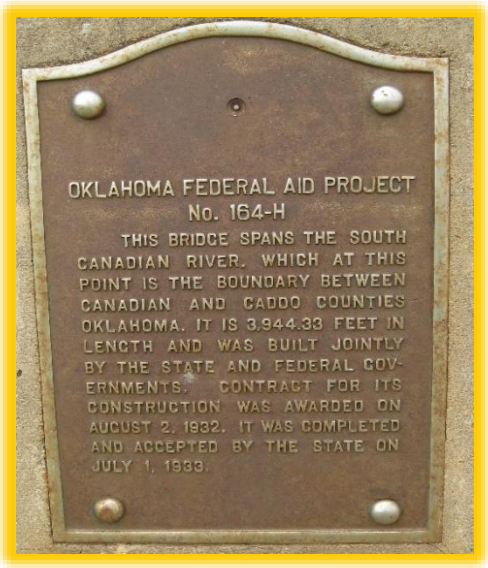


Figure 3 – Existing Bridge Plaque

The existing bridge (locally known as the "Bridgeport Bridge" after the nearby town of the same name) on US-281 over the South Canadian River (National Bridge Inventory (NBI) # 04085) was constructed in 1933 as part of the original Route 66 corridor **(Figure 3).** The approximately 3,945-foot long Warren pony truss structure consists of 38 100-foot long "camelback" pony truss spans, with two 36-foot long multi-beam approach spans at either end. The bridge is evaluated and inspected by ODOT on a biannual basis and is summarized in a "Fracture Critical Bridge Inspection Report." According to the latest report (2018), the bridge is rated as structurally deficient (SD), having several critical elements that are rated in poor condition, including the deck and superstructure (see bridge inspection reports (BIR) at Rt 66 BUILD). The bridge was recently posted for the restriction of heavy traffic loads, first with a maximum of 15 tons, then lowered to a maximum of 9 tons after worsening cracks and corrosion were discovered in gusset plates (**Figure 4**), floor beams and stringers. Due to the quickly deteriorating condition of the bridge, as of June 2019, ODOT has determined that even with ongoing inspection and maintenance, the **bridge will have to be closed to all traffic within 18 months**.

Figure 4 – Worsening Cracks and Corrosion in gusset plates

The bridge is currently 24 feet wide with one driving lane in each direction. The roadway approaches at either end of the bridge consist of an 18-foot wide concrete (with asphalt overlay) driving surface (two 9-foot driving lanes) with no shoulders, part of the original Route 66 roadway. The current average annual daily traffic (AADT) on US-281 across the bridge is 1,800 vehicles per day. Approximately 21% of the daily vehicles are trucks; 12% are heavy trucks (see traffic information at Rt 66 BUILD). The high truck volumes are a concern for the aging structure, and field observations indicate that many overweight vehicles continue to use the bridge, despite its load posting.

21%

of the 1,800 vehicles driving on the bridge each day are trucks.

1.2 The Historic Route 66 Corridor and Bridgeport Bridge

The US-281 Bridgeport Bridge was constructed as part of the original Route 66 corridor. The construction of Route 66 not only changed the landscape of the country, it spawned a culture of recreational and scenic travel in the U.S. It bolstered local and state economies, inspired poets, songwriters, artists and any average American with a desire to experience the country in a whole new way, by means of the "road trip."

1.2.1 Route 66 Corridor

Prior to the construction of Route 66, automobile travel in the U.S. was not the most common, affordable, nor enjoyable means of transportation. The vast majority of local roads and highways were unpaved and did not always provide a comfortable, reliable or safe means of travel (**Figure 5**). Automobiles were still largely used for short distance travel and work vehicles. Trains were by far the preferred choice for most long-distance journeys. With the release of the Ford Motor Company's Model T in 1908, automobiles and automobile travel became affordable for the average American. Paved highways became a necessity, and in 1921 the Federal Aid Highway Act was passed. This Act provided 50/50 matching funds between federal and state governments and planning of a U.S. highway network began. Design and construction of paved

Figure 5 – Model T Ford on a rutted unpaved roadway

highways became prevalent throughout the country with the designation of multiple U.S. Routes (later referred to as U.S. Highways.)

Construction of U.S. Route 66 began in 1926 and continued into the late 1930's. The highway became the primary route for Americans who chose to migrate west during the "Dust Bowl" of the 1930's, which is immortalized in the 1939 novel *The Grapes of Wrath* and the subsequent 1940 movie portrayal.

The importance of the highway's cultural significance surged in the post-World War II years, particularly the 1940's and 1950's when the U.S. economy steadily improved with returning U.S. soldiers beginning to rejoin the workforce, start families and take family vacations. Route 66 quickly became a favorite road trip corridor, and roadside attractions, both natural and manmade kept the family vacationers coming for the next several decades.

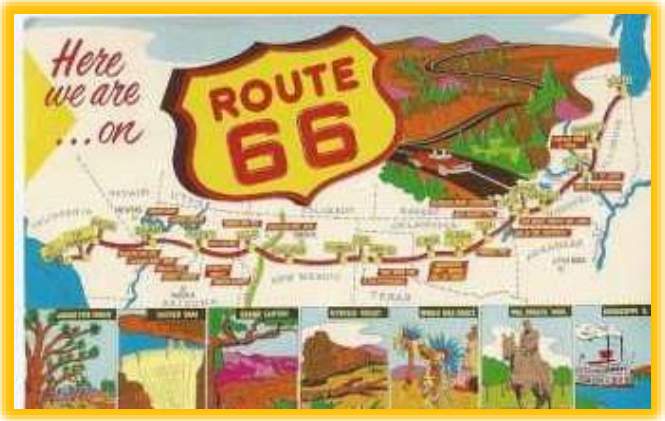


Figure 6 – Circa 1950s Route 66 Post Card

Travel guides, brochures, post cards and memorabilia were produced by local government entities, and merchants both small and large featuring natural scenic wonders such as the Grand Canyon and manmade glories such as the Hoover Dam, capitalizing on the growing popularity of this genuinely unique American travel experience (see **Figure 6**).

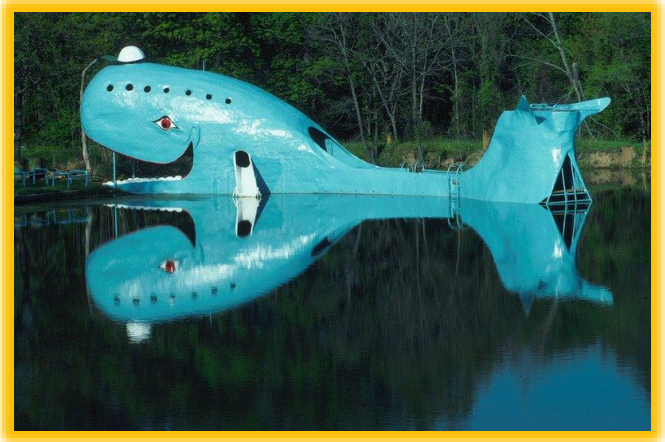


Figure 7 – The Blue Whale – Route 66 Roadside Attraction - Catoosa, OK

Travelers also required places to eat, relax and sleep along the way. A multitude of roadside diners, cafes, and travel stops were built, each featuring unique curiosities to entice the families to pull over, take a look, and stop in to have a meal and purchase collectables (see **Figure 7**).

Motor hotels, or motels, as they later became known, dotted the landscape surrounding the Route 66 rights-of-way as local "mom and pop" entrepreneurs found opportunities to provide

affordable overnight accommodations with a local flair. Many of the roadside diners, attractions, fueling stations and motels became famous and "must see" destinations in their own right, as travelers shared their experience with neighbors, family and friends. Also, the entertainment industry continued to produce music, movies and television programs featuring Route 66 as a desired or preferred vacation excursion (see **Figure 8**). Route 66 was given romantic nicknames such as "Mainstreet America" and "The Mother Road." In 1952 US-66 was officially designated "The Will Rogers Memorial Highway" in honor of the entertainer, humorist, social commentator and native Oklahoman.

Figure 8 – Wigwam Motel – San Bernardino, CA

With the passage of the Federal Aid Highway Act of 1956 the Interstate Highway System was planned (**Figure 9**). This network of fully controlled-access highways could support the increasing freight traffic needs of the country and allow travelers to drive at higher speeds and avoid having to stop at road intersections. By the early 1970's the constructed portions of interstate highways had paralleled the entire Route 66 corridor, and in many cases removed or replaced several contiguous segments of "the Mother Road." This unquestionably had devastating economic impacts to the small towns and businesses that had become accustomed to the daily business from highway travelers.

Figure 9 – Start of the Interstate Highway System

At over 400 miles of roadbed, Oklahoma boasts the most remaining drivable miles of Route 66 of all eight states, much of which is maintained by ODOT. Nearly all of the original corridor is maintained either as a local street or as portions of the Oklahoma State Highway (SH) 66, or other State or U.S. highways. Following the official removal of US-66 from the U.S. Highway

system in 1985, the focus of many individuals and organizations, both public and private, was on preserving as many of the culturally significant elements of Route 66 as possible. In 1989, with the backing of these groups, the Oklahoma State legislature formed a committee which established the Oklahoma Route 66 Association.

Over 65 culturally significant elements of the old Route 66 corridor in Oklahoma have been listed in the NRHP.

In 2002, the remaining original segments of Route 66 in Oklahoma were researched and documented in a joint effort between the Oklahoma State Historic Preservation Officer (SHPO), the Route 66 Association and ODOT in the report entitled *Oklahoma Route 66 Roadbed Documentation Project (1926-1970)*. To date, over 65 properties along the Oklahoma Route 66 corridor are listed in the National Register of Historic Places (NRHP), including a 17.7-mile segment of Route 66 from Hydro, OK extending east through Bridgeport Hill to the junction of US-281 listed as "Bridgeport Hill - Hydro Route 66 Segment," which encompasses the Bridgeport Bridge (Listing) (see Project Location Map at Rt 66 BUILD and Section 2.0). The Oklahoma legislature designated the Historic Route 66 as a State Scenic Byway in January 2005. In 2009, the U.S. National Park Service designated the entirety of Route 66 in Oklahoma as a National Scenic Byway.

In 2013, organizational leaders and nationwide Route 66 stakeholders met in Anaheim, CA for a strategic roundtable discussion regarding visions and strategies for a national framework for collaboration along the historic route. In November 2014, the *Route 66: The Road Ahead Initiative* was agreed upon and released (**Figure 10**). One of the main goals of this initiative is to pursue federal legislation to permanently designate Route 66 a National Historic Trail.

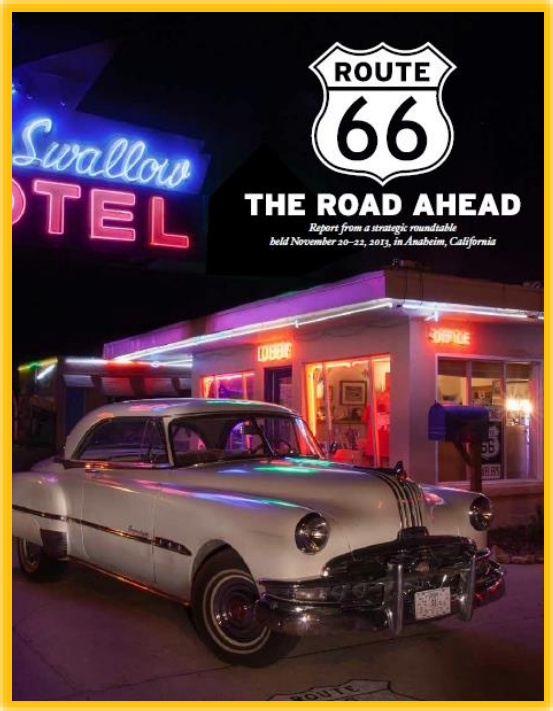


Figure 10 – The Route 66 Road Ahead Report

The Route 66 Corridor Preservation Program, started in 1999 and administered by the National Park Service (NPS), has been the only source of federal funding dedicated to preserving Route 66, and its authorization expires this year. A bill written to designate Route 66 a National Historic Trail was introduced to the U.S. Congress (H.R. 801 and S. 3609) in 2017,

and passed the House of Representatives in June of that year, but stalled in the Senate during the 2018 government shutdown. Supporters are hopeful that this bill is reintroduced and signed into law in 2019. Along with this bill, another related bill (H.R. 66 and S. 1014), proposes to create a national Route 66 Centennial Commission to coordinate 2026 centennial celebrations and promotions. In support of this effort, the Oklahoma Legislature recently created a new, 21-member Oklahoma Route 66 Centennial Commission to plan, coordinate, and implement a statewide effort celebrating the 100th anniversary of Historic Route 66. Governor Kevin Stitt signed the bill on April 30, 2019.

With BUILD assistance, ODOT will have the Bridgeport Bridge restored and open in time for the 2026

Route 66 Centennial

ODOT is in support of both The Road Ahead Initiative, and the associated legislation the group is pursuing. ODOT is seeking the BUILD grant funds in order for the Bridgeport Bridge to be restored and open to traffic in time with the planned 2026 Route 66 Centennial celebrations.

Figure 11 – Partners in Oklahoma Route 66 Historic Preservation

1.2.2 Bridgeport Bridge

The US-281 (Route 66) bridge over the South Canadian River has many unofficial names, including the William H. Murray Bridge (State Governor at the time of construction), the Pony Bridge (local nickname), the Grapes of Wrath Bridge (based on the fact that the bridge was featured in the 1940 movie of the same name), and the Bridgeport Bridge, as it is referred to by ODOT and in this document.

Figure 12 – Original Truss Span over S. Canadian River – Pre-1930

The Bridgeport Bridge is not the first large structure to span across the South Canadian River near the current location. The original County truss span was constructed in the early 1900's and served as a crucial link across the river (see **Figure 12**). Undoubtedly this important river crossing helped determine the location for the alignment of Route 66 through this rural corridor. Construction of the Bridgeport Bridge began in the fall of 1932, was completed in 1933 and open to traffic in 1934, providing a safe and modern river crossing for the US-66 corridor for the decades to come (**Figure 13**).

Figure 13 - 1932 Construction of Bridgeport Bridge

The bridge is considered historically significant not only for its engineering attributes, but also for its association with the Route 66 corridor and the mass migration of Oklahomans during the Great Depression and severe drought of the "Dust Bowl." Due to the length of the bridge, the complex engineering involved, and scope of the project, the construction of this bridge was described in the 1931-1932 Report of the State Highway Commission as: "The most pretentious bridge engineering project ever undertaken by the Oklahoma Highway Commission." The bridge has been individually determined eligible for listing in the NRHP and is considered a contributing element to the NRHP-listed Bridgeport Hill-Hydro segment of Route 66.

As the bridge has aged and the size and number of vehicles using the bridge has increased, ODOT recognized the need to make improvements to the structure. In 2014, ODOT tasked a consultant to conduct an alternatives analysis of the bridge, understanding that the historic significance of the bridge would demand a thorough review of all possible options to meet the requirements of Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act. ODOT also saw the need to engage stakeholders early, knowing that there would be many preservation-focused groups interested in the project. ODOT held an initial Stakeholder Meeting in June of 2015, to inform interested parties of the proposed project and obtain input. These meetings formally initiated consultation under Section 106 of the National Historic Preservation Act. The meetings were attended by members of ODOT, the Federal Highway Administration (FHWA), Oklahoma SHPO, the Oklahoma Tourism and Recreation Department, Preservation Oklahoma, Inc., Historic Bridge

Foundation, National Park Service Route 66 Corridor Preservation Program, the Oklahoma Historic Bridge & Highway Group, and the Oklahoma Route 66 Association. Overall, the project has received support from the consulting parties, who agree that keeping the bridge open to traffic and preserving historic integrity are equally critical. Notes from that meeting can be found at (Rt 66 BUILD).

Completed in 2016, the Alternatives Analysis evaluated rehabilitation and replacement options for the Bridgeport Bridge, in accordance with FHWA's *Programmatic Section 4(f) Evaluation and Approval for Projects that Necessitate the Use of Historic Bridges.* The 2016 report compared the impacts of the various alternatives (including the Do Nothing alternative) on roadway geometry, bridge condition, hydrology, constructability/traffic, right-of-way, utilities, environmental resources, and the local economy (**Figure 14**). ODOT then held an additional Stakeholder Meeting in September 2016 to present the results of the Alternatives Analysis. The 2016 Alternatives Analysis Report and notes from the second Stakeholder Meeting can be found at (Rt 66 BUILD).

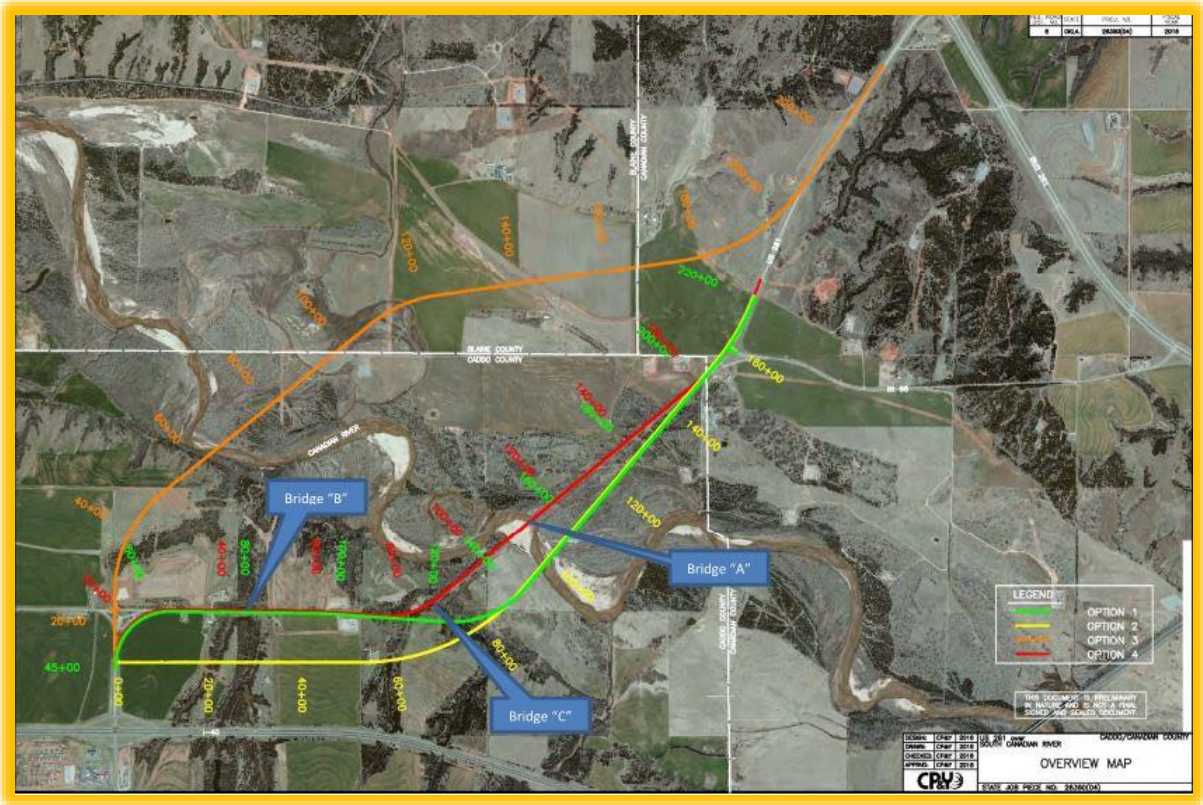


Figure 14 – 2016 Alternative Analysis Overview Map

The Alternatives Analysis shed light on the numerous challenges associated with this project. The condition of the bridge demands that any rehabilitation alternative would require repair or

replacement of so many of the truss elements that it would be difficult to maintain the integrity of the original materials and workmanship. Preserving the bridge as a monument was also not feasible, given that a new bridge in reasonably close proximity would negatively affect the setting, feeling, and association of the historic structure. In addition, closing the bridge to traffic would have negative impacts on the visitor experience of Route 66, and could have a negative economic impact on the region as tourist traffic would be diverted elsewhere.

Through the Alternatives Analysis and stakeholder consultation, ODOT has identified an innovative solution to achieving its goals of safety, historic preservation, and support for the tourism economy. The project proposed in this application will reconstruct the existing bridge on its current alignment. ODOT chose an option which would maintain the 24-foot width of the structure in order to preserve the bridge's feeling and association, and so as to not require widening of the adjacent Route 66 roadway. Traffic collision data (Rt 66 BUILD) supports the fact that the existing narrow width does not create a significant safety issue. The reconstruction of the bridge will include repairing the substructure, replacing the deck and entire superstructure, while expanding the piers to allow the pony trusses to be re-attached to maintain the historic integrity of the original bridge. The bridge will also be repainted and restored to its original look. Maintaining the bridge's original look and feel, as well as the majority of its original truss members, will preserve the historic context for years to come. The improvements will be in accordance with AASHTO Guidelines for Historic Bridge Rehabilitation and in harmony with the goals associated with the Route 66 Road Ahead Initiative.

This restoration project will benefit the local rural community and surrounding towns by beautifying the existing structure and allowing the local population to continue to use this alternate to I-40 to get to their destinations, transport local goods and access local services. The area is predominately rural and much of the land is used for farming, oil production and windfarms.

The bridge is situated between the two moderately populated cities of Weatherford to the west, and El Reno to the east, and the historic Route 66 corridor connects them both. Local communities stand to benefit economically from an increase in tourism with the announcement of the restored historic bridge in time for the national 100-year celebration. Thousands of enthusiasts from all over the world drive the old Route 66 corridor, and renewed national attention from the planned 2026 centennial initiative, along with the popularity and significance of the bridge is sure to create a surge in tourism and economic opportunities, as further discussed in Section 4.1.3.

1.3 Transportation Challenges

ODOT was faced with the difficult task of addressing the critical transportation needs of the corridor, following the results of the Alternatives Analysis. At the same time, consideration of the historic significance of the bridge, as well as the need to use any feasible and prudent methods to preserve the historic integrity of the corridor, the bridge and the driving experience were taken into account.

The Bridgeport Bridge is widely considered Oklahoma's most significant historic bridge. It is significant for its scale and length, as the second longest bridge in Oklahoma and the longest Route 66 bridge west of the Mississippi River. It is also significant for its repeating camelback truss configuration. Finally, the bridge is significant as a contributing element to the NRHP-listed segment of Route 66 from Bridgeport Hill-Hydro, which is also part of the Route 66 National Scenic Byway. As such, any alternative to improve the bridge must consider not only preserving the historic integrity of the bridge itself, but of the overall Route 66 roadway.

Despite its narrow width and recent load postings, high volumes of truck traffic (including loads much heavier than currently allowed) continue to use the bridge, preferring the shorter route rather than detour the 11.5 miles on US-281 BUS (**Figure 15**). ODOT considered an alternative that would close the bridge to trucks and only allow passenger vehicles; however, enforcing such a closure would be difficult, and a restriction of this kind would also preclude use of the bridge by recreational vehicle (RV) users wanting to drive Route 66.

Figure 15 – Heavy Truck Traffic on the Bridge

Due to the age of the bridge (over 35 years past its design life) and to the continual use by heavy trucks, the condition of the bridge has deteriorated rapidly over the past 10 years, and an accelerated schedule for replacement is now critically necessary. The proposed project would address the transportation challenges by replacing the superstructure with a new multi-beam steel structure and a concrete deck. The substructure would be repaired, and new pier caps added so that the original pony trusses can be reattached to the outside of the steel beams. In this manner, the trusses are no longer bearing the full structural load but would still appear in the same configuration as the original structure for drivers and for observers. The restored

bridge will be able to support the current and future anticipated heavy truck traffic while maintaining its historic significance.

The existing bridge railings will be replaced with modern crash-tested railings with a design consistent with the historic context of the bridge, in accordance with the Secretary of the Interior's Standards for Rehabilitation as outlined by AASHTO NCHRP Project 25-25, Task 19 (March 2007). ODOT has had previous success using modern railings that are historically consistent with Route 66-era originals.

2.0 PROJECT LOCATION

The US-281 Bridgeport Bridge is located in the far northeast corner of Caddo County, Oklahoma and spans approximately 3,945 feet across the South Canadian River and the associated flood plain. (**Latitude 35°32'30.0" N / Longitude 98°19'14.5" W**) Though the bridge is in close proximity to the cities/towns of Geary, Bridgeport, and Hinton, it is not within a U.S. Census-designated urbanized area, and is considered to be in a rural location (**Figure 16** and "Project Location Map" at **Rt 66 BUILD**).

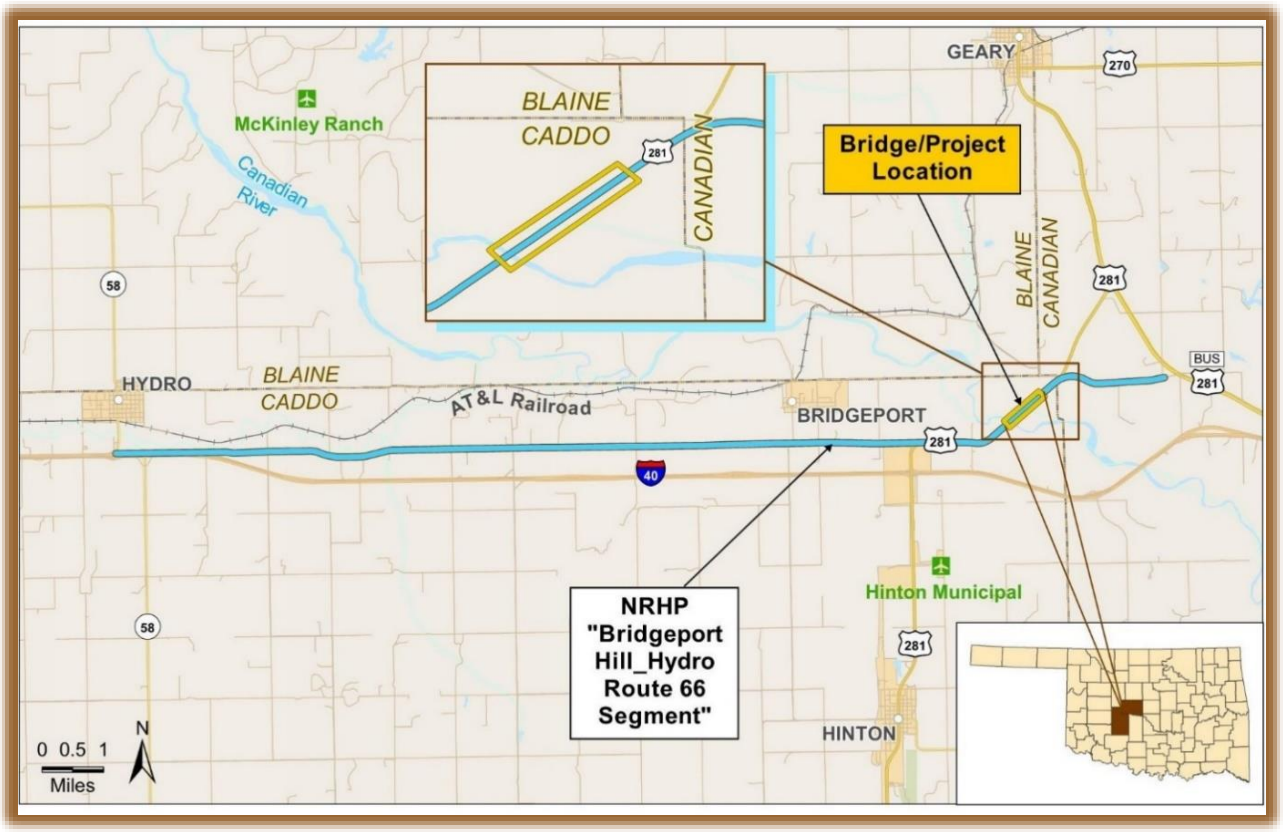


Figure 16 – Project Location Map

The project and bridge are within the NRHP-listed 17.7-mile segment of Route 66 from Hydro, OK extending east through Bridgeport Hill to the junction of US-281 BUS. This Route 66 segment is a parallel transportation option to I-40 just to the south, and the 11.5-mile (I-40 to US-281 to US-281 BUS) detour segment is used frequently by trucks. (Detour map at Rt 66 BUILD) The detour is also utilized when I-40 is closed due to traffic accidents or inclement weather. Bridgeport Bridge is adjacent to other transportation infrastructure including the Austin, Todd and Ladd (AT&L) Railroad approximately 1.5 miles to the north, and Hinton Municipal Airport 2 miles to the southeast.

3.0 GRANT FUNDS, SOURCES AND USES OF PROJECT FUNDS

ODOT is the project sponsor and is **requesting $17.2 million in BUILD funds** to contribute to the construction of the project. The total future eligible costs are $22,245,000, and ODOT proposes to contribute matching funds toward the project. Due to the budgetary structure of the State of Oklahoma, much of the funding allocated to ODOT derives from motor vehicle fuel taxes, which are based on gallons purchased, not price. Therefore, this is a declining revenue source as fuel efficiency continues to increase.

3.1 Funding Sources

ODOT has committed to provide matching State funds, totaling approximately $5.1 million. Included is a letter from ODOT Director Tim Gatz committing to advance the project development and dedicate the matching funds in the event the BUILD grant is awarded (Rt 66 BUILD).

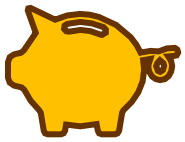
A summary of the funding sources is listed in **Table 1** below:

TABLE 1 - PROJECT FUNDING SOURCES

	SOURCES of FUNDS			
	NON-FEDERAL	BUILD	OTHER FEDERAL	TOTAL
Funding Partner	ODOT	USDOT		
Pre-Construction	$800,000	$0	$0	$800,000
* Construction	$4,289,000	$17,156,000	$0	$21,445,000
TOTAL	$5,089,000	$17,156,000	$0	$22,245,000
PERCENTAGE	23%	77%	0%	100%

* Contruction Estimate includes 15% Contingency

3.2 Project Budget



A detailed summary of project fund uses by individual project element is in **Table 2** below. A detailed cost estimate can be found at [Rt 66 BUILD].

TABLE 2 - USES OF FUNDS AND PROJECT BUDGET

DETAILED USE of FUNDS					
PROJECT CATEGORY	**PROJECT ELEMENT**	**AMOUNT**	**FUNDING SOURCE**	**% OF TOTAL**	**% IN DOLLARS**
Pre-Construction	**Environmental**	$200,000	ODOT	0.9%	$ 200,000
	Design	$400,000	ODOT	1.8%	$ 400,000
	R/W & Utility Relocation	$200,000	ODOT	0.9%	$ 200,000
Sub Total	**Total Pre-Const.**	**$800,000**	**100% ODOT**	**3.6%**	**$ 800,000**
Construction *	**Substructure Rehabilitation**	$17,023,000	ODOT	15.3%	$ 3,404,600
			BUILD	61.2%	$ 13,618,400
	Bridge Painting	$1,102,000	ODOT	1.0%	$ 220,400
			BUILD	4.0%	$ 881,600
	Removal and Resetting Trusses	$2,570,000	ODOT	2.3%	$ 514,000
			BUILD	9.2%	$ 2,056,000
	Roadway & Traffic Control	$750,000	ODOT	0.7%	$ 150,000
			BUILD	2.7%	$ 600,000
Sub Total	**Total Construction**	**$21,445,000**	**20% ODOT 80% BUILD**	**96.4%**	**$ 21,445,000**
GRAND TOTAL		**$22,245,000**		**100.0%**	**$ 22,245,000**

* All Construction Elements Include a 15% Contingency

In summary, ODOT is proposing to fund approximately $5.1 million of the total future eligible project costs of $22.3 million to be expended over a four-year period through obligated State sources and is requesting $17.2 million in BUILD funds from USDOT. The contribution from ODOT's State match represents 23% of the total project cost, which it intends to spend on all pre-construction activities including engineering design, environmental permitting, right-of-way (R/W) acquisition and utility relocation.

ODOT has invested $356,000 in prior work on this project, which has been part of ODOT's 8-year Construction Work Plan since 2008. Prior expenses have included reconnaissance data collection, preliminary engineering and alternatives analysis, stakeholder meetings, and consultations.

4.0 SELECTION CRITERIA

4.1 Primary Selection Criteria

4.1.1 Safety

Safety is of primary concern in the planning, design and construction of all ODOT projects. ODOT's mission statement reads, in part," …to provide a **safe**, economical and effective transportation network for the people, commerce and communities of Oklahoma." Of special focus at ODOT over the past 15 years has been the replacement or rehabilitation of structurally deficient bridges throughout the State. Since 2005, when the SD bridge focus began, the number of highway system SD bridges in Oklahoma has been reduced from 1,168 down to 132 at the end of 2018 (https://www.ok.gov/odot/Highway_System_Conditions.html).

The Bridgeport Bridge is one of ODOT's remaining SD bridges, and as was noted in earlier sections, is quickly deteriorating to the point of closure in coming months. The proposed reconstruction of the bridge involving the repair of the substructure and complete replacement of the superstructure with modern steel beams and precast deck panels using ultra high-performance concrete (UHPC) will improve the bridge to current load bearing standards which will be able to safely carry the high truck volumes.

The accident rate along the Bridgeport Bridge is

23%

lower than the statewide average.

The current collision data (**Rt 66 BUILD**) for the bridge corridor reveals relatively low accident volumes, with a collision rate 23% lower than the statewide average for similar roadways. Despite the narrow width of the deck and length of the bridge, there were no head on collisions or accidents with fatalities and only one collision on the bridge itself in the last 5-year period. These numbers allay concerns about restoring the bridge with its original 24-foot curb-to-curb width.

The safety of the bridge is anticipated to be improved with the installation of modern bridge rail that has been pre-selected to be context sensitive to Route 66. Crash modification factors (CMFs) of this countermeasure show between a 5% to 30% reduction in crashes, and a 60% to 90% reduction in crash fatalities with the addition of bridge rail (www.cmfclearinghouse.org). The monetary value of safety benefits is calculated in the benefit-cost analysis (BCA) as $29.6 million or $11.2 million discounted at 7% (see Section 6.0 below).

4.1.2 State of Good Repair

The existing Bridgeport Bridge is 85 years old and had an original anticipated design life of 50 years. The bridge has a sufficiency rating of 21.1 out of 100 and is classified as structurally deficient (SD). A bridge is classified SD if the deck, superstructure or substructure is rated in "poor" condition (0 to 4 on the NBI rating scale). Sufficiency ratings are determined during the biennial bridge inspection and are intended to indicate a measure of the ability of a bridge to remain in service. Calculations for sufficiency ratings utilize a formula that includes various factors determined during the bridge field inspection and evaluation. Because of the poor condition of the bridge and the need for careful monitoring, annual maintenance cost is averaging $93,000 and it has been determined that the bridge will need to be removed from service within 18 months.

The alternative to the proposed reconstruction project would be that the bridge would be closed to traffic, and mobility in the area would be adversely affected by the 11.5-mile detour.

The improvements as a result of the bridge reconstruction will provide a safe and stable structure with an extended design life of 75 years. ODOT would continue to use State funds for maintenance which is estimated to be approximately $18.5 million over the next 50 years (see bridge maintenance costs at Rt 66 BUILD).

Table 3 below summarizes the reconstruction option over the project lifecycle.

TABLE 3 - SUMMARY OF COSTS IN MILLIONS OF 2017 DOLLARS

	Over the Project Lifecycle		
	In Constant Dollars	Discounted at 7 Percent	Discounted at 3 Percent
Construction & Development Costs	$21.5	$16.3	$19.1
Operations and Maintenance	$2.7	$0.9	$1.7
Total	**$24.3**	**$17.2**	**$20.8**

4.1.3 Economic Competitiveness

The Route 66 corridor continues to grow in popularity as a nostalgic road trip adventure and is certain to surge in popularity with the upcoming 2026 Centennial. The Bridgeport Bridge is not only an essential historic link in the Route 66 story, it is also an essential physical link, connecting nearby Route 66 tourist attractions both east and west, from Robert's Grill (since 1926) in El Reno, OK to the Cherokee Trading post in Calumet, OK. Just west of the bridge is Lucille's Service Station

(built in 1929) in Hydro, OK (**Figure 17**), and the Route 66 Museum down the road in Clinton, OK (**Figure 18**).

In the State of Oklahoma, the *Oklahoma Travel Impacts 2010-2016* report produced by the Oklahoma Tourism and Recreation Department shows that direct travel spending amounted to $8.5 billion in 2016, generating $988 million in revenue. The National Trust for Historic Preservation notes the following economic benefits to preserving Route 66 on their website:

Figure 17 – Lucille's Service Station - Hydro, OK

- Nationwide, Cultural Heritage tourists spent $171 billion on travel in 2013
- Average annual spending along Route 66 is $132 million
- A typical Route 66 travel group spends between $1,500 and $2,000

The 2011 *Route 66 Economic Impact Study* conducted by Rutgers University cited two examples of successful Oklahoma economic generators along Route 66. One example near the project location is the Route 66 Museum of Clinton, OK which has approximately 35,000 visitors per year (near 4 times the City population). The second example, in Arcadia, OK is the restoration of the NRHP listed Round Barn, hosting visitors from all 50 States and 44 foreign countries in 2007. The success of the Round Barn led to the nearby commercial development of POPS, a Route 66 themed gas station, restaurant and convenience store which served more than 900,000 people in 2009 and continues to grow as a local Route 66 destination and generate tourism and dollars for the local community.

Figure 18 – Route 66 Museum – Clinton, OK

The Bridgeport Bridge project will enhance the growing economic potential of Route 66 as a tourist destination by maintaining this historically significant bridge and preserving the route for similar, potential tourist-driven, economic development. The project will

also increase efficiency of the movement of people and goods and will reduce commercial costs by keeping this vital truck route open and avoiding the 11.5-mile detour that would result if the bridge were closed to traffic. With the project, the bridge and corridor will reliably support freight and local transportation, and thereby improve connectivity.

4.1.4 Environmental Sustainability

One benefit to the environment can be measured in the reduction of fuel emissions that would occur as a result of maintaining the Route 66 corridor. Currently the bridge is unsafe for larger trucks and is posted at a 9-ton load limit. Larger trucks are currently directed to detour 11.5 miles around the bridge. Approximately 1,800 vehicles a day travel this route, and should the bridge be closed, as it would without this project and BUILD funding, all vehicles would have an additional travel distance between 8 to 11.5 miles depending on their destination. The environmental benefits to the reduced fuel emissions is calculated in association with the vehicle operating cost in the BCA. This amounted to $0.4 million in constant 2017 dollars or $0.2 million in dollars discounted at 7 percent. Therefore, the project would provide a modest reduction in emissions.

Figure 19 – Arkansas River Shiner

Another benefit to the selected design option is that the existing configuration of the substructure will be maintained. The existing drilled shafts will remain in place and no new bridge piers will be added in the river channel and floodplain. If a new bridge was constructed, the environmental impacts would be substantially higher due to the number of new piers that would be required along the 3,945-foot length. The South Canadian River provides designated critical habitat for the Arkansas River Shiner, a small silver colored minnow (fish) that is a listed by U. S. Fish and Wildlife Service (USFWS) as a threatened species (**Figure 19**). Any construction within 300 feet of the ordinary high-water mark (OHWM) of the river is considered an impact to this habitat and requires formal Section 7 consultation with the USFWS. The option selected for the project would have the smallest impact on this threatened species (estimated temporary impact of 1.6 acres) out of all other considered alternatives (estimated between 2.4 and 6.8 acres) in the 2016 alternatives analysis. Work can be completed outside of the shiner spawning season (approximately May 1 – Aug 30), thus minimizing impact to the ongoing sustainability of this species and the water resources.

Finally, the project sustains the cultural environment of the surrounding region as the best construction option to preserve the historic bridge and NRHP-listed historic Bridgeport Hill-Hydro district. The project preserves the historic integrity and viewshed, maintains the driver experience of Route 66, minimizes environmental impacts to species habitat and wetlands, is comparably low cost, and provides a safe reliable structure.

4.1.5 Quality of Life

By restoring the historic Bridgeport Bridge and preserving this portion of the NRHP-listed Route 66 historic district, the project provides a safe and reliable transportation choice for those that wish to experience Route 66, as opposed to bypassing the scenic and culturally historic area by using I-40. As discussed, access to Route 66 tourist destinations may become an economic lifeline to the rural community in the near future with the renewed national promotion efforts underway. The potential for tourist-oriented development could lead to other additions in the way of jobs, and more local and convenient services for the community.

The project would also allow for the transport of essential services (emergency vehicles, school bus and U.S. mail routes) through the rural community which would otherwise be rerouted to the next available river crossing on I-40, which is not preferable to use as a school bus route. The energy industry provides essential consumer goods and services as well as employment in the area. Reopening the corridor for the industry's large vehicle fleet to use will also have a positive impact on quality of life for the local rural residents.

4.2 Secondary Selection Criteria

4.2.1 Innovative Technology

ODOT plans to employ several innovative and cost-effective design solutions which include pre-cast concrete components that can be constructed in large quantities off-site and can be easily delivered and assembled in sections according to a predetermined order and schedule.

One planned innovation is to reuse the existing foundation elements by removing approximately the top five feet of each pier and leaving the rest in place. A new pier cap will be constructed to support the new superstructure and trusses using conventional methods. This will save on cost, time and environmental mitigation, since new piers will not need to be drilled in the South Canadian River channel.

Another innovation is an Accelerated Bridge Construction (ABC) system which will allow the construction contractor the flexibility to plan and schedule the construction of individual components in harmony with available company labor forces. The precast prefabricated abutment system is an innovation to help reduce bridge construction time (**Figure 20**). The technology consists of prefabricated precast abutment elements cast on or off-site utilizing standard materials. The precast elements create an efficient system that is compatible with conventionally constructed abutment elements and are capable of carrying bridge loads with predictable and reliable performance.

Using this approach, the designer places the bridge directly on the substructure unit, creating a seamless and smooth transition between the bridge and approach roadway without cast-in-place concrete. The smooth transition from the roadway to the bridge helps alleviate the "bump at the end of the bridge" problem caused by differential settlement between the bridge abutment and the approaching roadway.

Figure 20 – Construction with Pre-Cast Abutment

ABC offers the following advantages:

- Reduced Time: Precast abutment construction employs commonly available equipment and materials and does not require specialized labor. Constructing a precast abutment can potentially result in appreciable user cost savings over the duration of the project versus abutments built with conventional methods by reducing the overall closure time.
- Equivalent Maintenance: Once constructed and installed, precast prefabricated abutments are also durable and easy to maintain. These units do not increase the cost or frequency of maintenance.
- Convenience and Flexibility: Precast prefabricated bridge abutments also perform well and can be designed for a wide range of loading conditions, such as in seismic areas and rapidly changing water elevations.

Along with the abutments, the bridge deck will be designed and constructed using prefabricated full depth deck panels with UHPC connections with a surface overlay to create uniformity along the bridge. The ABC systems are promoted by the FHWA Everyday Counts (EDC) Program. The EDC program is a State-based model that identifies and rapidly deploys proven, yet underutilized innovations to shorten the

project delivery process, enhance roadway safety, reduce traffic congestion, and improve environmental sustainability. Proven innovations promoted through EDC facilitate greater efficiency at the State and local levels, saving time, money and resources that can be used to deliver more projects.

4.2.2 Innovative Project Delivery

ODOT's ABC system approach will also allow ODOT to maintain a project delivery schedule that can quickly address the challenges and reduce the amount of time the bridge would need to be closed to traffic. As noted above, using the precast materials will reduce the amount of time it will take the contractor to mobilize and construct since concrete bridge elements will not be cast in-place.

The project will also streamline other preconstruction project delivery requirements such as environmental study, documentation, and permitting. ODOT will pursue environmental approval as a Categorical Exclusion (CE) under the National Environmental Policy Act (NEPA). A schedule challenge in obtaining timely approval would be USFWS consultation for the Arkansas River Shiner. Critical habitat consultation and mitigation can often take several months, but since much of the substructure and all of the piers will be reused, this consultation will not be as complicated as if new construction in the channel was proposed. This project construction approach would also lend itself to a simplified and quicker Section 404 Permit application to the U.S. Army Corps of Engineers (USACE) since work in jurisdictional waters and wetlands at the bridge location will be minimized. ODOT currently has liaison staff in place at both the USFWS and USACE to review ODOT projects. At ODOT's direction, these staff can prioritize the Bridgeport project as needed to meet schedule milestones.

ODOT may also consider other proven strategies to reduce construction contract time such as Cost-Plus-Time Bidding (A+B bidding) and Lane Rentals.

4.2.3 Innovative Financing

ODOT has a practice described in State statue (Oklahoma Statutes, Title 69, O.S. 2016 § 1001-1004) of recycling revenue from the sale of excess or unused publicly owned land or assets through authorization by the State Transportation Commission and managed through ODOT's Facilities Management Division. By statute the recycled funds from the sale of land or equipment is deposited in the State Highway Construction and Maintenance Fund. These funds remain

dedicated to being used toward design, permitting, construction or maintenance of authorized and programmed highway and bridge projects, and cannot be reallocated by the State legislature. Should the BUILD grant be awarded these recycled funds would be available for use as a portion of the State's matching funds.

4.2.4 Partnership

There have been project information and stakeholder meetings held for this historic bridge project, most notably in June of 2015, and September of 2016, both at the Oklahoma History Center. At these meetings, alternate design options were discussed, and comments were received from the following consulting parties: Federal Highway Administration (FHWA), SHPO, Oklahoma Tourism & Recreation Department, Preservation Oklahoma, Inc, Historic Bridge Foundation, USNPS, Oklahoma Historic Bridge and Highway Group, and Oklahoma Route 66 Association. All entities have expressed support for the preservation options. Twenty-four comments have been received on ODOT's Cultural Resources website as a result of these stakeholder discussions, all in support of Bridgeport Bridge preservation. However, no additional commitments for funding partnerships have been obtained. Letters and statements of support can be found at **Rt 66 BUILD**.

5.0 PROJECT READINESS

5.1 Technical Feasibility

The final bridge design was chosen as a result of preliminary engineering studies and an Alternatives Analysis performed by ODOT in 2016, and ultimately was determined by the need to preserve as much of the existing historic structure as possible. Cost contingencies for construction items have been set at 15% in order to account for the variance in material costs and labor based on ODOT's construction experience in similar projects. The bridge design will include replacement of the pony truss and approach spans with a new superstructure consisting of a concrete deck on steel beams, maintaining the same 24-foot clear roadway width as the existing bridge. This will require the removal of all existing truss members, concrete deck, steel beams and stringers, and all bracing members from each span. The uppermost portions of the existing concrete pier columns will be removed and replaced by new concrete pier caps constructed to support the new steel superstructure. The existing concrete abutments will be removed, and new prefabricated concrete abutments will be constructed to carry the approach end spans. The new deck will consist of full-depth precast concrete deck panels placed on the steel beams with cast-in-place UHPC joint connections.

After construction of the new steel spans, the existing pony truss panels will be attached to the exterior fascia of the bridge, maintaining the historic integrity of the original structure. The truss panels will support their self-weight plus any applicable environmental loads, and be placed in a way such that they will appear functional, but will not be relied upon to perform in a significant structural load carrying capacity.

In order to facilitate concurrent demolition and reconstruction operations, temporary work roads on both sides of the bridge will be constructed adjacent to the structure, within the right-of-way limits, to access the spans and supports as necessary for rehabilitation. The work roads will be wide enough to accommodate large construction equipment and dump trucks for removal of existing bridge items as well as trucks and equipment necessary to rehabilitate existing elements and construct new superstructure (see Aerial Exhibit at Rt 66 BUILD).

The concrete deck will be removed using mechanical equipment to break up the concrete, drop it to the ground below in the non-wetted portion of the of the river channel or flood plain outside the limits of the OHWM or critical habitat. Removed concrete will be transferred into dump trucks by loaders and hauled off the site. Spans over the channel and within the OHWM will require the use of netting or other approved temporary falsework to catch and collect removed concrete from the deck. Steel stringers, floor beams, and braces will be removed by either cutting through gusset plates or removing rivet connections and disassembling from exterior truss panels. Cranes will be used to remove truss panels and transfer them to a staging area for minor rehabilitation work, including cleaning by fully contained media blasting methods and painting. Collection of waste and painting will be performed in accordance with ODOT Standard Specifications. All other existing steel members will be properly removed from the site. All elements will be removed from the bridge in pieces as large as possible to facilitate cleanup and expedite removal durations.

5.2 Project Schedule

The illustration of the major project milestones is outlined in the summary of schedule highlights below (see **Figure 21**), and the detailed project schedule is included in Rt 66 BUILD. The schedule begins with engineering design commencing in June 2019 and proceeding through the design, permit and approval process, funding obligation and construction, meeting all BUILD-required milestones. Subject to grant approval, ODOT will modify the scope and advance the project that is currently in the ODOT 8-year Construction Work Plan in 2025. Once the project scope is finalized, the NEPA approval process will continue concurrently with preliminary engineering and design. During design, ODOT will apply for all Federal and State regulatory permits and will obtain all needed approvals prior to the production of construction bid packages (September 2021 per schedule).

All necessary activities will be completed to allow BUILD funds to be obligated in advance of the September 30, 2021 deadline and for construction to be completed by 2023 in order to be open to traffic well in advance of the Route 66 Centennial in 2026.

Figure 21 – Summary of Schedule Highlights

Project construction will begin no later than January 2022, and BUILD funds will be expended according to the construction invoicing and payment schedule. With construction estimated to be complete in July 2023, ODOT can ensure that all construction claims can be paid, and all BUILD funds will be expended well in advance of the September 30, 2026 deadline.

5.3 Required Approvals

Environmental Permits and Reviews

Preliminary environmental data and constraints have been identified and were factors considered in the 2016 design Alternatives Analysis. The Alternatives Analysis in support of Section 4(f) of the DOT Act of 1966 for the historic bridge began in 2015, and coordination with the Oklahoma SHPO and consulting parties is well underway. The parties have provided their feedback, comments and concerns. While the alternative design described in this BUILD grant application was not specifically considered during that analysis, discussion of the goals of the project was conducted within ODOT, and a consensus was reached regarding the final bridge design and reconstruction. The project meets the goals of ODOT and the consulting parties of providing a safe facility, keeping the bridge open to all traffic, and preserving historic integrity. Completion of the *Programmatic Section 4(f) Evaluation and Approval for FHWA Projects that Necessitate the Use of Historic Bridges* should follow a standard review timeline once the detailed cultural resources study is completed and concurrence is received on the Section 106 consultation.

The environmental studies (detailed research including but not limited to topics such as biology, cultural resources, hazardous materials, and wetlands) will be initiated once the project scope

is finalized. At that time, a public involvement plan will be developed to present the project to the public and obtain input. It is anticipated that formal consultation with USFWS may be required for the impacts to the Arkansas River Shiner critical habitat as mandated in Section 7 of the Endangered Species Act of 1973. Once studies, preliminary engineering, and public involvement are complete, ODOT will submit a single National Environmental Protection Act (NEPA) document to FHWA for approval. It is anticipated that this **project will be processed with a Categorical Exclusion (CE)**. ODOT has scheduled the remainder of the study, coordination and permitting efforts and is committed to obtaining FHWA approval of the document by January 2021 per the project schedule (Rt 66 BUILD).

Formal consultation with USFWS can be time consuming; however, ODOT has consulted on several projects and has a good coordination process with dedicated USFWS staff liaisons. Once the Section 7 formal consultation begins, USFWS typically requires a 135-day (4 ½ month) review period to determine species effect and consult regarding mitigation requirements. From prior experience, ODOT is prepared to streamline this process and design for anticipated mitigation, such as avoiding construction activities during the threatened species spawning season, and to phase the project so that construction work roads do not impact more than 50% of the OHWM at a given phase.

The coordination regarding the historic bridge and associated NRHP-listed district has been ongoing since 2015, including two official consulting party meetings. After additional Section 106 consulting party comments have been reviewed and preliminary engineering design is complete for the selected alternative (June 2020 per schedule), ODOT will schedule a public meeting to obtain input from the local residents, as well as interested parties and stakeholders. ODOT will then address public comments and the public involvement summary will be posted on ODOT's website and included in the NEPA document. Section 106 consulting party meetings will also continue to be a primary element in obtaining stakeholder comments.

The only permitting anticipated for the project is a Section 404 Permit, to be coordinated with the U.S. Army Corps of Engineers (USACE) in accordance with the Clean Water Act of 1972. ODOT has identified known wetlands and is prepared to design to minimize impacts to jurisdictional waters and anticipates a streamlined review and permit schedule. The permit application will be submitted for approval with the final set of design plans. ODOT has a dedicated staff liaison at the USACE who reviews and permits only ODOT projects, and who responds to ODOT's priorities. ODOT will direct this individual to provide review and approval in a timely manner in accordance to the schedule.

State and Local Approvals

Support for the project by state and local entities is indicated by several **letters of support** available at **Rt 66 BUILD**. The project has the support of the ODOT Director, who has resolved to commit State funds and expedite the project schedule in order to ensure the project is completed in time for the 2026 Route 66 Centennial celebrations.

Included in the letters of support are testimonials from the Route 66 and historic preservation community as to the importance and significance of this corridor and cultural preservation project and appreciation of ODOT's commitment to the preservation of historic Route 66 infrastructure.

Federal Transportation Requirements Affecting State and Local Planning

The bridge project, including roadway approach improvements, had been programmed in ODOT's 8-year Construction Work Plan (CWP) 2017-2024 (scheduled for Federal Fiscal Year (FFY) 2024 construction). However, due to budget shortfalls, it was reprogrammed to remove the bridge component in 2018. There is a project in FFY 2025 in the current CWP, relating to this bridge and adjacent roadway. This project will be updated to include the bridge if the BUILD grant is received. The Statewide Transportation Improvement Program (STIP) includes a list of priority transportation projects in the long-range plan for only the next four years, therefore, the project is not currently listed in the STIP. With the award of BUILD grant funds, ODOT is committed to reprogramming the project with the bridge reconstruction scope in the STIP and CWP for a FFY 2021 construction letting and the project will be added to the STIP at that time.

The project is consistent with the goals set out in ODOT's 2018-2027 Transportation Asset Management Plan (TAMP) with the goal of maintaining and preserving Oklahoma's transportation network. Additionally, the application supports the mobility, connectivity, accessibility and economic vitality goals of the Oklahoma Freight Transportation Plan, 2018-2022.

5.4 Assessment of Project Risks and Mitigation Strategies

There is some risk to the preconstruction schedule for this project given that design and environmental work are not yet complete. A typical environmental study and CE documentation process for ODOT spans approximately nine to 12 months from the start of studies to the completion of the NEPA document. The BUILD schedule allows for an 18-month duration for this process. The risks stem from that fact that the environmental studies for this project are not typical and would likely require the additional time shown in the schedule. The factors that influence the risk are the likely need for a formal

Section 7 consultation with USFWS, completion of the historic preservation (Section 4(f) and Section 106) processes, along with public involvement and the subsequent response and documentation.

The schedule risk is mitigated by the fact that much of the preliminary work (environmental reconnaissance, alternatives analysis, Section 4(f) and Section 106 coordination) has already been completed or is nearing completion. Another factor mitigating this risk is that engineering design and environmental study services are already under contract, so there will be little additional time required to initiate these activities, as shown in the schedule. ODOT's experience on similar projects is also a factor mitigating this risk.

Figure 22 – Historic Purcell-Lexington Bridge

ODOT recently completed the environmental study and documentation of the historic US-77 Purcell to Lexington Bridge (**Figure 22**) over the South Canadian River approximately 65 miles southeast of the Bridgeport Bridge. Similar to the Bridgeport Bridge, the Purcell-Lexington Bridge was experiencing rapidly deteriorating truss conditions and was ultimately forced to close. The Purcell-Lexington Bridge is a vital link between two communities and required a detour of over 40 miles. ODOT accelerated the design, environmental approval, and permitting and let the project within 18 months of closure (**Figure 23**). Many of the same environmental (USFWS) and historic consultations (SHPO) were necessary, as well as a critically time sensitive project schedule due to deteriorating bridge conditions. ODOT will apply lessons learned and

Figure 23 – Purcell-Lexington Reconstruction - 2018

use the same agency contacts and coordination methods that successfully delivered that project to completion on schedule.

One other project risk worth noting is ODOT's planned use of innovative construction methods that have not been completed at the size and scale of this project. While construction of small bridges using precast components has been successful on many ODOT projects, the particular combination of techniques and the number of bridge spans has not yet been attempted by ODOT. The innovative solution of re-attaching the original steel trusses to the new bridge is also untested in Oklahoma. To mitigate these risks, ODOT will continue consult with other DOT agency partners, FHWA and industry experts for guidance to benefit from lessons learned and implement strategies that have been most successful.

6.0 BENEFIT COST ANALYSIS

Summary of Findings and BCA Outcomes

The tables below summarize the BCA findings. Annual costs and benefits are estimated over the life cycle of the project (years from 2019 to 2042). As stated earlier, construction is expected to be completed by July 2023. Benefits accrue during the operation of the project (over the years 2023-2042), beginning in August 2023.

Considering all monetized benefits and costs, the estimated internal rate of return of the project is 26.3 percent. With a 7 percent real discount rate, the $16.3 million investment would result in $54.1 million in total benefits, Net Present Value of $37 million, and a **Benefit/Cost ratio of approximately 3.3**. With a 3 percent real discount rate, the Net Present Value of the project is $71.3 million, with a Benefit/Cost ratio of 4.7. (**Table 4**)

TABLE 4 - OVERALL RESULTS OF THE BENEFIT COST ANALYSIS IN MILLIONS OF 2017 DOLLARS

Project Evaluation Metric	Undiscounted	Present Value at 7% Discount Rate	Present Value at 3% Discount Rate
Total Benefits	$143.6	$54.1	$92.1
Total O&M Costs	$2.7	$0.9	$1.7
Total Construction Costs	$21.5	$16.3	$19.1
Net Present Value	$119.1	$36.9	$71.3
Benefit / Cost Ratio	6.5	**3.3**	4.7
Internal Rate of Return (%)	26.3%		

BENEFIT COST ANALYSIS RESULTS

3.3 *Benefit / Cost Ratio* at the **7%** *Discount Rate*

4.7 *Benefit / Cost Ratio* at the **3%** *Discount Rate*

Table 5 below compiles all project benefits evaluated. The table demonstrates that the majority of project benefits (79 percent) is accounted for by travel time savings and vehicle operating cost savings. The avoidance in accident costs accounts for 21 percent of the overall benefits, while environmental cost savings account for 0.3 percent.

TABLE 5 - OVERALL BENEFITS IN MILLIONS OF 2017 DOLLARS

Benefit Categories	Over Project Lifecycle		
	Undiscounted	Present Value at 7% Discount Rate	Present Value at 3% Discount Rate
Travel Time Savings	$57.9	$21.7	$37.1
Vehicle Operating Cost Savings	$55.4	$21.0	$35.6
Reduction in Accident Costs	$29.6	$11.2	$19.1
Environmental Cost Savings	$0.4	$0.2	$0.3
Total Benefits	**$143.4**	**$54.1**	**$92.1**

BCA Sensitivity Analysis

The BCA outcomes presented in previous sections rely on a large number of assumptions and long-term projections, both of which are subject to considerable uncertainty. The primary purpose of the sensitivity analysis is to help identify the variables and model parameters whose variations have the greatest impact on the BCA outcomes: the "critical variables."

The sensitivity analysis can also be used to evaluate the impact of changes in individual critical variables – how much the final results would vary with reasonable departures from the "preferred" or most likely value for the variable; and assess the robustness of the BCA and

evaluate, in particular, whether the conclusions reached under the "preferred" set of input values are significantly altered by reasonable departures from those values.

The sensitivity analysis was conducted with respect to changes in the value of travel time, value of statistical life, capital cost estimate, and annual O&M. The changes in the value of statistical life and capital cost estimate are the parameters that have the greater impact on net present value. The outcomes of the quantitative analysis for the changes in value of travel time, value of statistical life, capital cost estimate, and rate of growth in traffic estimate using a 7 percent discount rate are summarized in **Table 6** below. The table provides the percentage changes in project NPV associated with variations in variables or parameters. The table demonstrates that this project features strong performance even in situations when key input values change in the direction that reduces net benefits. In all situations examined, BC ratio remains well above 1.

TABLE 6 - QUANTITATIVE ASSESSMENT OF SENSITIVITY, SUMMARY

Parameters	Change in Parameter Value	New NPV	% Change in NPV	New B/C Ratio
Value of Travel Time	Lower Bound of Range Recommended by US DOT ($10.35 for autos and $22.86 for trucks)	$30.8	-16.4%	2.9
	Upper Bound of Range Recommended by US DOT ($17.69 for autos and $34.34 for trucks)	$41.2	11.6%	3.5
Value of Statistical Life	Lower Bound of Range Recommended by US DOT ($5.4 million)	$33.2	-10.1%	3.0
	Upper Bound of Range Recommended by US DOT ($13.4 million)	$40.3	9.2%	3.5
Capital Cost Estimate	25% Reduction	$41.1	11.1%	4.3
	25% Increase	$32.8	-11.1%	2.6
Rate of Growth in Traffic	Reduction from 1.98% to 1% Annually	$30.5	-17.2%	2.9