CITY OF Tulsa
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City of Tulsa Bridge Project:
Improving Tulsa's River Crossings

BRIDGE INVESTMENT PROGRAM

September 2022

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1 Basic Project Information

The City of Tulsa is pleased to submit this application for state of good repair improvements to four critical bridges: the Southwest Boulevard Bridge, 23rd Street Bridge, 71st Street Bridge, and Joe Creek Bridge. These bridges operate as the only non-Interstate crossings over the Arkansas River in Tulsa, providing critical connections to a growing Census-designated Urbanized Area with a population of approximately 411,000. This includes a vibrant central business district of approximately 35,000 workers, a large freight cluster directly across the river from Downtown in West Tulsa, and a diverse cluster of hospitality, tourism, education, and healthcare centers in South Tulsa.

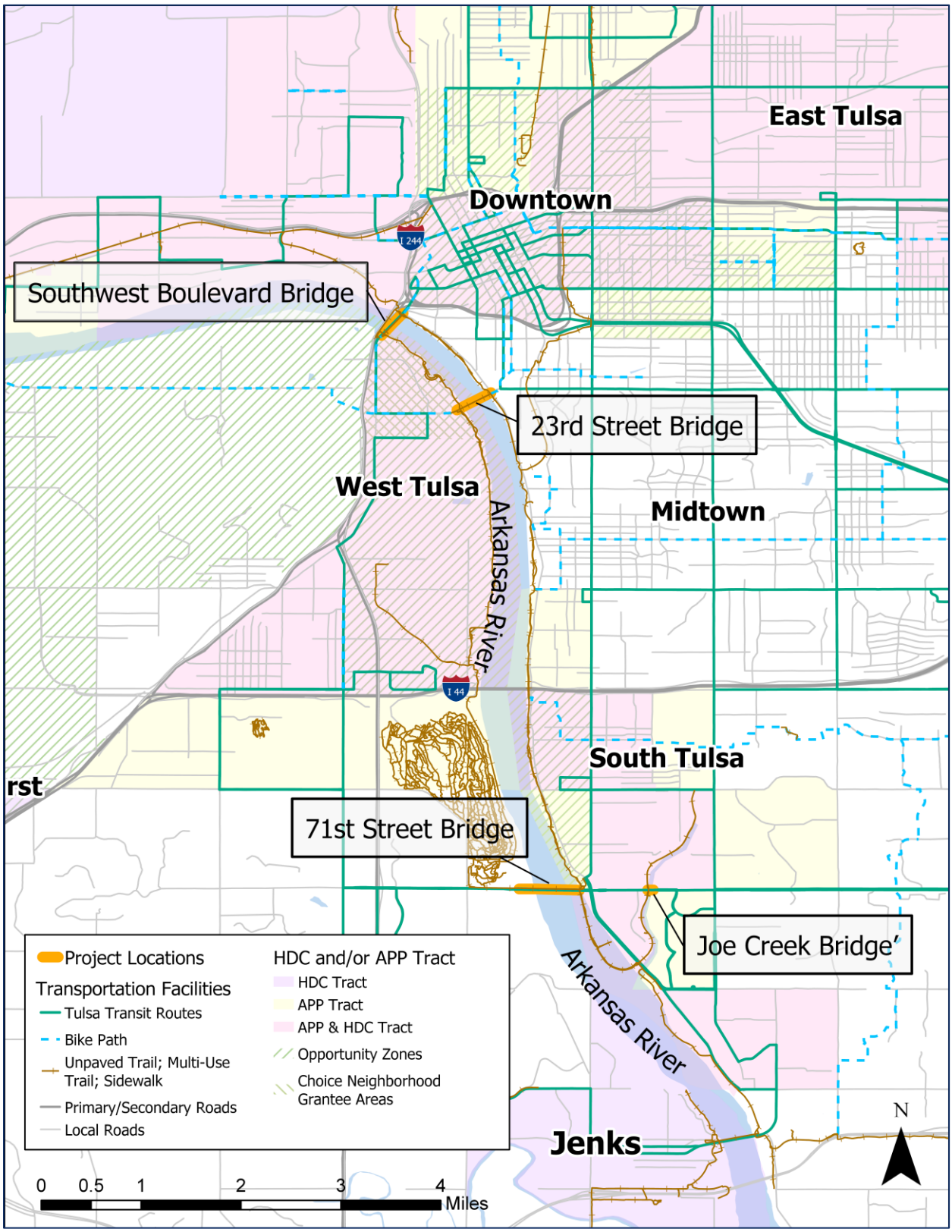
To address the degradation of multiple components of these bridges, the City of Tulsa, having already spent $391,300 on preliminary design, is requesting $9,996,120 of Bridge Investment Program (BIP) grant funding to supplement $1,110,680 of committed funding for the project. This funding will be used to address deck, superstructure, and substructure state of good repair improvements for each bridge. As part of these improvements, non-motorized infrastructure in the form of multimodal paths will be repaired, while two of the bridges will also have new LED lighting installed. As a result of safety improvements and operations and maintenance (O&M) savings, this project will generate $2.40 in benefits (discounted to 2020 dollars) for every $1 invested.

Constructed between the 1930s and 1980s, each of the four bridges is reaching the end of its functional life. Two of these bridges already carry a 'structurally deficient' rating based on National Bridge Inspection Standards (NBIS). The remaining two bridges are considered 'At Risk' for becoming structurally deficient within the next few years. For the time being, all four bridges are safe for travel. However, this investment will allow for more timely and comprehensive repairs that will save money and reduce maintenance activities in the long run.

The lead applicant for this project is the City of Tulsa, which has a long history of planning and constructing Federally aided projects. The City is a frequent recipient of Surface Transportation Program (STP), Transportation Alternative (TA), and federal transit funds. The City has well over $25 million in federal funding programmed in the current Transportation Improvement Program (TIP) for the Tulsa Transportation Management Area under the Indian Nations Council of Governments (INCOG). As the second-largest city in the State of Oklahoma, Tulsa maintains over 300 bridges and routinely uses a mix of Federal, State, and Local funding in its projects. If awarded, the City will work closely with its Federal partners to ensure judicious and expeditious delivery of the proposed project.

Figure 1 on the next page shows a map of the project locations, and Figure 2 through Figure 5 on the following pages provide brief descriptions of each bridge.

Figure 1 Project Locations



Southwest Boulevard Bridge

Constructed in 1980, the Southwest Boulevard Bridge over the Arkansas River is a north-south oriented 1,412-foot prestressed concrete beam bridge connecting West Tulsa with Downtown Tulsa. The bridge, which parallels Interstate 244 and carries two lanes of traffic per direction, handles approximately 11,100 vehicles per day as of 2022. In addition to vehicular traffic, the bridge carries a barrier-separated multimodal path for non-vehicular traffic.

Figure 2 Southwest Boulevard Bridge

23rd Street Bridge

Originally constructed in the 1930s and retrofitted in 1984, the 23rd Street Bridge over the Arkansas River is an east-west oriented 1,735-foot prestressed concrete beam bridge connecting West Tulsa and Midtown. The bridge carries two lanes of traffic per direction and handles approximately 18,700 vehicles per day as of 2022. In addition to vehicular traffic, the bridge carries a barrier-separated multimodal path for non-vehicular traffic.

Figure 4 23rd Street Bridge

71st Street Bridge

Constructed in 1983, the 71st Street Bridge over the Arkansas River is an east-west oriented 2,177-foot prestressed concrete beam bridge connecting the southern portions of West Tulsa and South Tulsa. The bridge, which carries West 71st Street, has two lanes of traffic per direction, and handles approximately 50,500 vehicles per day as of 2022. In addition to vehicular traffic, the bridge carries a barrier-separated multimodal path for non-vehicular traffic.

Figure 3 71st Street Bridge

Joe Creek Bridge

Constructed in 1965, the Joe Creek Bridge is an east-west oriented 168-foot steel I-Beam bridge in South Tulsa which carries East 71st Street traffic over Joe Creek. This bridge is directly east of the 71st Street Bridge over the Arkansas River and is critical to mobility cross the river. The bridge carries two lanes of traffic in each direction and handles approximately 24,300 vehicles per day as of 2022. In addition to vehicular traffic, the bridge carries raised sidewalks on both sides of roadway and passes over the Joe Creek Trail.

Figure 5 Joe Creek Bridge

State of good repair improvements for these four bridges will ensure the safety of both motorized and non-motorized users for decades to come. It will improve local and regional connectivity between eastern and western neighborhoods of Tulsa, including multiple Opportunity Zones, the city's Choice Neighborhood Implementation (CNI) grant-funded community in West Tulsa, and the following transit-served Census Tracts considered both Areas of Persistent Poverty and Historically Disadvantaged Communities: 46, 49, 76.09, 76.42; as well as Census Tracts 76.08 and 76.41 which are solely deemed Areas of Persistent Poverty (see Figure 1 for a map of these areas).

2 National Bridge Inventory Data

According to the National Bridge Inventory, the Southwest Boulevard Bridge (NBI Number 19838) is currently in a 'Structurally Deficient' condition, with the bridge deck rated in poor condition. The Joe Creek Bridge (NBI Number 16548) is also currently in a 'Structurally Deficient' condition, with the bridge substructure rated in poor condition. The remaining two bridges are the 23rd Street Bridge (NBI Number 20866) and 71st Street Bridge (NBI Number 20579). Both of these bridges are considered to be in 'At Risk' condition. More detailed National Bridge Inventory information can be found in the Project Template.

3 Project Costs

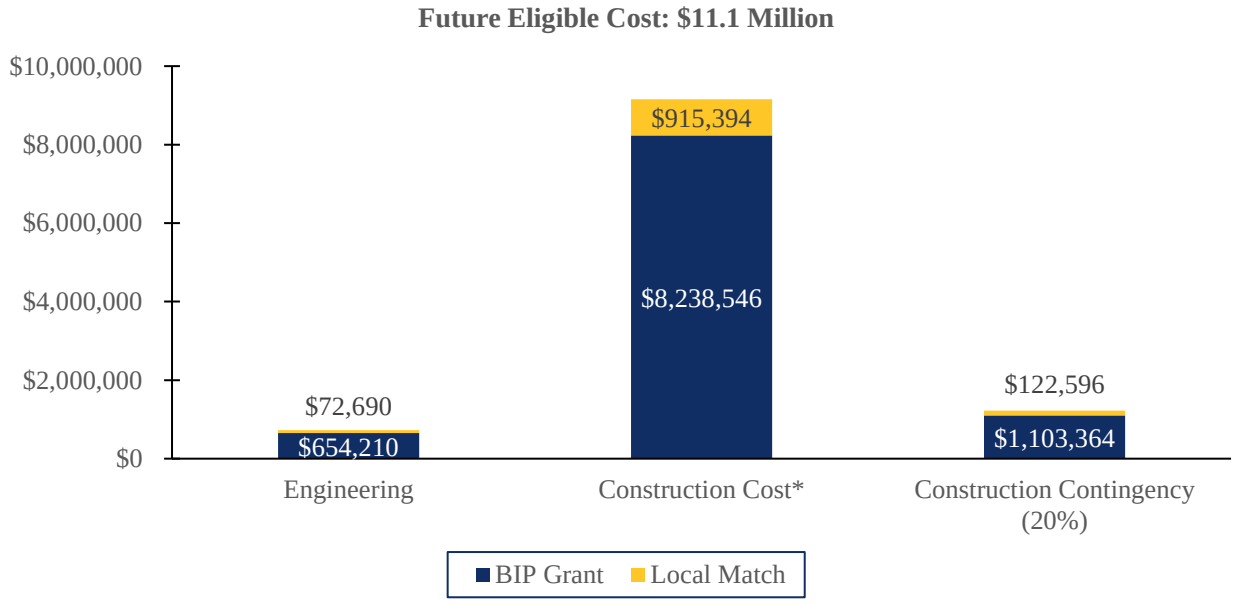
The total project cost, including costs outside of this application, is $11,498,100 (as reflected in the Benefit-Cost Analysis). The future eligible cost of this state of good repair project is $11,106,800, out of which this application requests 90 percent Bridge Investment Program (BIP) Funding of $9,996,120 for these off-system bridges. This will cover final design and construction costs for the proposed state of good repair upgrade for the four identified bridges.

The total eligible cost of this project, broken out by individual bridge, is shown in Table 1, while a breakdown of funding by source is shown in Figure 6. The entirety of this funding, which includes a construction cost contingency of 20 percent, will be used for repairs and upgrades needed to rehabilitate the four bridge decks, superstructures, and substructures back to a state of good repair. The project is scalable in that the number of bridges in this application can be altered.

Table 1 Future Cost Breakdown of Tulsa Bridge Improvements[1]

Cost	Southwest Boulevard Bridge	23rd Street Bridge	71st Street Bridge	Joe Creek Bridge
Engineering	$271,900	$281,600	$152,500	$20,900
Construction Cost *	$3,463,290	$3,580,240	$1,854,150	$256,260
Construction Contingency (20%)	$420,110	$441,460	$323,550	$40,840
Total Cost	**$4,155,300**	**$4,303,300**	**$2,330,200**	**$318,000**

Figure 6 Future Cost Breakdown by Funding Source



*Includes 8% mobilization cost.

Local funding used to cover the BIP-required 10 percent local match will come from Tulsa City Bonds. In 2019, Tulsa voters approved a capital improvements package "Improve Our Tulsa 2" which included these four bridges. A letter of funding commitment from the City of Tulsa can be found in Appendix C. No Federal formula funding will be used for this project; BIP funding would be the sole form of Federal funding, used to cover the remaining 90 percent of funding.

[1] Excludes Preliminary Design and NEPA Fees.

4 Project Outcome Criteria

4.1 State of Good Repair

Maintaining a state of good repair of the citywide transportation infrastructure network is a key priority of the City of Tulsa. Forming the only non-Interstate crossings over the Arkansas River within the Tulsa city limits, maintenance and safety of these critical assets is paramount to ensure citywide and regionwide mobility. The inventory of city-maintained bridges consists of 309 crossings. The majority of these are smaller crossings over creeks and streams, including on local and feeder/collector streets. As of 2022, of these 309 crossings, 74 (24 percent) are in fair or poor condition based on NBIS standards. Given the economic and socioeconomic significance of the four bridges included in this project, the City of Tulsa has prioritized these crossings for improvement.

Each of the four bridges slated for improvement carry a rating of '5' (Fair) or lower according to NBIS standards. **Two of the bridges are classified as structurally deficient and two are at risk of becoming so in the next three years without remedial action** (see Table 2 and Table 3), based on the Federal Highway Administration's Long-Term Bridge Performance InfoBridge analytical tool. Although structurally deficient bridges are not necessarily in danger of collapse or unsafe, the increased monitoring, inspections, and maintenance required to maintain safety will lead to increased O&M costs that could be avoided with this proposed project.

Table 2 Tulsa Arkansas River & Joe Creek Crossing Bridge NBIS Structural Classification

Bridge	2022 Person-Miles Impacted*	2050 Person-Miles Impacted[1]	Classification	'Fair' or Worse Components
Southwest Boulevard Bridge	18,560	33,616	Structurally Deficient	▪ Deck ▪ Superstructure ▪ Substructure
23rd Street Bridge	31,174	56,466	At Risk	▪ Deck ▪ Superstructure ▪ Substructure ▪ Scour
71st Street Bridge	84,321	152,738	At Risk	▪ Superstructure ▪ Substructure
Joe Creek Bridge	40,657	73,647	Structurally Deficient	▪ Substructure

*Assumes a vehicle occupancy rate of 1.67 passengers per vehicle as per updated USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs.

Table 3 Tulsa Arkansas River & Joe Creek Structural Classification Ratings by Component

Bridge	Deck	Superstructure	Substructure	Channel	Scour
Southwest Boulevard Bridge	4	5	5	8	8
23rd Street Bridge	5	5	5	6	5
71st Street Bridge	6	5	5	7	8
Joe Creek Bridge	6	6	4	7	8

Source: NBI

In an effort to return all four bridges to a state of good repair, and in accordance with city guidelines, repairs and upgrades are planned for the deck, superstructure, and substructure bridge components. Although the decks of two of the bridges are rated as '6' (Satisfactory), the extensive repairs planned for the superstructures and substructures warrant deck examinations as well.

Figure 7 Deterioration Across all Four Bridges

Figure 7 on the previous page shows deterioration typical of the 71st Street Bridge (top-left), Southwest Boulevard Bridge (top-right), 23rd Street Bridge (bottom-right), and Joe Creek Bridge (bottom-left). Typical bridge deck repairs include the replacement of deteriorated or delaminated concrete, joint resealing and cleaning, and the application of a floodcoat treatment. Lastly, LED lighting will be installed on two (Southwest Boulevard and 23rd Street) bridges.

Superstructure repairs include the repair of beams and beam ends, and the cleaning and painting of bearings. Substructure repairs include addressing deteriorated sections of abutments, pier caps, and columns. Repairs or upgrades are not proposed for the channels or scour improvements.[2] Specific repairs for each bridge are described in detail in the Statement of Work in Section 6.

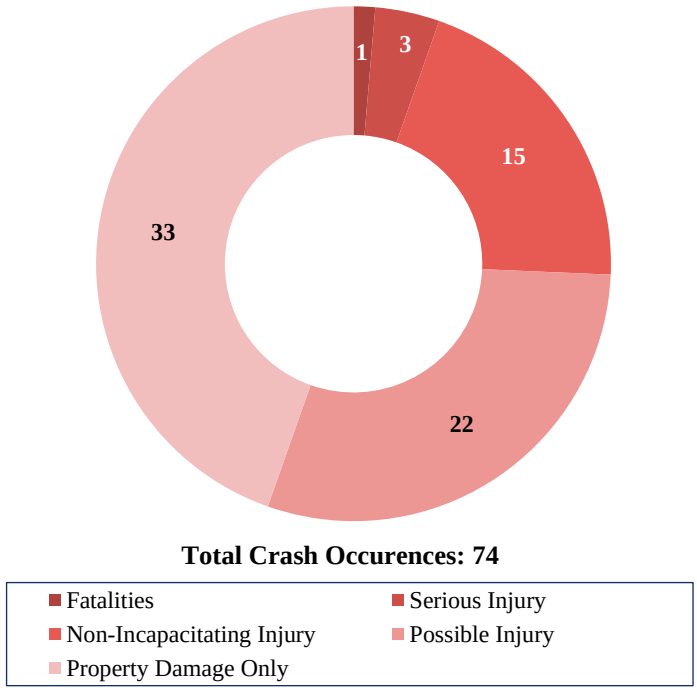
These state of good repair improvements will result in reduced O&M costs for the City of Tulsa as a result of reductions in the frequency of required routine maintenance, as well as extending the timeline for more substantial rehabilitation needs. In all, and over the course of 30 years, **these proactive improvements would save the City of Tulsa nearly $17 million (discounted to 2020 dollars)**.

4.2 Safety

Overall, both motorized and non-motorized users will benefit from the reduced likelihood of infrastructure failure on one or more of these bridges. However, given the magnitude of the repairs planned for each of the bridges, the opportunity to improve the safety of motorized and non-motorized users is given special focus.

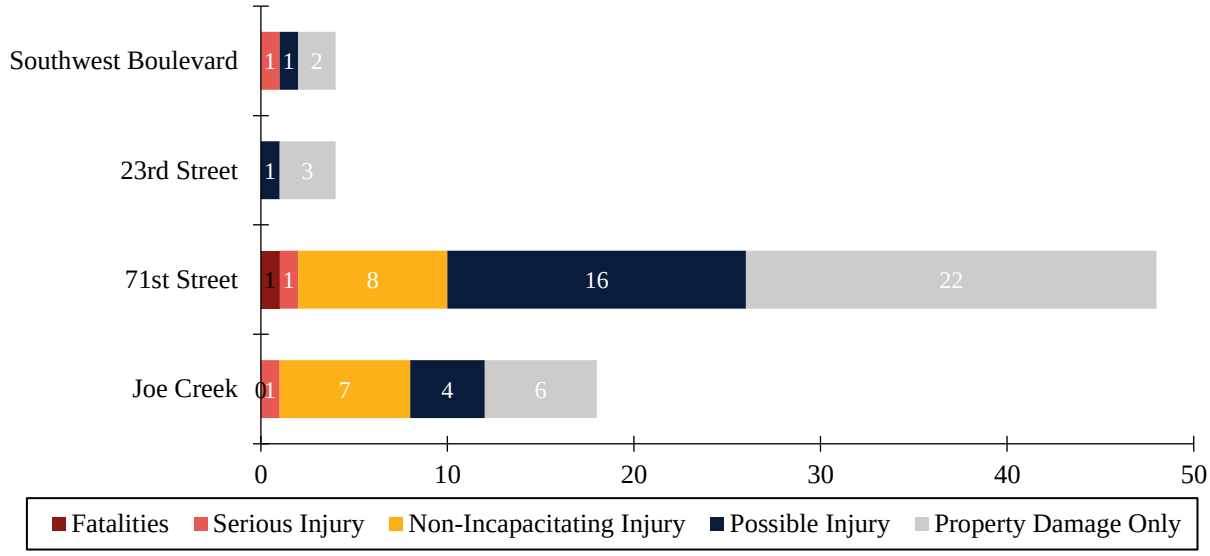
Over the period between January 2016 and July 2022, there were a total of 74 crashes across the four bridges. The majority of these occurrences did not involve a serious injury or fatality (Figure 8). Additionally, 45 percent of the crash occurrences involved property damage alone. Broken out by location (Figure 9), the 71st Street Bridge recorded the most crash occurrences. Most of these involved property damage alone or a possible injury.

Figure 8 Crash Occurrences by Severity (January 2016–July 2022)



[2] The scour of Bridge 258 was rated '5' which indicates that the original foundations, i.e., pier footings, are exposed. There has been no indication that scour is affecting the stability of the bridge or has worsened over the past several inspection cycles. Because the bridge piers supported on shallow rock, the cost of scour remediation was estimated to exceed the potential benefits.

Figure 9 Crash Occurrences by Location (January 2016–July 2022)



Motorized Users

To reduce crashes on these bridges, two key strategies are planned. First, the bridges will include newly painted lane markings, allowing clearer delineations of lanes for motorized users. Second, as part of the deck repairs, new LED lighting will be installed on the Southwest Boulevard and 23rd Street Bridges. In accordance with the BCA guidelines, the installation of new LED lighting allows the use of a crash modification factor of 0.41.[3] Based on this crash modification factor, there is an expectation that LED lighting will result in a 59 percent reduction in crashes across these two bridges.

Non-Motorized Users

The planned repairs of this project are expected to improve safety for non-motorized users as well. As part of the state of good repair improvements, the multimodal paths on all four bridges will be repaired. This will ensure connectivity with the River Parks trail system, a network of multimodal trails lining the Arkansas River throughout Tulsa. From a personal safety perspective, the installation of new LED lighting will improve conditions for pedestrians and bicyclists, especially during evening and nighttime hours. This is a particular benefit for lower-income individuals who may not have access to automobiles, and who may work in the retail, freight, or medical sectors. For these types of jobs, night, evening, and early morning work shifts occurring outside of Tulsa Transit hours of service are common. As such, preserving and enhancing the non-motorized crossing components of these bridges is paramount.

[3] http://www.cmfclearinghouse.org/detail.cfm?facid=659

4.3 Mobility and Economic Competitiveness

Mobility and economic competitiveness are key drivers of this bridge improvement project. In total, these four bridges carried nearly 175,000 person-miles in 2019, helping to facilitate the flow of people and goods alike across the Arkansas River. Due in large part to the growing economic strength of Tulsa as a state and regional commerce hub, total person-miles carried by these four bridges is expected to increase by nearly 81 percent to approximately 316,000 person-miles by 2050.

Employment Accessibility

The four bridges slated for improvement play an important role in the facilitation of employment access across Tulsa. Over 66,000 jobs are located within 1.5 miles of these four bridges, representing nearly a quarter of Tulsa's total employment despite comprising less than 10 percent of the city's total area.[4]

Supporting over 35,000 workers, Downtown Tulsa contains a mix of corporate, retail, and hospitality jobs, in addition to a growing residential population (Figure 10). Key freight-based employers including HollyFrontier's Tulsa Refinery (Figure 11) and BNSF's Cherokee Rail Yard are located at the southwestern end of the Southwest Boulevard Bridge, the only local connection (i.e., non-Interstate) over the Arkansas River into and out of Downtown Tulsa. Both facilities, as part of this larger cluster of freight facilities in West Tulsa, are also directly accessible through the West 23rd Street Bridge.

Figure 10 Downtown Tulsa and the Southwest Boulevard Bridge

Source: Travel Oklahoma

[4] https://onthemap.ces.census.gov/

Table 4 Total Employment of Key Economic Generators

Location	Total Employment
Downtown Tulsa	35,000[5]
HollyFrontier Tulsa Refinery	375[6]
BNSF Cherokee Yard	Unavailable
Oklahoma Surgical Hospital	500[7]
River Spirit Casino Resort	1,600[8]
Oral Roberts University	700[9]

South of Downtown Tulsa and the West Tulsa freight cluster, East 71st Street, a major arterial, forms another key gateway to the city's large job clusters, including Oral Roberts University, River Spirit Casino Resort, and the Oklahoma Surgical Hospital, in addition to a mix of retail and hospitality establishments. Overall, as a result of these repairs, the four bridges will be more reliable and less prone to closures, which will allow for the uninterrupted flow of commerce across these various economic hubs.

Figure 11 HollyFrontier's Tulsa Refinery

Source: Tulsa World

Construction Employment Benefits

The upgrade of each of these four bridges will directly lead to well-paying jobs in the construction sector throughout the extent of this project. The median hourly wage in Oklahoma is $18.03 as compared to $21.64 in construction.[10] This represents a 20 percent premium over the prevailing median hourly wage.

[5] https://www.tulsapeople.com/city-desk/downtown-tulsa-by-the-numbers/article_fe8017a2-0327-11eb-9334-6f738d92d75a.html#:~:text=Downtown%20contains%20the%20largest%20employment,in%20just%201.3%20square%20miles.

[6] https://www.buzzfile.com/business/Hollyfrontier-Corporation-918-581-1800.

[7] https://www.linkedin.com/company/oklahoma-surgical-hospital-llc/life#:~:text=About%20Oklahoma%20Surgical%20Hospital%2C%20LLC,flexible%20spending%20plans%2C%20and%20more.

[8] https://tgandh.com/news/Tribal-stories/muscogee-creek-nations-river-spirit-casino-resort-reopens-to-public-in-tulsa/#:~:text=The%20Resort%20employs%201%2C600%20workers,paying%20employees%20during%20the%20closure.

[9] https://oru.edu/human-resources/index.php?locale=en#:~:text=Oral%20Roberts%20University%20is%20a,a%20wide%20variety%20of%20positions.

[10] https://www.bls.gov/oes/current/oes_ok.htm#47-0000.

4.4 Climate Change, Resiliency, and the Environment

This project aims to promote environmental resiliency in relation to the city's transportation infrastructure network. As part of the state of good repair improvements, the multimodal paths along each bridge will be preserved and repaired to encourage the use of climate-friendly non-motorized forms of transportation such as walking and cycling. These multimodal paths will provide direct connections to the city's River Parks trail system which runs along both sides of the Arkansas River. Additionally, as explained in further detail in Section 4.5, three of the four bridges slated for state of good repair improvements carry multiple Tulsa Transit bus routes. In relation to environmental justice, these transit routes play a pivotal role in supporting mobility in a number of Historically Disadvantaged Communities.

Two of the three Arkansas River bridges' state of good repair deck improvements will include replacement and installation of new LED lighting. In addition to safety benefits, this installation of LED lights will yield positive environmental impacts. In comparison to older lights, new LED lights can be up to 80 percent more energy efficient.[11] In turn, the new, brighter lights will provide a safer, more welcoming environment for non-motorized, greener modes of transportation, including walking and cycling. Furthermore, because the project will extend the useful life of these four assets, the prevention of full bridge replacement will reduce the amount of carbon-intensive materials used for new construction such as concrete. These repairs will also help reduce the negative effects from yearly freeze and thaw cycles which can accelerate concrete deterioration.

During the construction phase of the project, contractors performing the rehabilitation work may be able to use a Snooper vehicle instead of constructing a temporary work road below the bridges (Figure 12). The City of Tulsa will discuss this opportunity with contractors to encourage its use to reduce environmental impacts on waterflows and aquatic life below the bridges, which could result if a temporary work road were constructed.

Figure 12 Snooper vehicle on the Southwest Boulevard Bridge

[11] https://www.sepco-solarlighting.com/blog/the-advantages-of-led-lights-for-the-environment#:~:text=A%20longer%20life%20span%20means,%2C%20packaging%20materials%2C%20and%20transportation.

If a temporary work road has to be utilized, the City will work with the US Army Corps of Engineers and the US Fish and Wildlife Service to minimize impacts to flood control releases from Keystone Dam upstream, and to aquatic species in the river. Typically, work roads in the Arkansas River are limited to half of the channel at a time to minimize these impacts.

4.5 Quality of Life

Each of the four bridges slated for improvements provide a vital link in the Tulsa transportation network—including by public transit (access to Tulsa Transit Routes 117, 490, and 700 which connect South Tulsa, West Tulsa, and Downtown Tulsa)—and by active transportation (access to the River Parks trail system). The bridges also provide access to and from designated Opportunity Zones in West Tulsa and South Tulsa, a CNI grant-funded community project in West Tulsa, and at least one census tract designated as a Historically Disadvantaged Community and/or Area of Persistent Poverty. This includes Census Tracts 46 and 49 in West Tulsa, and Census Tracts 76.08, 76.09, 76.41 and 76.42 in South Tulsa (see Figure 1). The state of good repair activities represent an important improvement for these historically overburdened and underserved communities.

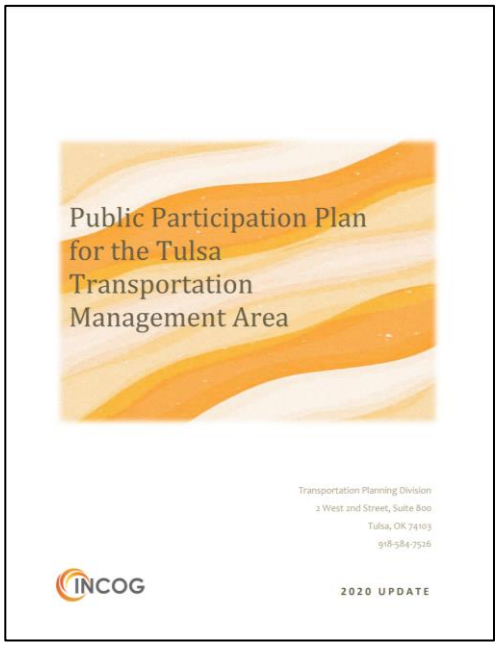
The four bridges also provide access to vital social services and affordable housing complexes. In Downtown Tulsa, the Oklahoma Child Welfare Department and Department of Human Services as well as the city's Family Safety Center and Assistance Network of Tulsa are located within half a mile of the Southwest Boulevard Bridge. To the south, Urban Strategies Inc. (a community development nonprofit) and Walker Hall (a transitional housing complex) are located within three blocks of the 23rd Street Bridge. The YWCA (a social justice nonprofit) and Harvest House (a nonprofit dedicated to poverty reduction) are located along 71st Street in between the 71st Street Bridge and Joe Creek Bridge. Finally, Miller Hospice and the Charles Schusterman Jewish Community Center are located just across Joe Creek from these other locations.

Promoting Equity

Upon receipt of BIP funding, the City of Tulsa will commence with the public participation process as a key component of environmental review. A robust engagement process will be conducted in accordance with the Indian Nations Council of Government (INCOG) public participation plan, updated in 2020[12] (Figure 13).

INCOG's Public Participation Plan includes effective strategies for gathering public input. These include guidance on meetings, posting of project information, and methods to identify key and vulnerable stakeholders, in accordance with Title VI guidelines.

Figure 13 INCOG's 2020 Public Participation Plan



[12] http://www.incog.org/Transportation/Documents/PIP2020_Final.pdf.

Typical public outreach includes timely posting of project information to the city's website, hybrid in-person and virtual public hearings, and mailed notices of opportunity to comment to abutting property owners.

As a means of further promoting equity throughout the project planning process, the City of Tulsa maintains a Disadvantaged Business Enterprise (DBE) goal of 6 percent. In addition to this DBE goal, the City of Tulsa maintains a Small Business Enterprise (SBE) goal of 10 percent for all professional and construction services.[13] To help achieve this goal, the City of Tulsa maintains an up-to-date directory of regionwide SBEs.

Public Transportation

Public transportation plays an important role in providing mobility for vulnerable populations across Tulsa. Over 8 percent of households in Tulsa do not have access to a vehicle.[14] Many of these households are concentrated in the city's low- and moderate-income census tracts which can be found in the city's north side, but also in West Tulsa and along the Arkansas River. In 2019, Tulsa Transit, the city's public transit system, carried over 2.7 million unlinked passenger trips.[15]

Figure 14 Tulsa Transit Aero BRT

Source: Tulsa Transit.

Three of the four bridges slated for improvement provide an important link for multiple Tulsa Transit routes. Along Southwest Boulevard, the northernmost bridge slated for improvement, Tulsa Transit's Route 117 traverses the Arkansas River as the sole public transit connection between West Tulsa and Downtown Tulsa, the transfer point for six other transit routes, and the region's primary job and economic center. Further south, Route 490, an east-west route, utilizes the 71st Street Bridge to connect commercial centers along 71st Street, with the southern portion of West Tulsa.

Lastly, the Joe Creek Bridge is utilized by Route 700, also known as Tulsa Transit's Aero Bus Rapid Transit (BRT) route. Commissioned in 2020 to operate on 20-minute headways, and connecting North Tulsa, Downtown, and key commercial hubs to the south, Route 700 is one of the most important routes operated by Tulsa Transit. This also includes direct access to Oral Roberts University, Walmart, and key designated transfer points to access Routes 410, 490, and 500. Together, these three bridges play a vital role for Tulsa Transit, a dynamic and growing transit system, providing critical connections between the city's various neighborhoods on both sides of the Arkansas River.

[13] https://partnertulsa.org/doing-business/small-business-and-entrepreneurs/sbe/.

[14] https://data.census.gov/cedsci/table?q=cars&g=1600000US4075000.

[15] https://www.transit.dot.gov/sites/fta.dot.gov/files/transit_agency_profile_doc/2019/60018.pdf.

Active Transportation

The improvement of each of these four bridges includes enhancing the existing active transportation amenities. For the Southwest Boulevard, 23rd Street, and 71st Street bridges, this includes repairing the surface of the barrier-separated bicycle and pedestrian pathways. For the Joe Creek Bridge, a much smaller bridge of 168 feet in length, this includes sidewalk repairs along both sides of the roadway. Additionally, although active transportation amenities will be replaced to their current format, increased emphasis will be placed on new LED lighting to promote safety and security.

4.6 Innovation

The primary means of innovation is the bundling of these four bridges for state of good repair improvements. This bundling is expected to result in cost savings of at least 5 percent, taking into account improved efficiency in the use of labor, transport of materials, and project scoping.

In addition to bundling, the City of Tulsa may be able to utilize a Snooper vehicle to perform necessary repairs instead of having to construct a temporary work road, as described in Section 4.4. If feasible, this innovation would result in potentially reduced costs, simplified permitting procedures, and reduced impacts to waterflows during the construction phase of the project.

Lastly, to avoid bottlenecks and minimize resulting traffic congestion, bridge repairs would be staggered. Along each individual bridge, lane closures would also be coordinated to optimize traffic flow while repairs are actually taking place.

5 Benefit-Cost Analysis

The results of the benefit-cost analysis (BCA) show a benefit/cost ratio (BCR) of 2.40 based on safety improvements and O&M savings (Table 5). The project is estimated to generate nearly $53 million over the life of the project in undiscounted benefits.

Table 5 Benefit-Cost Ratio Summary

BCA Metric	Project Lifecycle	
	Undiscounted (Millions of Year of Expenditure $)	7% Discount (Millions of $2020)
Benefits:		
Safety Crash Costs	$5.78	$1.35
Operations & Maintenance Savings	$58.53	$16.69
Total Benefits	**$64.32**	**$18.04**
Total Costs	**$11.49**	**$7.51**
Benefit/Cost Ratio	**5.59**	**2.40**
Net Present Value	**$52.82**	**$10.52**

The majority of the monetized benefits stem from expected O&M savings. These savings are captured from a reduction in the required frequency and magnitude of maintenance and rehabilitation due to the deck, superstructure, and substructure repairs. Additional benefits are expected from safety improvements as a result of the installation of LED lighting on two of the bridges.

Under a 'No Build' scenario in which the City of Tulsa does not receive BIP funding, the city would not be able to undertake the required repairs for each bridge. Instead, each of the four bridges would require more frequent and costly preventative O&M as well as major repairs and rehabilitations in future years. Additionally, the LED lighting replacement and multimodal path refurbishment would not occur.

6 Project Readiness and Environmental Risk

6.1 Technical Feasibility

The City of Tulsa has completed preliminary plans on the Southwest Boulevard and 23rd Street Bridges as the first step in initiating state of good repair improvements (see the Project Website for the preliminary plans). Because this is a relatively simple rehabilitation effort, multiple project activities cited in the NOFO are not required for this project, including topographic surveys, metes and bounds surveys, geotechnical investigations, hydrologic analysis, traffic studies, financial plans, and HazMat assessments. Utility engineering is not required because there is no change to utilities locations. Final design and environmental clearance will be undertaken upon grant award, and existing estimates on types and quantities of materials will be refined pending completion of final design. Given that the bridge repairs are within the existing right-of-way, a Categorical Exclusion is anticipated.

Statement of Work

This project will consist of typical work elements associated with bridge state of good repair upgrades. The entire scope of the project consists of four bridges. Three bridges are major crossings spanning the Arkansas River in Tulsa; the remaining bridge, located just over half a mile from the Arkansas River, spans Joe Creek. Specific repairs planned for each bridge are as follows:

Southwest Boulevard Bridge

The Southwest Boulevard Bridge carries a Structurally Deficient classification. This includes deficient scores for the deck, superstructure, and substructure conditions. To bring the bridge to a state of good repair, the following repairs are planned:

- **Deck:** Improvements include performing deck repairs, cleaning and resealing existing joints, applying floodcoat treatment to the deck and parapet, and the installation of new LED lights and light poles.
- **Superstructure:** Deteriorated sections of beam ends will be repaired using pneumatically placed mortar, epoxy crack injection, and carbon fiber-reinforced polymer. Steel bearings will be replaced (as needed), cleaned, and painted.

- **Substructure:** Deteriorated sections of abutments, pier caps, and columns will be repaired using pneumatically placed mortar, epoxy crack injection, and carbon fiber-reinforced polymer.

These improvements are expected to improve the overall NBIS rating of the bridge to '6' (Satisfactory).

23rd Street Bridge

In terms of state of good repair, the 23rd Street bridge carries an At Risk classification. This includes deficient scores for the deck, superstructure, and substructure conditions. To bring the bridge to a state of good repair, the following repairs are planned:

- **Deck:** Improvements include performing deck repairs, cleaning and resealing existing joints, applying floodcoat treatment to the deck and parapet, and the installation of new LED lights and light poles.

- **Superstructure:** Deteriorated sections of arches and beam ends will be repaired using pneumatically placed mortar, epoxy crack injection, and carbon fiber-reinforced polymer. Steel bearings will be replaced, as needed, cleaned, and painted.

- **Substructure:** Deteriorated sections of abutments, pier caps, and columns will be repaired using pneumatically placed mortar, epoxy crack injection, and carbon fiber-reinforced polymer.

These improvements are expected to improve the overall NBIS rating of the bridge to '6' (Satisfactory).

71st Street Bridge

In terms of state of good repair, the 71st Street Bridge carries an At Risk classification. This includes deficient scores for the superstructure, and substructure conditions. To bring the bridge to a state of good repair, the following repairs are planned:

- **Deck:** Minimal Class B & Class C repairs are needed for the bridge deck. In addition to these repairs, existing joints will be cleaned and resealed, a floodcoat treatment will be added to the deck and parapet.

- **Superstructure:** Deteriorated sections of beam ends will be repaired using pneumatically placed mortar, epoxy crack injection, and carbon fiber-reinforced polymer. Steel bearings will be replaced (as needed) cleaned, and painted.

- **Substructure:** Deteriorated sections of abutments, pier caps, and columns will be repaired using pneumatically placed mortar, epoxy crack injection, and carbon fiber-reinforced polymer.

These improvements are expected to improve the overall NBIS rating of the bridge to '6' (Satisfactory).

Joe Creek Bridge

In terms of state of good repair, the Joe Creek Bridge carries a Structurally Deficient classification. This includes deficient scores for the substructure condition. To bring the bridge to a state of good repair, the following repairs are planned:

- **Deck:** Minimal Class B repairs are needed for the bridge deck.
- **Superstructure:** No repairs.
- **Substructure:** Deteriorated sections of abutments, pier caps, and columns will be repaired with pneumatically placed mortar, epoxy crack injection, and carbon fiber-reinforced polymer.

These improvements are expected to improve the overall NBIS rating of the bridge to '6' (Satisfactory). Following project completion, future maintenance of the four bridges will be the responsibility of the City of Tulsa. The city includes funds for bridge maintenance in its annual budget.

As part of this project, it is anticipated that two of the four lanes on each bridge will need to be shut down to accommodate workers and equipment at any given time, which may lead to some temporary increases in local traffic congestion. Additional environmental impacts to surrounding neighborhoods and areas are expected to be minimal. Aside from the potential for intermittent noise which may be heard from neighboring households while certain portions of the repairs are being undertaken, the project is not expected to impact any nearby residences.

Since these state of good repair improvements only involve the decks, superstructures, and substructures, and no expansions to any of the bridges, no impacts are expected to water quality in the Arkansas River or Joe Creek. Correspondingly, no impacts to local ecosystems are expected beyond the potential for temporary waterflow disruptions if a temporary work road needs to be constructed. The City of Tulsa will discuss the potential to avoid the need for a temporary work road with the contractor.

Title VI Compliance & Public Participation

The City of Tulsa works closely with the INCOG, the metropolitan planning organization (MPO) for the Tulsa region. This includes strict adherence to Title VI nondiscrimination regulations, as well as the use of methods and strategies from the MPO's public participation plan which was updated in 2020. Public input for this project will be gathered and considered as part of the required NEPA process. This would occur following the awarding of grant funding.

Public support for investments in aging infrastructure in Tulsa is generally very strong. Since 2008, Tulsa residents have voted in favor of General Obligation Bonds which have been used to fund capital improvements across the city, an initiative known as Improve Our Tulsa, and subsequently, Improve Our Tulsa 2. Importantly, each of the four bridges included in Improve Our Tulsa 2 were approved by City of Tulsa voters.[16] This application also has the support of

[16] https://www.cityoftulsa.org/improve-our-tulsa/about-improve-our-tulsa/.

local elected officials, ODOT and the Tulsa Regional Chamber of Commerce, as indicated in the letters of support found on the Project Website.

6.2 Project Schedule

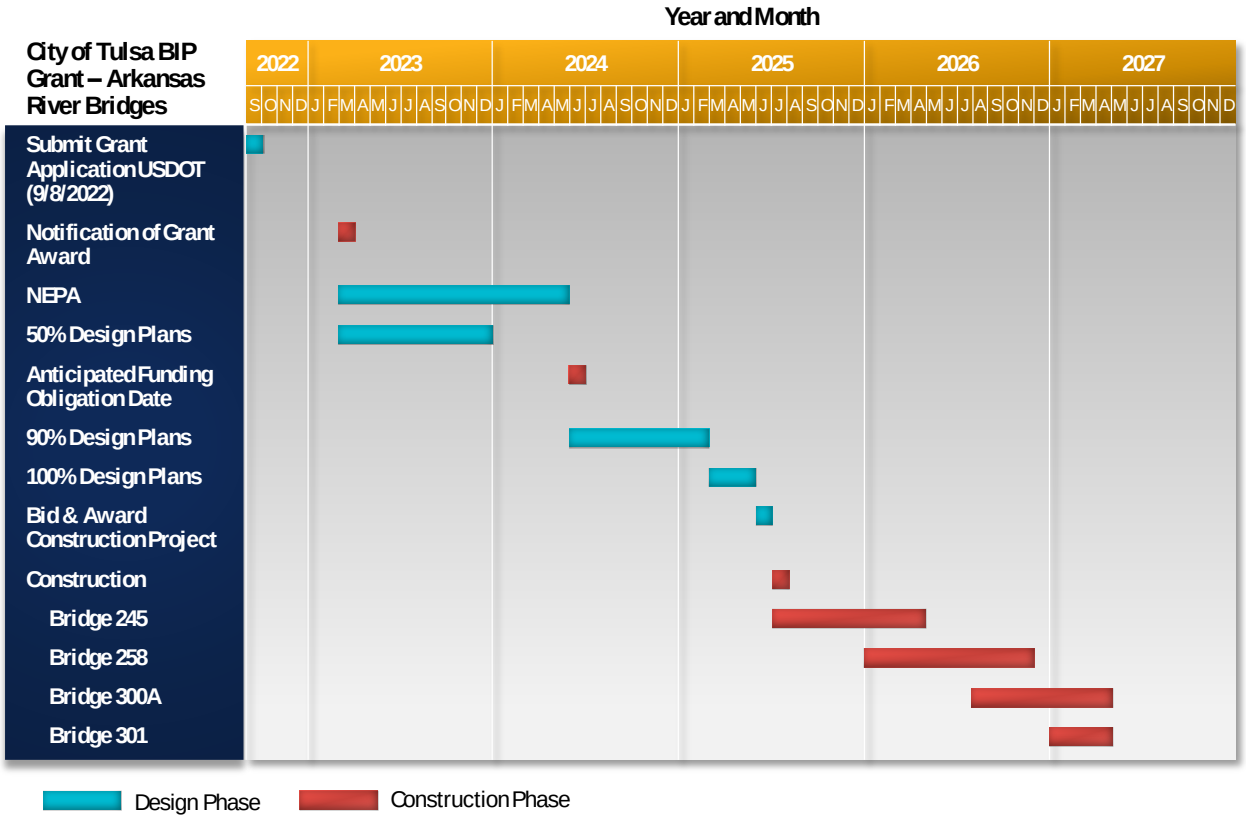
As shown in Figure 15, it is anticipated that construction will be able to begin within one year after funds are obligated, assuming obligation occurs in the second quarter of 2024.

This schedule confirms:

- This project will be obligated well in advance of the September 30, 2025 deadline;
- The project is advancing to the next step of project development within 12 months of environmental clearance;
- The project can begin construction no later than 18 months after obligation and will be expended expeditiously.

There is no right-of-way acquisition required for this project.

Figure 15 Project Schedule



6.3 Required Approvals

Prior to construction, all required Federal, State, and local approvals will be obtained. As indicated in the project schedule, the NEPA process will begin immediately after grant funding is awarded. This is expected in March 2023, and will also include the project's public engagement process. Depending on construction method, the three bridges spanning the Arkansas River may require a Section 404 Clean Water Act (CWA) Permit from the US Army Corps of Engineers. If temporary work roads are required, Nationwide Permit 14 may be applicable. If work roads can be avoided, permits may not be needed if work does not occur within the jurisdictional stream channels. No additional State or Federal approvals or permits are required.

These municipally owned and operated bridges do not currently have any federal funding and are not currently programmed into the regional Transportation Improvement Program or Statewide Transportation Improvement Program for repair. Upon award of the BIP funding, the City of Tulsa will work with INCOG to include this project into these federal certification documents by amendment.

Risks and Mitigations

The key risks associated with this project are time and cost overruns. These may occur due to a wide range of issues including unforeseen issues with the selected contractor, materials availability, and/or labor shortages. At the national scale, inflation, caused by a multitude of factors including ongoing supply chain shortages, continues to impact nearly every portion of the economy. This has translated into increased prices including in relation to materials and labor. Given the ongoing labor shortage, which has especially impacted the construction industry, such issues are further exacerbated. The City has mitigated for these risks by bundling the bridges together, bringing down costs through economy of scale and making the projects more attractive to potential bidders that specialize in larger projects and therefore have greater resource availability.

There is also a potential risk in relation to whether the selected contractor elects to use a temporary work road or a Snooper vehicle for repairs. These risks are also related to material, product, and labor shortages. If the temporary work road is used, adverse environmental conditions such as flooding could impact construction. Mitigation would include designing the work road to an appropriate flood event level.

7 Project Priority Considerations

This project meets the four priority considerations listed in the FY2022 BIP NOFO. The decks, superstructures, and/or substructures of **the four identified bridges carry a rating of 'Structurally Deficient' or 'At Risk'. The two bridges specifically deemed 'At Risk' are at risk of becoming structurally deficient in the next three years** without remedial action.

Construction plans for two of the four bridges have currently been completed up to 30 percent and are included on the Project Website. Following NEPA clearance, **the project should**

proceed to the next project development phase (final design) within 12 months of environmental clearance, by June 2025.

Furthermore, **final design can be completed within 12 months of funding obligation**, assuming an obligation date of June 2024 and final design completed by June 2025. This will put the project on track to **beginning construction within 18 months of funding obligation**, by July 2025.

Finally, there is currently no programmed funding within the Oklahoma Statewide Transportation Improvement Program for construction, and only minimum funding for small repairs in the City of Tulsa budget. Due to funding constraints, in the absence of a BIP grant, **it is unlikely that this project would commence otherwise before September 30, 2025.**

8 Statutory Evaluation Requirements

Requirement	Response
Costs avoided by the prevention of the closure or reduced use of the bridge to be improved by the project (23 U.S.C. § 124(f)(3)(B)(i)(I))	The primary costs avoided stem from reduced O&M needs for each of the four bridges.
Benefits from protection as described in 23 U.S.C. § 133(b)(10), including improving seismic and scour protection (23 U.S.C. § 124(f)(3)(B)(i)(VII))	The four bridges in this proposed project do not have seismic or scour issues justifying inclusion in this project. The one bridge which was rated '5' for scour conditions is in relation to exposed pier footings. However, there has been no indication that scour is affecting the stability of the bridge or has worsened over the past several inspection cycles.
Reductions in maintenance costs, including, in the case of a Federally owned bridge, cost savings to the Federal budget (23 U.S.C. § 24(f)(3)(B)(i)(XI))	These state of good repair improvements are expected to result in savings of over $16.7 million to the City of Tulsa over the next 30 years. These savings stem from a reduction in the frequency and magnitude of required O&M for each of the four bridges.

Requirement	Response
Safety benefits, including the reduction of accidents and related costs (23 U.S.C. § 124(f)(3)(B)(i)(III))	The implementation of new LED lighting on the two of the three bridges (SW Blvd & 23rd Street) spanning the Arkansas River is expected to result in a 59 percent reduction in crashes across these two bridges. This will result in an estimated cost savings of over $1.3 million over 30 years, as a result of the reduced crashes. Additional safety benefits are expected from lane restriping. For non-motorized users, new LED lighting will result in improved safety along the barrier-separated multimodal paths.
Person and freight mobility benefits, including congestion reduction and reliability improvements (23 U.S.C. § 124(f)(3)(B)(i)(IV))	The four bridges carried nearly 175,000 person-miles in 2019, and are expected to carry 316,000 person-miles by 2050. This represents an increase of nearly 81 percent. Additionally, these bridges provide direct access to a number of important freight generators such as HollyFrontier's Tulsa Refinery and BNSF's Cherokee Rail Yard. As a result of these repairs, the four bridges will be more reliable and less prone to closures for repairs, which will allow for the uninterrupted flow of commerce.
National or regional economic benefits (23 U.S.C. § 124(f)(3)(B)(i)(V))	All four bridges play an important role in the facilitation of access to multiple population, freight, and commercial centers within Tulsa. This includes Downtown Tulsa, freight clusters in West Tulsa, and multiple economic generators in South Tulsa, as well as surrounding neighborhoods.
Benefits from long-term resiliency to extreme weather events, flooding, or other natural disasters (23 U.S.C. § 124(f)(3)(B)(i)(VI))	The resulting state of good repair improvements will result in improvements to the decks, superstructures, and substructures of each bridge, making them more resilient to extreme weather impacts. These repairs will also help reduce the negative effects from yearly freeze and thaw cycles which can accelerate concrete deterioration.

Requirement	Response
Environmental benefits, including wildlife connectivity (23 U.S.C. § 124(f)(3)(B)(i)(VIII))	This project includes the installation of new LED lighting which is up to 80 percent more energy efficient than existing lighting. Additionally, for three of the bridges, a Snooper vehicle may be utilized instead of temporary work roads during construction. This would eliminate the need for work in the Arkansas River, maintaining stream flow and avoiding impacts to aquatic species.
Benefits to nonvehicular and public transportation users (23 U.S.C. § 124(f)(3)(B)(i)(IX))	Three of the four bridges are utilized by one or more Tulsa Transit routes which connect South Tulsa, West Tulsa, and Downtown Tulsa. This includes Tulsa Transit's new Aero BRT route. As part of the state of good repair improvements, the multimodal paths along each bridge will be repaired. This includes new LED lighting on two bridges which will increase safety and well-being.
In the case of a bundle of projects, benefits from executing the projects as a bundle compared to as individual projects (23 U.S.C. § 124(f)(3)(B)(i)(II))	The bundling of projects is expected to result in a cost savings of 5 percent. These cost savings stem from improved efficiency in the use of labor, transport of materials, and project scoping.
Benefits of using innovative design and construction techniques or innovative technologies (23 U.S.C. § 124(f)(3)(B)(i)(X)(aa) and (bb))	This project may be able to utilize a Snooper vehicle instead of constructing a temporary work road to perform repairs. This would result in potentially reduced costs and reduced impacts to waterflows below each bridge.
Whether and the extent to which the benefits, including the benefits described in 23 U.S.C. § 124(f)(3)(B)(i), are more likely than not to outweigh the total project costs (23 U.S.C. § 124(f)(3)(B)(ii))	Section 5 provides an overview of the Benefit-Cost Analysis which shows a Benefit-Cost Ratio of 2.40, much greater than the 1.0 threshold.