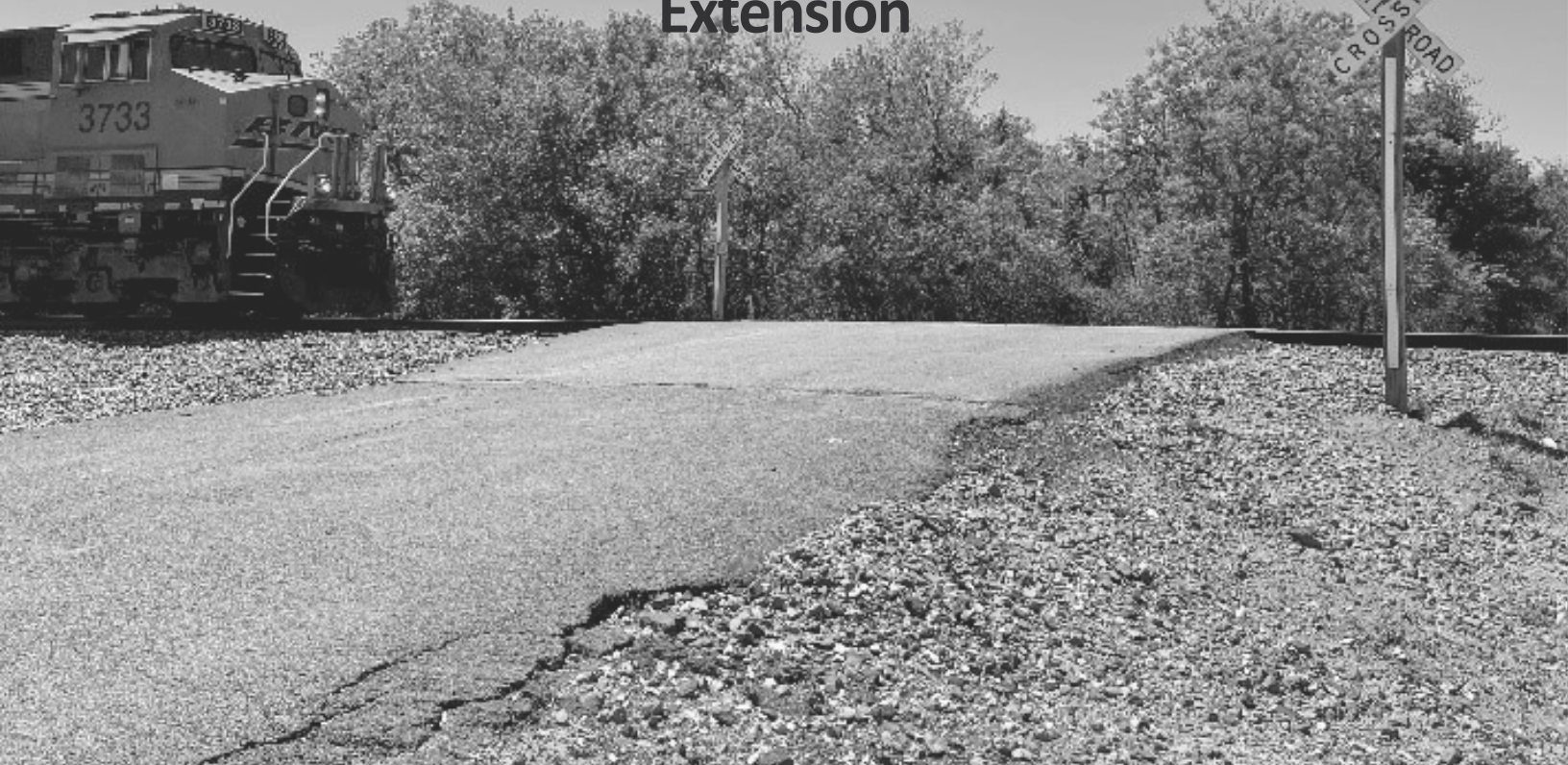




OKLAHOMA
Transportation

At-Grade Rail Safety Improvements to Reestablish the Heartland Flyer Northern Extension



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May 23, 2022

Application materials also
available on the [project
website](#)

FY2022 MULTIMODAL PROJECT DISCRETIONARY GRANT APPLICATION

PROJECT TITLE: At-Grade Rail Safety Improvements to Reestablish the
Heartland Flyer Northern Extension

Basic Project Information	
What is the Project Name?	At-Grade Rail Safety Improvements to Reestablish the Heartland Flyer Northern Extension
Who is the Project Sponsor?	Oklahoma Department of Transportation
Was an application for USDOT discretionary grant funding for this project submitted previously?	No
A project will be evaluated for eligibility for all three programs, unless the applicant wishes to opt-out of being evaluated for one or more of the grant programs:	<input checked="" type="checkbox"/> Opt-out of Mega? <input checked="" type="checkbox"/> Opt-out of INFRA? <input type="checkbox"/> Opt-out of Rural?
Project Costs	
MPDG Request Amount:	\$21,158,400
Other Federal funding:	\$ 5,289,600
Other Federal funding from Federal Formula dollars:	\$0
Other Federal funding being requested from other USDOT grant opportunities:	\$0
From What Program(s):	N/A
Non-Federal funding:	\$0
Future Eligible Project Cost:	\$0
Previously incurred costs (if applicable):	\$0
Total Project Cost:	\$26,448,000
Future Eligible Costs by Project Type (Rural)	\$26,448,000
Project Location	
State(s) in which the Project is located:	Oklahoma
Urbanized Area in which project is located, if applicable	Partial, OKC
Population of Urbanized Area (According to 2010 Census)	861,505
Is the Project located (entirely or partially) in an Area of Persistent Poverty or a Historically Disadvantaged Community?	Yes, portions (See Figure 15)
Is the Project located (entirely or partially) in Federal or USDOT designated areas?	No
Is the Project currently programmed in the TIP, STIP, MPO Long Range Transportation Plan, State Long Range Transportation Plan, or State Freight Plan?	No. Projects will be added to STIP and ACOG TIP.



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PROJECT DESCRIPTION

PROJECT OVERVIEW

The Oklahoma Department of Transportation (ODOT) is seeking \$21,158,400 in Rural Transportation Grant (Rural) funds under the Multimodal Project Discretionary Grant (MPDG) opportunity to improve safety at 52 at-grade crossing locations by systematically updating these at-grade crossing warning devices to facilitate safe and efficient freight and new passenger rail operations. The At-Grade Rail Safety Improvements to Reestablish the Heartland Flyer Northern Extension Project (The Project) will improve safety at 52 at-grade railroad crossings to ensure each crossing provides flashing lights, gates, and medians. The at-grade railroad safety improvements will include crossings in Oklahoma City (8), Ponca City (9), Guthrie (5), Perry (14), Newkirk (3), Mulhall (2), Orlando (1), Red Rock (4), and Marland (6). Fifty of the 52 roadways that intersect with the at-grade rail crossings are locally owned by the city or county. Each at-grade rail crossing has independent utility and can be constructed as a single and complete project. Burlington Northern Santa Fe (BNSF) Railway owns and operates freight trains along this section of the Red Rock subdivision. BNSF operates 31 trains per day at a length of 8,000 feet and speeds between 25 and 55 mph.

Figure 1. Road 0740 at-rail Crossing in Logan County



Amtrak previously provided passenger rail service between Kansas City, Wichita, Newton, and Oklahoma City but this service ended in 1979 due to funding constraints. In April 2021, Amtrak released the “Connect Us” expansion map, which included passenger rail service from Oklahoma City to Newton, Kansas. The state of Oklahoma and Kansas, ODOT and Kansas Department of Transportation (KDOT) are

committed to supporting the reestablishment of passenger rail along this growing rural midwestern corridor. As noted in the [Heartland Flyer Extension fact sheet](#), “New rail connections between smaller cities in the corridor and Wichita, Oklahoma City, and Fort Worth would improve mobility for underserved communities, connecting residents to new education and employment opportunities along the corridor.”

TRANSPORTATION CHALLENGES

Today, the 52 at-grade crossing conditions do not provide the needed safety protections to support and reestablish passenger rail service along this corridor. Of the 52 at-grade crossings, 10 crossings provide flashing lights, gates, and cantilevers, nine provide flashing lights with pedestals and gates, 15 crossings with pedestals provide flashing lights, and 17 crossings only provide crossbucks. Of the 52 at-grade rail crossings, 36 (69%) of the intersecting roadways provide a rough surface.

HOW THIS PROJECT WILL ADDRESS TRANSPORTATION CHALLENGES

This Project will improve the smoothness of the crossing surface at all 52 at-grade crossings. According to the Federal Railroad Administration (FRA) *Highway-Rail Crossing Guidelines* Third Edition, "roughness of a crossing surface and the profile of the surface and its approaches may be major areas of concern for road users. A rough surface may contribute to a collision by diverting the road user's attention from the prime tasks of observing the crossing signals and looking for a train."ⁱ

Figure 2. Flashing Lights at Memorial Road in Oklahoma City



This Project will include flashing-light signals, which are a fundamental active warning device, at all 52 at-grade crossings. According to the FRA *Highway-Rail Crossing Guidelines* Third Edition, "flashing-light signals consist of two light units that flash alternately at a rate of 35 to 65 times per minute. The signal lens is red and comes in a variety of designs that direct the light toward the motorist."ⁱⁱ

The Project will include audible bell sounds at all 52 at-grade crossings to improve safety for non-motorized road users. According to the FRA *Highway-Rail Crossing Guidelines* Third Edition, "bells or audible warning devices in conjunction with the flashing-lights provide additional warning for pedestrians, bicyclists, and/or other non-motorized road users."ⁱⁱⁱ

The Project will install medians at 20 at-grade crossing where warranted to eliminate drivers crossing the centerline pavement marking and driving around a gate. According to the FRA *Highway-Rail Crossing Guidelines* Third Edition, "curbed medians typically range in width from four to 16 feet, although wider medians may be present along divided highways. Although they do not present a true barrier, wide medians can be nearly as effective because a driver would have significant

difficulty attempting to drive across to the opposing lanes.”^{iv} The Project is [supported](#) by the Oklahoma Congressional Delegation, Association of Central Oklahoma Governments (ACOG), Northern Flyer Alliance, Noble County (24 at-grade crossings), City of Guthrie (5 at-grade rail crossings), City of Oklahoma City (8 at-grade rail crossing), Amtrak, and BNSF.

PROJECT HISTORY

AT-GRADE CROSSINGS

Improving safety is this highest priority of the Federal Highway Administration (FHWA) and ODOT. Since 1987, ODOT has participated in FHWA’s Rail-Highway Crossing (Section 130) Program, which allocates funding to eliminate hazards at railway-highway crossings. The Section 130 program funds are eligible for projects at all public crossings including roadways, bike trails and pedestrian paths. Fifty percent of a state's apportionment under 23 USC 130(e) is dedicated for the installation of protective devices at crossings. The remainder of the funds apportionment can be used for any hazard elimination project, including protective devices. On average, ODOT’s Section 130 program has an annual budget of \$8 million and the department reviews an average of 50 at-grade crossing and then identifies 30 at-grade railroad crossings eligible for Section 130 funding. No costs have been incurred by ODOT on any of the 52 at-grade rail crossings included in this Project.

HEARTLAND FLYER

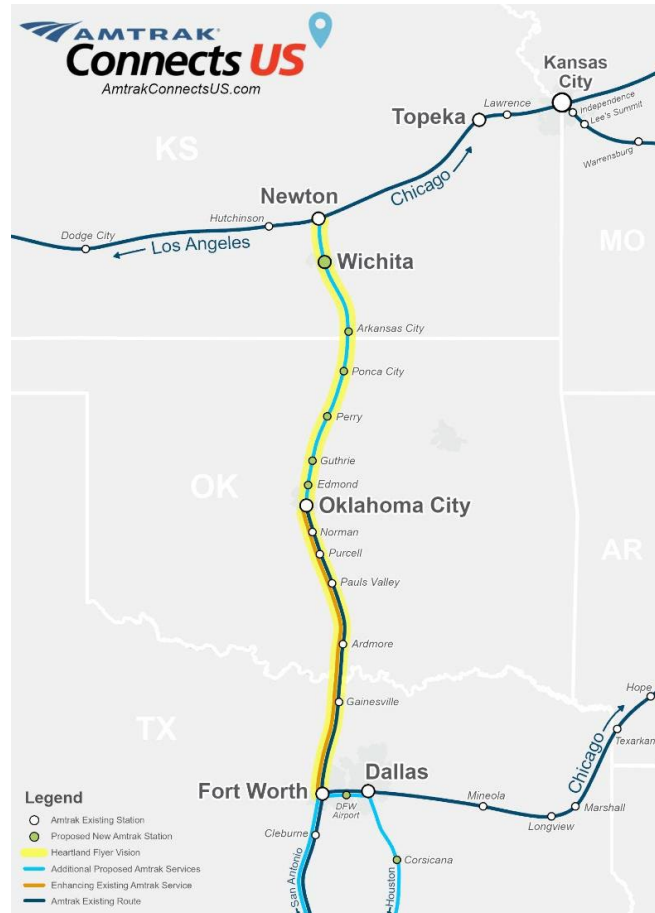
Presently the only intercity passenger rail service in Oklahoma is Amtrak’s Heartland Flyer service between Fort Worth, Texas and Oklahoma City, which operates one round trip train a day on BNSF-owned track. The Heartland Flyer makes station stops in Oklahoma City, Norman, Purcell, Pauls Valley, and Ardmore, Oklahoma; and Gainesville and Fort Worth, Texas. Ridership in 2019 totaled 67,951. Connections can be made in Fort Worth to Amtrak’s Texas Eagle, which operates between Chicago, Illinois; St. Louis, Missouri; and Los Angeles, California, via San Antonio, Texas. Stakeholder feedback during the Oklahoma Rail Plan update in 2021 noted that the highest priority for future rail service was developing new routes to serve new destinations. When asked where passenger rail service should be expanded, stakeholders said the “[Heartland Flyer should be extended north to Newton and KC](#) [Kansas City].”

HEARTLAND FLYER NORTHERN EXTENSION

For more than a decade, ODOT and Kansas Department of Transportation (KDOT) have been working together to examine options for adding intercity passenger rail service between Kansas and Oklahoma. In 2011, the agencies completed a *Passenger Rail Service Development Plan* that looked at the feasibility of extending the Heartland Flyer from Oklahoma City to Newton, as well as introducing a new standalone daytime service between Kansas City and Fort Worth via Oklahoma City, either in place of, or in

conjunction with, the Heartland Flyer extension. This Service Development Plan built off of a previous feasibility study conducted by Amtrak in 2010, and was jointly paid for by ODOT and KDOT, using a \$250,000 Federal FY2009 high-speed rail grant that provided half the funding for the study.

Figure 3. Heartland Flyer and Northern Extension



To further these efforts, Amtrak operated an inspection train from Oklahoma City to Kansas City in 2017, during which officials discussed the feasibility of reinstating regularly scheduled passenger rail service between the two cities. The inspection train made brief stops along the route at Guthrie, Perry, and Ponca City, Oklahoma; as well as Arkansas City, Wichita, Newton, Emporia, Topeka, and Lawrence, Kansas. The inspection train was a preliminary step in a feasibility assessment process to evaluate service options and costs for reinstating passenger rail service.

Since the operation of the inspection train, ODOT and KDOT have taken additional steps in the feasibility assessment process. These steps included engaging with BNSF Railway in

the development of preliminary capital cost estimates to better understand the types of infrastructure investments that would be needed to establish service, such as track upgrades to permit 79 mph passenger train speeds and engaging with Amtrak in the development of preliminary revenue and operating cost estimates to better understand the impacts of potential service options.

In 2020, Amtrak approached the states of Oklahoma and Kansas to enter into a multistate operational partnership for an extension of the Heartland Flyer north of Oklahoma City to Newton, Kansas, with connecting service provided to Amtrak's Southwest Chief at Newton and Texas Eagle at Fort Worth. The Kansas Senate and the House of Representatives passed a concurrent resolution in 2020 supporting the extension of Heartland Flyer service to Newton and supporting the establishment of a multistate operational partnership with Kansas and Amtrak for the extension. The resolution notes that the Kansas Senate and House of Representatives had passed the

Eisenhower Legacy Transportation Program, which included money for the operational expenses that Kansas would pay for the Heartland Flyer extension. However, both Oklahoma and Kansas would require federal capital funding to develop the service extension.

On February 10, 2021, Amtrak presented a proposal for the state of Kansas at the 2021 Passenger Rail Coalition Forum to request 100 percent federal funding for the Heartland Flyer extension capital costs, and three to five years of operational costs through reauthorization of the Surface Transportation Act. Soon after, the Oklahoma Senate and House of Representatives passed a [concurrent resolution](#) on April 26, 2021 endorsing the extension of Amtrak Heartland Flyer service to Newton and a multistate partnership between Amtrak, Oklahoma, and Kansas. The resolution urged the Oklahoma Congressional delegation to support the inclusion of federal funding for the full implementation and development of the Heartland Flyer extension from Oklahoma City to Newton, Kansas, including a second frequency directly connecting Kansas City, Missouri with Fort Worth, Texas, and to support the inclusion of full federal funding for the maintenance and future development of the Southwest Chief in the 2021 reauthorization of the Surface Transportation Act.

On November 15, 2021, President Joe Biden signed the \$1.2 trillion Infrastructure Investment and Jobs Act (IIJA), a once-in-a-generation investment in national infrastructure. The IIJA invests \$110 billion into roads, bridges and other major projects. It also invests \$66 billion in freight and passenger rail, including upgrades to Amtrak. The IIJA did not include Amtrak's request to fund 100 percent of the Heartland Flyer Northern Extension capital costs, but the IIJA did include an 80/20 FRA discretionary grant for capital costs and annual discretionary grants (2022 to 2026) to cover operational costs.

In April 2021, Amtrak released the "Connect Us" expansion map based on potential infrastructure funding from the U.S. government. The funding would create over 30 new routes and as noted by Amtrak, "if all goes as planned, the Heartland Flyer, which travels between Texas and Oklahoma, will expand to Wichita and Newton Kansas in the north and Austin and San Antonio Texas in the south. This change will connect the Heartland Flyer with the Southwest Chief and Sunset Limited routes that travel to cities including Los Angeles, New Orleans and Chicago."^v

OTHER TRANSPORTATION INVESTMENTS

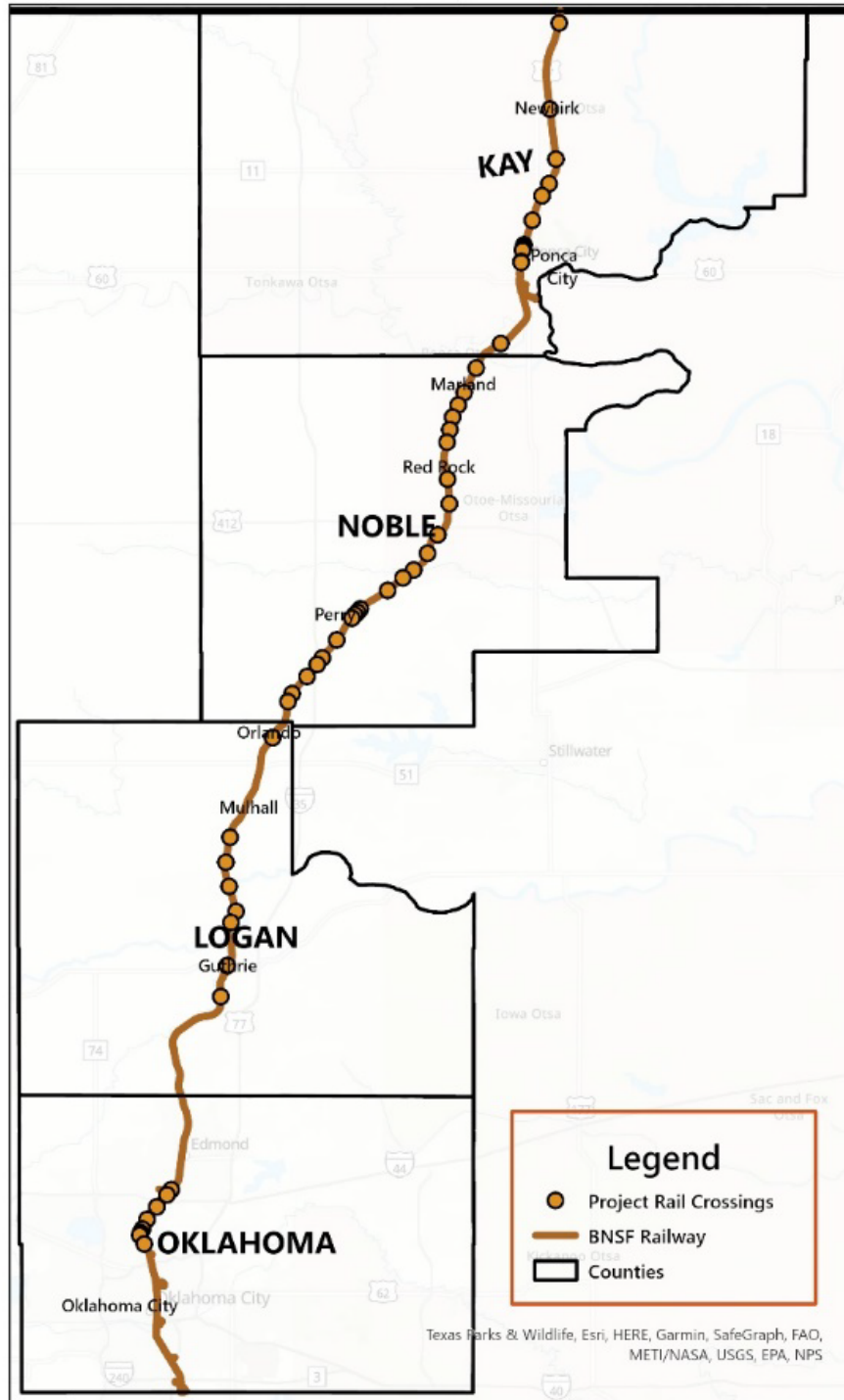
Since 2016, \$3.6 million of federal, state, and BNSF funds have been used to improve at-grade rail crossing signals and \$282,169 have been used to improve at-grade rail crossing surfaces along the Red Rock Subdivision. ODOT is being proactive in addressing the challenges of improving the safety of BNSF railway tracks and at-grade crossings to support reestablishing the Heartland Flyer Extension. The Rural grant funds

will provide needed resources to improve the safety of the 52 at-grade crossings needed to reestablish the Heartland Flyer Northern Extension.

PROJECT LOCATION

The Project will improve at-grade rail crossing safety to support reestablishing passenger rail service to four counties (Oklahoma, Noble, Logan, Kay) and nine cities (Oklahoma City, Guthrie, Mulhall, Orlando, Perry, Red Rock, Marland, Ponca City, and Newkirk) where proposed Heartland Flyer Northern Extension rail stations are located. Eight (15%) at-grade rail crossing are located in the Urbanized Areas of Oklahoma City and the remaining 44 (85%) at-grade crossing are located in rural Oklahoma. Figure 4 shows the locations of the 52 at-grade crossings that will be improved by this Project. As shown in Figure 5, 12 of the 52 counties are located in an area of persistent poverty (APP), historically disadvantaged communities (HDC), or Opportunity Zones.

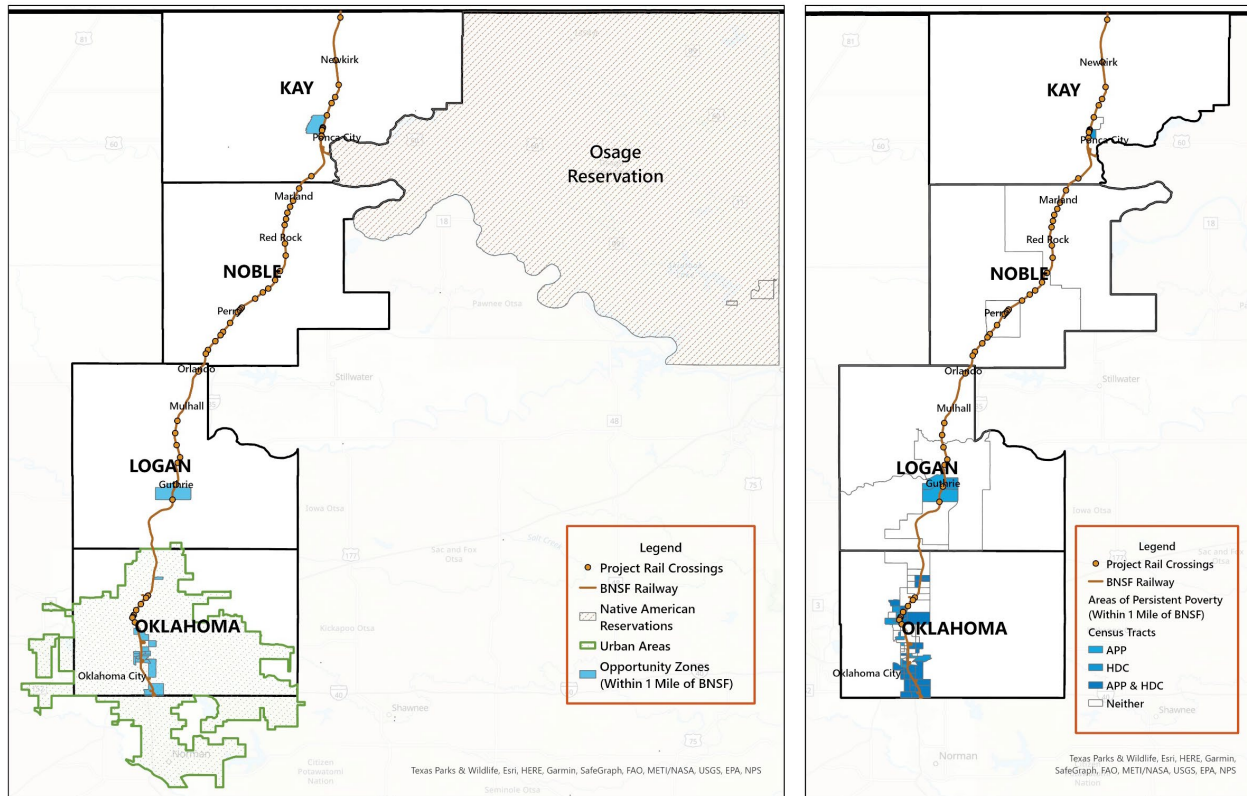
Figure 4. Project Location



There are over 80,000 residents that live one-mile or less from one of the 52 at-grade

rails crossing that reside in an area of persistent poverty, historically disadvantaged communities, or Opportunity Zone. There are no Empowerment Zones, Promise Zones, or Choice Neighborhoods located in the Project areas. However, the Osage Nation is a federally recognized Native American Government, and it resides east of Ponca City.

Figure 5. Project Location Relative to Opportunity Zones, Urban Areas, and Native American Reservations, Areas of Persistent Poverty, and Historically Disadvantaged Communities within a 1-Mile Radius of BNSF



Sources: [Areas of Persistent Poverty Project \(APP\) and Historically Disadvantaged Community \(HDC\) Status Tool](#) & [CDFI Opportunity Zones Resources](#)

PROJECT PARTIES

ODOT is the Project sponsor, and the Department has extensive experience using transportation discretionary and formula funds to improve Oklahoma’s multimodal transportation system. BNSF Railway is also a supporting partner for this Project as they own the railroad track. As noted in the Project Location section, the at-grade crossings are located across four counties, and the Amtrak Heartland Flyer Northern Extension has passenger rail stations in one existing urban area (Oklahoma City – Santa Fe Transit Hub) and eight proposed rail stations in rural communities.

GRANT FUNDS, SOURCES, AND USES OF PROJECT FUNDS

BUDGET

Table 1 shows the nearly \$26.5 million estimated budget for the 52 at-grade rail crossings in the nine cities. Of the \$26.5 million, \$21.8 million (82%) is in rural areas and \$4.6 million (18%) is the Oklahoma City urbanized area and the population is more than 200,000 population. As shown in Table 2, ODOT is requesting \$21,158,400 in MPDG Rural funds and since this is a Rural grant, ODOT will use \$5,289,600 of Section 130 funds to cover the 20 percent match.

Table 1. Project Costs by City and Area

City	Area	Cost Estimate	City	Area	Cost Estimate
Guthrie	Rural	\$2,436,000	Orlando	Rural	\$464,000
Marland	Rural	\$2,784,000	Perry	Rural	\$6,844,000
Mulhall	Rural	\$928,000	Ponca City	Rural	\$4,988,000
Newkirk	Rural	\$1,508,000	Red Rock	Rural	\$1,856,000
Oklahoma City	Urban	\$4,646,000			
Total					\$26,448,000

Table 2. Project Costs by Source of Funds

	State Funds		Federal Funds Section 130		MPDG Rural Funds	Total Project Cost
	Incurred	Future	Incurred	Future		
Environmental & Engineering	\$0	\$0	\$0	\$250,000	\$0	\$250,000
ROW & Utilities	\$0	\$0	\$0	\$0	\$0	\$0
Construction	\$0	\$0	\$0	\$1,641,600	\$21,158,400	\$22,800,000
Construction Management	\$0	\$0	\$0	\$1,368,000	\$0	\$1,368,000
Contingency & Other	\$0	\$0	\$0	\$2,030,000	\$0	\$2,030,000
TOTAL				\$5,289,600	\$21,158,400	\$26,448,000

Table 3 shows the annual amount of capital costs for FFY 2023 to 2027. This is based on starting the at-grade safety improvements in March 2023 and completing all 52 at-grade rail crossing improvements by June 2027.

Table 3. Project Costs by Year

	Total	2023	2024	2025	2026	2027
Capital Costs	\$26,448,000	\$3,364,000	\$6,032,000	\$6,496,000	\$6,032,000	\$4,524,000

FUNDING COMMITMENTS

While adequate transportation funding is a perennial challenge, robust modal systems that improve connectivity and that provide transportation opportunities and choices are important to Oklahoma's long-term economic viability. When considering the need to move both people and freight, ODOT administers several mode-specific programs, serving in a number of roles related to railroads and railroad-related activities. The Rail Programs Division administers the Federal Highway Administration's Grade Crossing Safety Program which provides funding to make safety improvements to Oklahoma's 3,612 at-grade public railway/road intersections; manages Oklahoma's Heartland Flyer passenger rail service, one of Amtrak's highest-rated trains for customer satisfaction; and serves as a liaison between ODOT and rail companies for ODOT projects that involve railroads or railroad property. The Rail Programs Division continuously explores federal funding opportunities to grow and improve Oklahoma's passenger and freight rail systems. With that said, ODOT is committed to these rural crossing improvements as part of this grant application project. Upon notice of award, these projects are ready to proceed through the processes identified in the application.

PROJECT OUTCOME CRITERIA

SAFETY

The highway-rail crossings identified in this grant along the Red Rock subdivision see operating train speeds range from 25 to 55 mph. The current average daily traffic counts range from 25,000 vehicles daily in Oklahoma City to 10,000 in Guthrie, 3,200 in Perry and 9,500 in Ponca City, all with traffic volumes expected to continue to increase. Of the 52 highway-rail grade crossings, 17 of the crossings only have crossbucks, 15 have pedestals with flashing lights, 9 of the crossing locations have flashing lights on pedestals with gates, and 11 of the crossings are fitted with flashing lights, cantilevers, and gates. Much of the forementioned safety equipment is out of date and difficult to repair or find replacement parts. Over the last 20 years, there have been eight fatalities, 17 injuries, and 25 incidents at the at-grade rail crossings in the Project area.

The significant increase in the potential for incidents at these crossings due to growth in roadway and rail traffic vividly illustrates the time-critical need for the safety upgrades being proposed. The installation of new signals with gates and enhanced crossing improvements will decrease the probability of incidents occurring, leading to fewer fatalities, injuries, and unnecessary property loss. In addition, the public safety benefits that result from the Project improvements to rail operations on the Red Rock Subdivision create smoother operations and reduced costs for roadway and railroad operators, which will allow for safer freight and future passenger rail operations.

The ODOT Multimodal Division Safety Section works with all railroads active in Oklahoma and the Oklahoma Corporation Commission, as well as counties and communities where railroads are present, to actively pursue actions that lead to direct safety improvements for Oklahoma’s citizens, as well as employees of the railroads themselves. The Highway Safety Improvement Program (HSIP) is a core Federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. This Project is in alignment with the HSIP as the improvements will improve the safety at the 52 at-grade rail crossings.

The ODOT Rail Safety Program is comprised of three primary focuses – (1) single high-priority rail crossing locations; (2) statewide minimum rail safety standards projects; and (3) rail corridor safety improvements. These programs aim to either improve on-the-ground safety conditions, or close and eliminate highly active railroad crossings that rise to the top of the annual ranking and inspection reports. Through a combination of annual crossing database reporting results and field-based diagnostic team inspections, the ODOT Multimodal Division can identify the crossings most in need of attention.

The individual location safety improvements are selected utilizing the methods previously described in conjunction with Section 130 requirements and the FRA Accident Prediction Equation. This combination provides the incredibly detailed information necessary to prioritize locations with the highest potential for hazard and gives Oklahoma one of the nation’s most sophisticated models for conducting rail crossing hazard analysis.

The statewide minimum requirements program is focused on providing the minimum safety requirements for at-grade crossing locations as established nationally and accounted for in the *Manual on Uniform Traffic Control Devices*. The types of improvements included in this program are crossbuck signs, advanced warning signs, American Association of Railroads/Department of Transportation (AAR/DOT) inventory number postings, supplemental advanced warning signs (where applicable), and advanced warning pavement markings, at locations where the surface will facilitate the life cycle of the pavement marking proposed for placement.

When a community holds a section of track with multiple crossing locations, it becomes eligible to participate in a “Corridor Rail Crossing Improvement Project.” The main objectives of these safety improvements include: (a) eliminating the risk of conflict between roadway users and trains by installing and or upgrading with the latest technology in highway-rail crossing equipment and surface improvements; (b) eliminating potential queuing of vehicles stopped for train crossings; and (c) reducing the potential for high severity collisions at the intersections.

STATE OF GOOD REPAIR

Today, the 52 at-grade crossings vary in condition from poor to fair. Of the 52 at-grade rail crossings, 36 (69%) of the intersecting roadways have a rough surface. ODOT is constantly working to better assess, predict and prioritize their state of good repair needs. The Rail Programs Division completed an inventory of all highway-rail grade crossings statewide in 2020. ODOT recognizes that having well maintained,

Figure 6. Guthrie Prairie Grove Road at-grade Crossing



modern, and reliable rail infrastructure (namely highway-rail grade crossing surfaces, tracks, lighting, and signal equipment systems) helps ensure safe, dependable, and accessible services. Installing flashing lights, gates, and median improvements will modernize critical at-grade rail crossings and improve the state of repair backlog for existing at-grade rail crossings that are handling growing volumes of freight shipments and potential future passenger rail service. The surface improvements at the at-grade crossings will increase the overall quality and good condition of the existing at-grade rail crossing infrastructure, which is expected to result in fewer critical repairs in the future.

ECONOMIC IMPACTS, FREIGHT MOVEMENT, AND JOB CREATION

The improvements to the 52 at-grade rail crossings will provide significant safety benefits, and promote additional opportunities for increased rail speeds, reduce vehicular delay at crossings, and eventually allow for reestablishing intercity passenger rail service via the Heartland Flyer Northern Extension. The Project is an incremental but necessary step toward improving future service and potential operational impacts, as it will enhance safety and enable higher speeds at crossings from improved surface profile and approaches. Future investments or operational changes supporting faster service will provide logistics and shipper cost savings to freight rail customers and create opportunities for passenger rail tourism.

ANTICIPATED ECONOMIC IMPACTS, FREIGHT MOVEMENT, AND JOBS OUTCOMES

The Project will either provide or enable the following outcomes with other investments or operational changes:

- **Travel time reliability.** Improvements will not only reduce delays due to conflicts with vehicular traffic at at-grade rail crossings but will upgrade surface

smoothness and approaches to at-grade crossings, allowing for higher speeds and potentially enhancing competitive rail speeds and service for shippers.

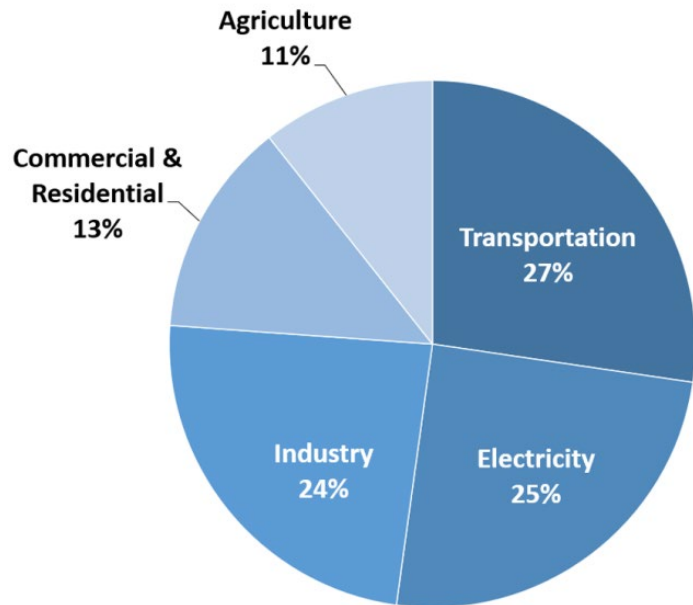
- **Multimodal transportation.** The proposed Heartland Flyer Northern Extension will reestablish service to an inter-city passenger rail corridor with over 10 million residents, connecting Oklahomans and Kansans to up to 160 communities throughout the United States. A passenger profile study from the Texas A&M Transportation Institute found that 62 percent of existing Heartland Flyer Passengers diverted from automobiles.^{vi} Therefore, expanded passenger rail service will provide better multimodal options and promote diversions from automobiles, thereby offering additional congestion, emissions, and delay benefits. Amtrak noted in the [Heartland Flyer Extension fact sheet](#) that if passenger service returns to this region, the economic impact would be \$64.8 million annually, plus \$1.9 billion in economic activity from one-time capital investments.
- **Economic linkages and enhancing tourism opportunities.** Working toward enabling new passenger service is critical for creating economic linkages for Oklahomans in rural and underserved areas, particularly north of Oklahoma City. As expressed by several Oklahoma State legislators, many Oklahomans have little, if any, access to air, bus, or rail travel; extending passenger rail service from Oklahoma City to Newton, Kansas will connect currently isolated communities to opportunities for transportation, tourism, jobs, and economic development. In 2019, the Heartland Flyer's total ridership was 68,744 trips.^{vii} If extended, the future ridership along the corridor would grow to 92,000 per year.^{viii}
- **Current contributions to job creation.** A 2015 Amtrak study found that rail tourism spending created a total of \$0.9 million in direct and indirect spending in Oklahoma each year, supporting local businesses. Freight rail in Oklahoma supports high-paying jobs; the average compensation for freight rail workers in Oklahoma is \$116,860 per year,^{ix} which is more than double the average wage for occupations in Oklahoma.^x Freight and supporting industry growth are critical as population projections for Oklahoma suggest a 10.9 percent growth between 2020 and 2040, which is in line with historical growth of 6.7 percent between 2010 and 2020.^{xi} Growth in these industries will support the expanding labor force in Oklahoma and provide well-paying jobs.
- **Fostering economic growth and development.** Oklahoma's economy at the end of 2021 was the 7th fastest-growing state economy in the United States, growing at 8.1 percent, almost two-percentage points more than the overall economy. The trade, transportation, and utilities sectors make up almost 16 percent of Oklahoma's \$198 billion economy.^{xii} As such, the BNSF Logistics Center in Moore, Oklahoma is a key employment center offering critical supply chain connections, flexibility, and efficiency for the region and the global supply

chain. Further freight rail and logistics investments in the region will support the movement of goods, creating additional capacity and speeds, which can help alleviate future supply chain constraints.

CLIMATE CHANGE, RESILIENCY, AND THE ENVIRONMENT

The transportation sector accounts for the largest share of greenhouse gas emissions in the United States (Figure 7). According to the United States Environmental Protection Agency (EPA), greenhouse gas emissions from transportation primarily come from burning fossil fuel to power cars, trucks, ships, trains, and planes. Increasing greenhouse gas emissions result in global climate and environmental changes such as more frequent and severe flooding and increased prevalence of wildfires. The U.S. Global Change Research Program states that “these trends are expected to continue and pose growing risks to health, food, water, energy, and transportation systems, and increasingly threaten the economy and the vitality of communities.”^{xiii} Urgent changes are needed in the transportation sector to address this challenge, and public transportation is a key climate action strategy.

Figure 7. U.S. Greenhouse Gas Emissions by Sector (2020)



RESILIENCY, THE ENVIRONMENT, AND CLIMATE CHANGE IMPACTS

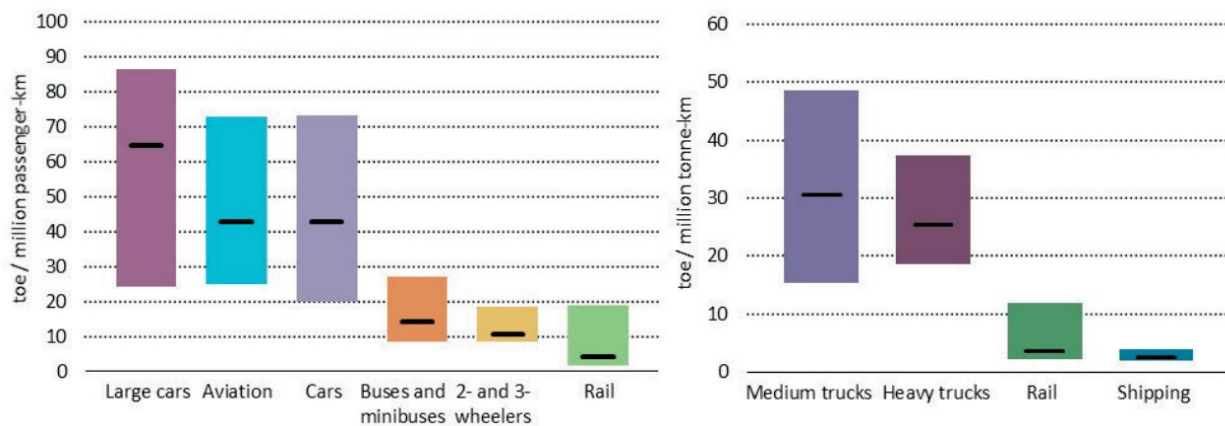
At-grade rail crossing improvements proactively improve resiliency and the environment and reduce climate change impacts. Even though the transportation sector is working hard to reduce emissions through mode shift, more efficient vehicles, alternative fuels, and operational efficiencies, increased shocks and stressors like extreme weather events due to climate change are occurring more frequently. ODOT and other state departments of transportation (DOTs) across the United States are working together to ensure the existing transportation system and new infrastructure investments are resilient to these shocks and stressors. Modal options, particularly those like the Heartland Flyer and reestablishing the Heartland Flyer Northern Extension, can provide emergency evacuation to more portions of the U.S., which may help to increase the resilience of the overall transportation system.

Amtrak’s Heartland Flyer Extension fact sheet^{xiv} notes that the growth experienced by the Wichita-Dallas corridor has been accompanied by increased traffic congestion, especially along Wichita’s I-235 highway. The Dallas – Fort Worth – Arlington corridor is One of the most congested areas in the United States. According to the Texas A&M Transportation Institute, each driver in the region lost 65 hours sitting in traffic in 2019, and total annual delay hours was nearly 220 million hours.^{xv} Reestablishing the Heartland Flyer Northern Extension closes a critical gap in the passenger rail network and in turn provides access to numerous portions of the county that are previously inaccessible by passenger rail. Reestablishing the Heartland Flyer Northern Extension may bring much-needed relief to congested communities as passenger rail provides an affordable transportation option that provides climate change, environment, and resiliency benefits.

CLIMATE CHANGE AND RESILIENCY BENEFITS

Energy efficiency and greenhouse gas reductions: If this grant funds this Project’s at-grade crossing improvements, it will support reestablishing passenger rail travel, which is among the most energy efficient modes of transportation. According to the International Energy Agency (IEA), rail is the most energy-efficient means of motorized passenger transport, and freight rail is much more energy-efficient than road freight (Figure 8).^{xvi} Amtrak estimates that passenger rail emits up to 83 percent fewer greenhouse gases than driving and up to 73 percent fewer than flying.^{xvii} Additionally, the at-grade crossing improvements from this grant may help improve the energy efficiency of existing BNSF freight rail using the improved corridor.

Figure 8. Energy Intensity of Different Transport Modes



Source: IEA

Reduced local air pollution and improved public health: Shifting trips from single occupancy vehicles to public transportation options such as passenger rail results in improved local air quality as well as reduced greenhouse gas emissions. By shifting trips to a lower-emitting mode, the Heartland Flyer Northern Extension may help to reduce

local air pollutants like ozone and particulate matter and could have a direct effect on public health, especially for young children and those with reduced immune systems.

Resilient infrastructure:

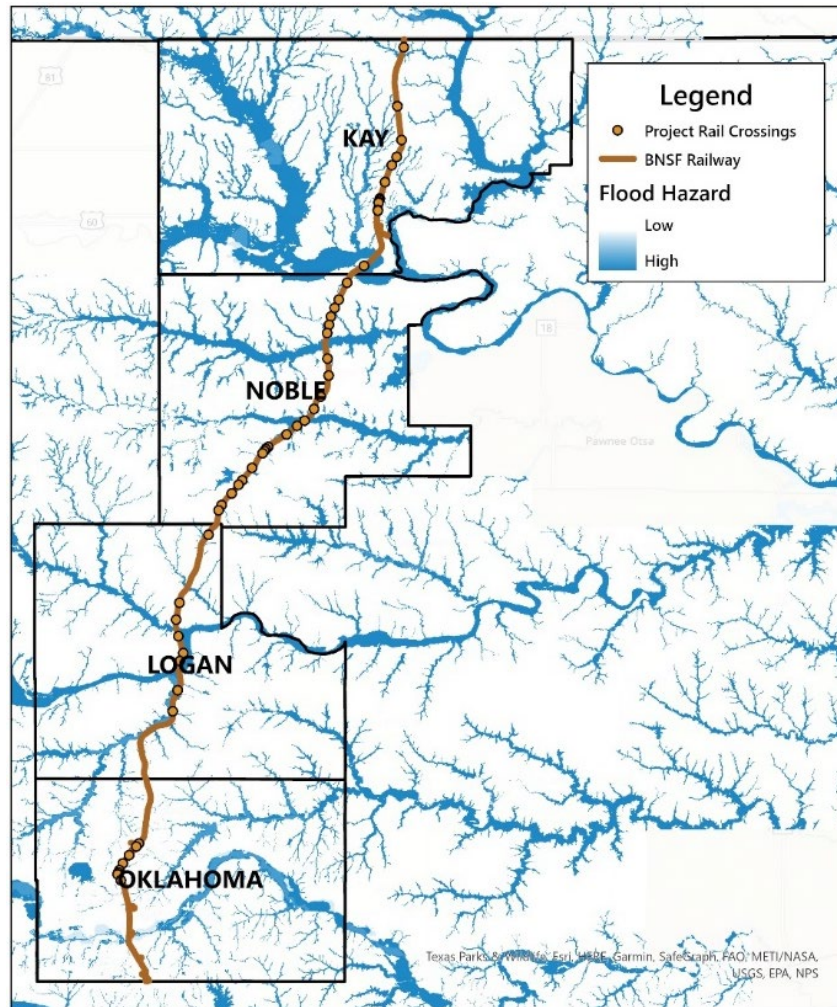
The EJScreen mapping tool shows that several of the at-grade rail crossings lie within the 100-year floodplain (Figure 9).

ODOT will ensure that all crossings are designed to be resilient to flooding and other future extreme weather events, including consistency with the Federal Flood Risk Management Standard in Executive Order 14030, Climate-Related Financial Risk (86 FR 27967) and 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input. A key consideration when assessing transportation

system resilience is to promote system redundancies and modal options. Improving the 52 at-grade rail crossing to support reestablishing the Heartland Flyer Northern Extension will provide such redundancy in Oklahoma’s critical transportation lifeline infrastructure, including the possibility of acting as an alternative evacuation option in case of natural or manmade disasters.

Fiscally responsible land use and transportation efficient design: Beyond the direct emissions benefit of shifting to a more efficient mode, research indicates that public transportation options including connections to passenger rail support fiscally responsible land use and transportation efficient design because “residents in a location-efficient area are able to make shorter trips, fewer trips, or walk or bike to meet their daily needs.”^{xviii} As such, the Heartland Flyer extension may act as a “multiplier” in reducing net overall greenhouse gas and local air pollution emissions in the region. Both

Figure 9. At-grade Rail Crossing Locations Relative to the 100-Year Floodplain



the Association of Central Oklahoma Governments (ACOG) and Indian Nations Council of Governments (INCOG) TIPs consider land use implications and promote low carbon travel, with criteria including the following:

- Does this project increase access in an area of Environmental Justice concern?
- Does this project support efforts to improve air and water quality?
- Does this project integrate multiple transportation modes?
- Does this project utilize strategies that help improve reliability of travel times?

EQUITY, MULTIMODAL OPTIONS, AND QUALITY OF LIFE

EQUITY & BARRIERS TO OPPORTUNITY

At-grade rail crossing improvements proactively address equity and barriers to opportunity. As noted in the Project location summary (Figure 5), 12 of the 52 at-grade crossing improvements are in areas of persistent poverty, historically disadvantaged communities and Opportunity Zones. As shown in Table 4, there are over 80,000 residents that live one-mile or less from one of the 52 at-grade rails crossing that reside in an area of persistent poverty, historically disadvantaged communities, or Opportunity Zones.

Table 4. Population Within One-Mile from an At-Grade Rail Crossing Location

Area	Population
Area of Persistent Poverty	8,783
Area of Persistent Poverty & Historically Disadvantage Community	55,354
Area of Persistent Poverty, Historically Disadvantage Community, & Opportunity Zone	9,347
Area of Persistent Poverty & Opportunity Zone	2,386
Opportunity Zone	4,545
TOTAL	80,415

Source: [Areas of Persistent Poverty Project \(APP\) and Historically Disadvantaged Community \(HDC\) Status Tool](#) & [CDFI Opportunity Zones Resources](#)

Proposed enhancements to at-grade rail crossings will support a future Heartland Flyer Northern Extension and will provide access to jobs, recreation, healthcare, and education for these underserved communities. The 52 proposed at-grade crossing enhancements will also provide important equity, multimodal, and quality of life benefits, particularly in the areas of safety and multimodal/intermodal efficiency. These benefits also influence regional and national economic robustness.

Over the last 20 years, there have been eight deaths, 17 injuries, and 23 incidents among the 52 at-grade rail crossings. Enhancing safety for drivers and vulnerable road users for rural and disadvantaged Oklahomans inherently improves quality of life. Rural road safety is a particular concern because most highway fatalities in the nation take place on rural roads. For at-grade rail crossings in particular, driver inattention and human error must be considered to enhance safety, particularly in rural areas, where minimal traffic

congestion is often expected by travelers. While human factors may seem impossible to overcome, ODOT and its private rail partners including BNSF^{xi} understand that providing drivers with flashing lights, gates, medians in some areas, and advance-targeted warnings on upcoming nearby level crossing activity will reduce accidents and injuries by efficiently warning drivers to avoid the path of potential incoming trains.

Community outreach programs include education on safety. ODOT is committed to helping all Oklahomans understand capital, operations, and technology investments and enhancements that are programmed on the state's transportation system. Environments that drivers already use are a particular focus for ODOT. ODOT has developed a public involvement plan that outlines how the department will engage with the public to receive meaningful consideration and input from interested individuals. ODOT will continue to educate all system users on where and how to access information on the status of the states' roadways; this will include targeted outreach on grade crossing safety as previously conducted for the *Oklahoma Highway-Rail Grade Crossing State Action Plan* and *State Rail Plan*.^x

Particularly in the light of today's supply chain constraints, the efficiency of the rail system is another critical consideration for equity and quality of life concerns today not only for rural Oklahomans and all Oklahomans, but also for all Americans. The state of Oklahoma is committed to not only reducing delays due to conflicts with vehicular traffic at at-grade rail crossings, but also upgrading rail line infrastructure and facilities to meet today's rail shipping demands and enhancing competitive rail access and service for shippers.^{xi} Rail plays a critical part in shippers' businesses, and intermodal freight transfers allow for cost-effective long hauls between Oklahoma, the U.S. East, West, and Gulf coasts; Mexico; and Canada. Multimodal and intermodal efficiency is essential to the Oklahoma freight network and provides shippers with transportation options and competitive rates to move their goods. Because of Oklahoma's central location, BNSF is committed to intermodal operations in the region. The BNSF logistics center in Moore, Oklahoma provides jobs as well as important supply chain connections that offer shippers choices, flexibility, efficiency for the region and the global supply chain.^{xii} This facility requires safe and efficient rail connections.

IMPROVING EQUITY, MULTIMODAL OPTIONS, AND QUALITY OF LIFE

The proposed Heartland Flyer Northern Extension would bring new service to Oklahoma and Wichita, Kansas, and would also connect to the Texas Triangle and national Amtrak routes. The Texas Triangle includes the Dallas/Fort Worth area, which is home to over 7.5 million people, the fourth largest metropolitan area in the United States. As part of Amtrak's vision, reestablishing the upgraded Heartland Flyer Northern Extension route in total would serve an area with more than 10 million residents directly and would also connect Oklahomans and Kansans to as many as 160 communities throughout the

United States. Amtrak’s larger vision for the future is a modern passenger rail network that creates more than half a million jobs and delivers over \$150 billion in economic benefit to impacted local communities by 2035. The economic benefits are related to multimodal transportation system accessibility and expanded multimodal access for all Americans.^{xxiii}

Access is particularly critical for Oklahomans in rural and underserved areas. While the I-35 Corridor has state, national, and international significance as a key transportation corridor for passengers and goods and acts as one of the nation’s most critical links both socially and economically, the transportation options for residents north of Oklahoma City are limited. Because of the importance to residents and the economy, the Oklahoma legislature overwhelmingly supports the Heartland Flyer extension and passed a resolution in 2021. Representatives noted: “Our citizens find themselves in a transportation desert, with no access to air, bus or rail travel; passenger rail service from Oklahoma City to Newton, Kansas, is vitally important to our communities for transportation, tourism, and economic development.”^{xxiv} The support of the Oklahoma legislature is critical because the legislature is listening to its residents. Moreover, operation of the existing Heartland Flyer between Oklahoma City and Fort Worth, Texas is financed primarily through funds provided by the states of Oklahoma and Texas.

One community that lacks access to transportation is Oklahoma’s Mennonite Community. The Mennonite presence in Oklahoma began in 1880 and is an important part of the state’s history and culture. Mennonite beliefs span a social spectrum, with varying degrees of assimilation into today’s modern society. For example, Holdeman Mennonites have four churches in Oklahoma and practice conservative principles. As such, a sizable percentage of Holdemans do not own cars. Multimodal access to Newton, Kansas for the Holdemans and other Mennonites is an important cultural activity because the Western District Conference (WDC) of the Mennonite Church is held there. The WDC is a regional grouping of congregations of Mennonites. WDC is composed of more than 50 Mennonite congregations located in Nebraska, Kansas, Oklahoma and Texas. The Heartland Flyer Northern Extension would provide Texas and Oklahoma Mennonites with increased mobility options between states and to the key activity centers in Newton.

These and other stories of the need for multimodal access and connectivity are documented in ODOT’s public outreach in the 2021 State Rail Plan and the 2045 Long Range Transportation Plan. The need for Heartland Flyer Northern Extension was supported and documented during public and stakeholder involvement in the development of the last three updates for the State Rail Plan.

For the Rail Plan, stakeholders included shippers, modal operators, transportation academics, logistics organizations and service providers, current and potential rail

passenger users, various industrial and manufacturing sectors, state, regional, county and city government agencies, elected and appointed public officials, economic development and business interests, special interest and advocacy groups, and the public. Stakeholder involvement included participation in freight and passenger rail planning activities, identifying priorities and goals for Oklahoma, and identifying issues, needs and potential investments for freight and passenger rail. Similar project-specific public outreach would be performed prior to Heartland Flyer Northern Extension expansion and would include meaningful engagement for all Oklahomans.

To date, the Oklahoma and Kansas Senate and House as well as 22 cities, counties, and Metropolitan Planning Organizations (MPO) have passed [resolutions](#) supporting the Heartland Flyer Northern Extension.

INNOVATION AREAS: TECHNOLOGY, PROJECT DELIVERY, AND FINANCING

INNOVATIVE TECHNOLOGIES

Higher standards and improved safety technology has helped reduce the risk of potential incidents at highway-rail grade crossing locations. These improvements may include the latest technology in the installation or upgrade of active traffic controls which give visual and audible advance notice of approaching trains. Examples include flashing-light signals (both mast-mounted and cantilevered), bells, automatic gates, active advance warning devices, and highway traffic signals. Flashing-light signals operate on a calculated schedule based on speed variance timed before the arrival of oncoming trains at highway-rail grade crossings. Warning devices employed in active traffic control systems are actuated by train detection with circuits designed on the fail-safe principle. Where "Preemption" will be installed, the normal sequence of traffic control signal indications are preempted upon the approach of trains to avoid entrapment of vehicles on the highway-rail grade crossing by conflicting aspects of the traffic control signals and the highway-rail grade crossing flashing-light signals. Additionally, the prevalence of smartphones provides additional audio and visual alerts for its navigation systems that help notify drivers of potential encounters with trains as they approach a crossing.

INNOVATIVE PROJECT DELIVERY

ODOT will bundle the 20 at-grade median improvements to expediate project delivery.

INNOVATIVE FINANCING

ODOT is requesting \$21,158,400 in MPDG Rural funds and since rural grants can use federal funds to match the grant funds, ODOT will use \$5,289,600 million in Section 130 funds for the 20 percent match.

BENEFIT COST ANALYSIS

A Benefit Cost Analysis (BCA) was conducted for this Project. The BCA follows the most recent 2022 USDOT guidance for BCAs, which provides both methodological guidance and specific values for monetizing several types of benefits. All values from that guidance are in 2020 dollars. All monetary values in the BCA, including costs, are expressed in constant 2020 dollars.

The following general parameters and assumptions have been used in the BCA:

- All costs and benefits are in 2020 dollars. A real discount rate of 7 percent is applied to all costs and benefits.
- A project life cycle of 30 years is assumed with no residual value at the end of the 30-year benefit period.
- The Project construction is assumed to begin in March 2023 and end in 2027, assuming each of the 52 grade crossing projects take one month to complete. Operational safety benefits are phased throughout the construction period based on percent completion. The safety benefits from improving the at-grade crossing will begin in 2028.
- The \$24.3 million in project cost (in 2020 dollars) reflect improvements including smoothing the crossing surface of all 52 at-grade crossings, installing flashing-light signals and audible bell sounds at all 52 at-grade crossings, and installing medians at 20 at-grade crossings.
- It is assumed that the Project will not generate any additional operating and maintenance costs beyond the existing no-build.
- The primary estimated benefit is safety, as no major operational changes are envisioned from improving the 52 at-grade crossings. While there are a range of future benefits that will be unlocked due to this project, these benefits were excluded to ensure this analysis demonstrates the independent utility of the capital investment in the 52 at-grade crossings.
- Existing conditions and crash rates were estimated using Federal Railroad Administration's (FRA) "Highway-Rail Grade Crossing Accident/Incident Reports" for each crossing. Crash Modification Factors (CMFs) were applied to estimate the reduction in crashes for the 52 crossings. Monetized values by crash severity from the 2022 USDOT guidance for BCAs were used to estimate the future benefits.

Based on the assumption and methodology, the Project yields a Benefit-Cost Ratio of 1.1 and a Net Present Value of \$1.6 million. Additional results and methods for the BCA can be found in Appendix B.

PROJECT READINESS AND ENVIRONMENTAL RISK

TECHNICAL FEASIBILITY

The Project construction cost estimates and 9.6 percent contingency levels were completed and estimated by ODOT professional engineers, based on recent similar at-grade rail crossing projects in Oklahoma. All work will be contained within the BNSF Railway right of way, and no utilities will need to be relocated, therefore. The Statement of Work for the Project includes improving the smoothness of the crossing surface; installing flashing-light signals, which are fundamental active warning devices; installing audible bell sounds at all 52 at-grade crossings to improve safety for non-motorized road users; and installing medians at 20 at-grade crossing to eliminate drivers crossing the centerline pavement marking and driving around a gate.

ODOT's Rail Programs Division recently completed a statewide highway-rail grade crossing inventory in 2020. The data collected from the inventory along with the FRA "Priority Index Ranking" supports the projects identified for safety improvement within this application. Data from the inventory and the FRA Priority Index Ranking utilized to prioritize and optimize the project delivery and completion. The at-grade rail crossing safety improvements have a basis of design identified along with preliminary cost estimates. Similar to other at-grade rail projects, the preliminary design phase for the 52 at-grade rail crossings will begin upon notice of award.

PROJECT SCHEDULE

ODOT, BNSF, and local communities are prepared to proceed upon notice of award. The proposed improvements have a basis of design identified along with a preliminary cost estimate. The average project timeframe for each at-grade rail crossing safety improvement is anticipated to be between 12 and 18 months. This includes the Diagnostic Team Inspection, design of the at-grade rail crossing improvements, and construction. As noted in the Grant Funds, Sources, and Uses of Project Funds Section, ODOT would start the at-grade rail crossing safety improvements in March 2023 and complete all 52 at-grade rail crossing improvements by June 2027. Since there is no right-of-way acquisition or utility relocation needed for this Project, it is anticipated that a Categorical Exclusion (CE) would be sufficient for the environmental approval process and that would be completed in 2023. ODOT will do the preliminary engineering for each at-grade crossing improvement. However, ODOT does not sign the final plans for at-grade rail crossing improvements. Most of the work will be designed and executed by BNSF. As noted below in more detail, all 52 at-grade rail crossings will be included in the State Transportation Improvement Program (STIP) after Oklahoma Transportation Commission (OTC) approval, and then the 8 at-grade improvement in the ACOG area will be added to the TIP.

REQUIRED APPROVALS

ENVIRONMENTAL PERMITS AND REVIEWS

The at-grade rail crossing safety improvements will not have any notable change to environmental sustainability. The at-grade rail crossing safety improvements are within existing railroad right of way. Therefore, a Categorical Exclusion (CE) will be sufficient for the environmental approval process. It is possible that reviews by the Oklahoma State Historic Preservation Office (SHPO) and the U.S. Fish and Wildlife Service may be required at some locations. There are no additional agency approvals anticipated to complete the at-grade rail crossing safety improvements.

STATE AND LOCAL APPROVALS

As noted earlier, ODOT utilizes the FRA "Priority Index Ranking" system to prioritize at-grade rail crossing candidates for improvements each year. The Priority Index Ranking system utilizes several factors to select the list of at-grade rail crossings within the state. These factors include roadway geometrics, train speed, traffic volumes, lanes of traffic, collisions/incident data, and existing crossing equipment. Collision incidents are the greatest determining factor when prioritizing candidates for improvement. ODOT identifies and confirms the highest ranked at-grade rail crossings to establish each year's projected funding expenditures and then presents improvement recommendations to the Director of Capital Programs for inclusion on the Oklahoma Transportation Commission (OTC) agenda. The OTC meets every month to review and approve transportation projects. All projects selected by ODOT are presented at the OTC meeting for funding approval. Following OTC approval, the Railroad is notified and then files an application for approval with the Oklahoma Corporation Commission (OCC) detailing the crossing location and proposed improvements. Once the OCC holds an approval hearing, an order is issued for the project to proceed. Each process takes approximately 30 to 60 days to complete. ODOT also includes the projects in STIP upon OTC approval.

FEDERAL TRANSPORTATION REQUIREMENTS AFFECTING STATE AND LOCAL PLANNING

The 52 at-grade rail crossing safety improvements are not required to be included in the State Freight Plan and Long Range Transportation Plan. As noted above, ODOT will include the at-grade rail safety improvements to the STIP after OTC approval.

ASSESSMENT OF PROJECT RISKS AND MITIGATION STRATEGIES

Table 5 describes the Project risks and identifies strategies to mitigate the risk.

Table 5. Project Risks and Mitigation Strategies

Name	Description	Mitigation Strategy
Administrative	ODOT will administer the federal and state transportation funding. The railroad will manage the rail contracting and construction.	ODOT is the official state executive agency for administration and implementation of federal and state transportation spending. ODOT will assist with the administration of the rail contracts as needed.
NEPA	Historic/archaeological/cultural resources discoveries	Proposed improvements are not expected to go outside existing right of way. It is not anticipated that significant historic or archaeological resources are present within existing right of way.
Site-Specific Concerns	Specific sites may have construction challenges.	ODOT/railroads have successfully installed systems at challenging sites in the past.

PROJECT REQUIREMENTS

The Project will generate regional economic, mobility, or safety benefits.

- The Project will improve the safety of 52 at-grade rail crossings to ensure each crossing provides flashing lights and gates and 20 crossings install medians to eliminate drivers crossing the centerline pavement marking and driving around a gate.

The Project will be cost effective.

- The Project has a benefit cost ratio of 1.1 and a net present value of \$1,570,000.

The Project will contribute to one or more of the national goals.

- The Project will improve **Safety** at 52 at-grade railroad crossings to ensure each crossing provides flashing lights, gates, and medians. These improvements are aligned and will contribute to the national Safety goal "To achieve a significant reduction in traffic fatalities and serious injuries on all public roads."
- The Project will improve the **Infrastructure Condition** at 52 at-grade railroad crossings. The safety improvements for the at-grade crossings will improve the state of repair backlog for existing infrastructure that is handling growing volumes of freight shipments and potential future passenger rail service. The surface improvements at the at-grade crossings will increase the overall quality of the existing infrastructure, which is expected to result in fewer critical repairs in the future. These improvements are aligned and will contribute to the national Infrastructure Condition goal "To maintain the highway infrastructure asset system in a state of good repair."

- The EJScreen mapping tool shows that several of the at-grade rail crossings lie within the 100-year floodplain. ODOT will ensure that all crossings are designed to be resilient to flooding and other future extreme weather events. These improvements are aligned and will contribute to the national **Environmental Sustainability** goal “To enhance the performance of the transportation system while protecting and enhancing the natural environment.”

The Project is based on the results of preliminary engineering.

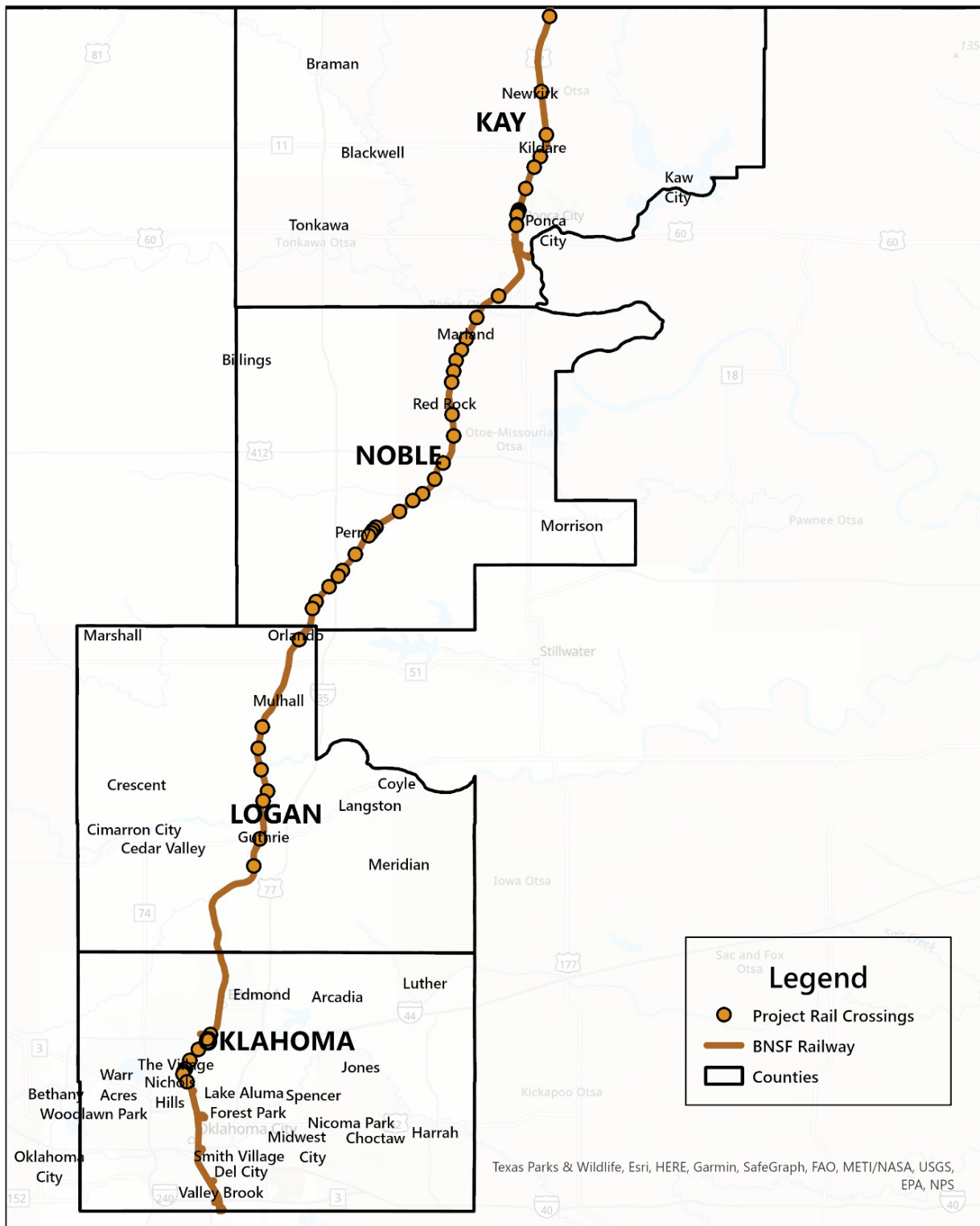
- ODOT will do the preliminary engineering for each at-grade crossing improvement. However, ODOT does not sign the final plans for at-grade rail crossing improvements. Most of the work will be designed and executed by BNSF.

The Project is reasonably expected to begin no later than 18 months after the date of obligation of funds for the Project.

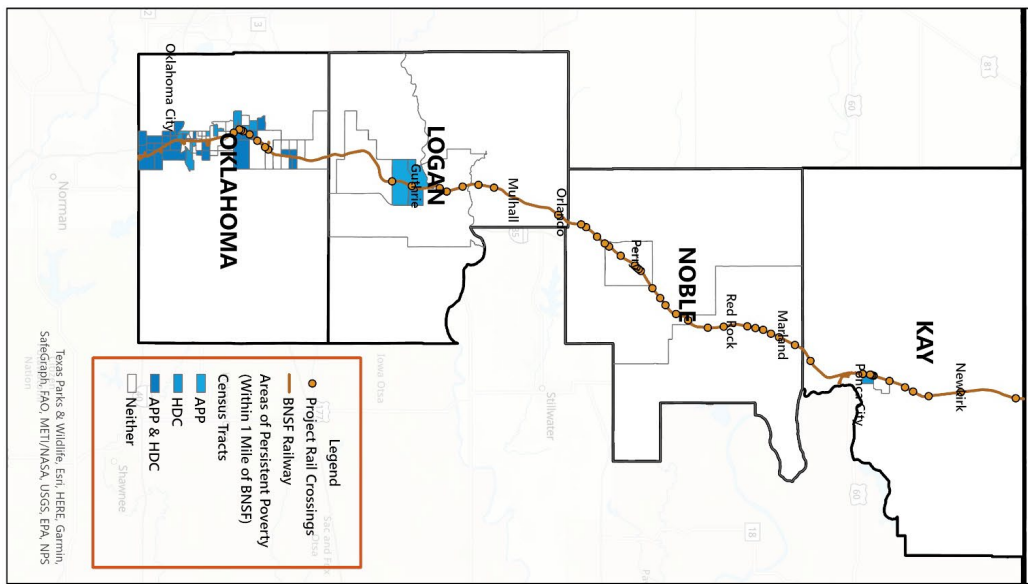
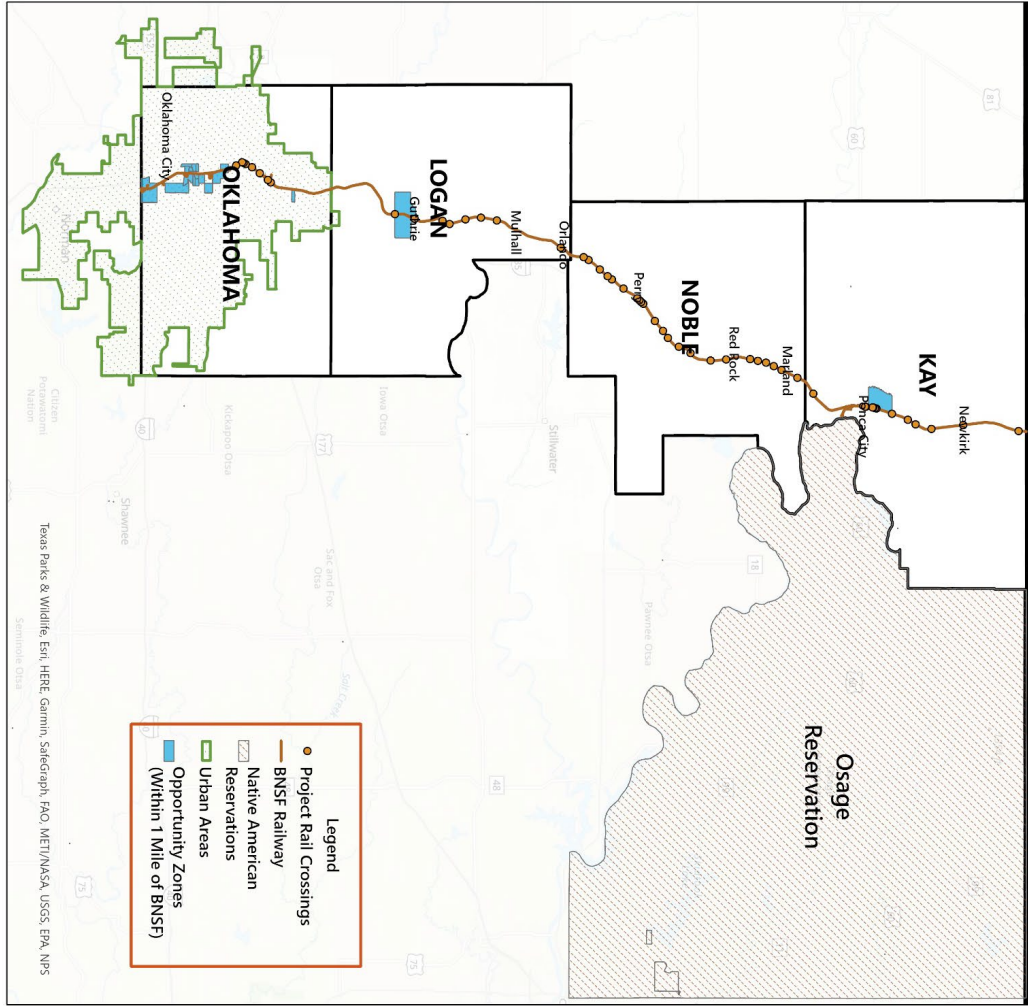
- ODOT is prepared to begin this Project in March 2023.

Appendix A – Full Size Maps

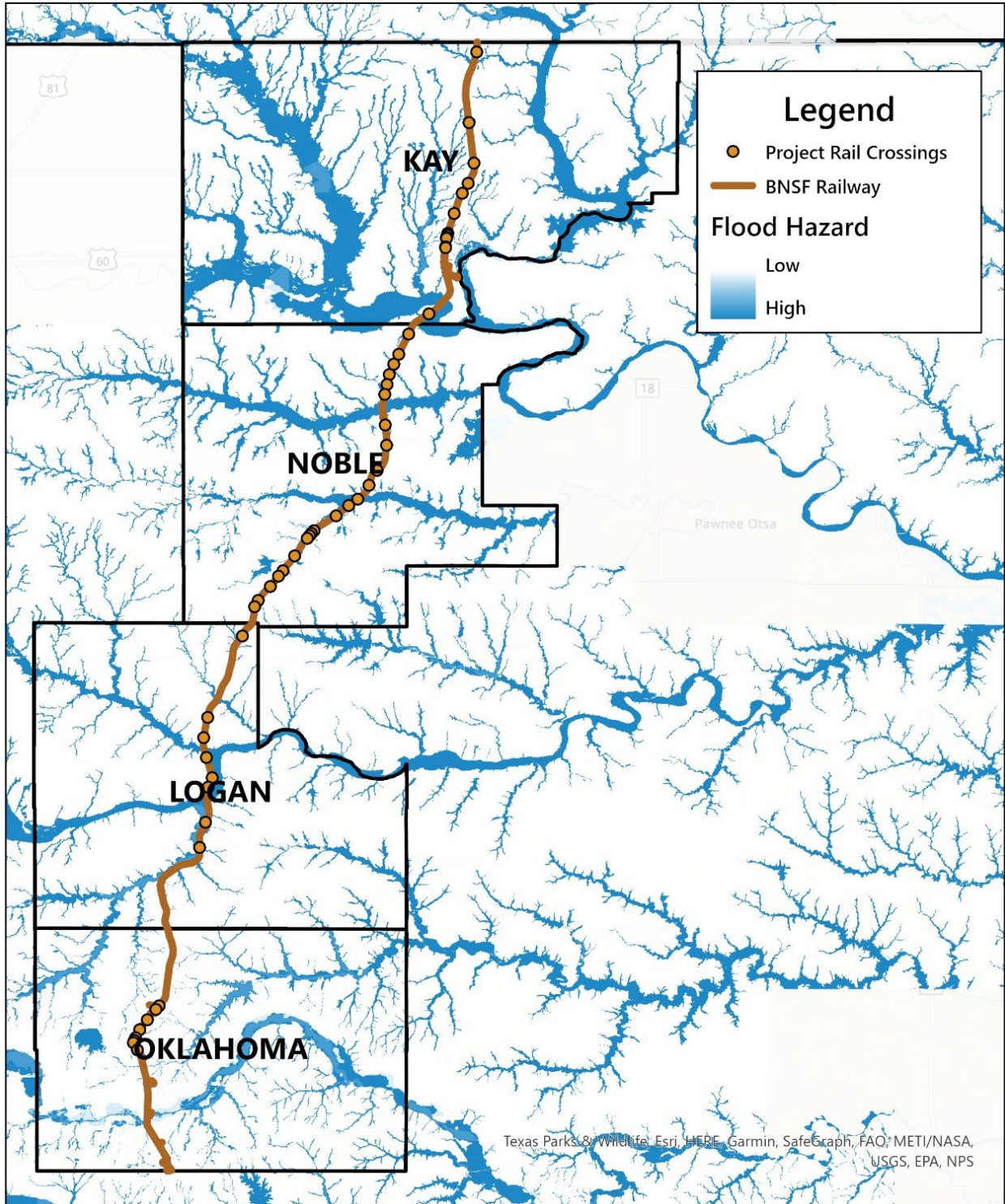
Project Location



Federally Designated Zones



Project Location relative to the 100 Year Floodplain



Appendix B – Benefit Cost Analysis

OVERVIEW OF APPROACH

A Benefit Cost Analysis (BCA) was conducted for the At-Grade Rail Safety Improvements to Reestablish the Heartland Flyer Northern Extension. The BCA follows the most recent 2022 USDOT guidance for BCAs, which provides both methodological guidance and specific values for monetizing several types of benefits. All values from that guidance are in 2020 dollars. All monetary values in the BCA, including costs, are expressed in constant 2020 dollars.

The following general parameters and assumptions have been used in the BCA:

- All costs and benefits are in 2020 dollars. A real discount rate of 7 percent is applied to all costs and benefits.^{xxv}
- A project life cycle of 30 years is assumed with no residual value at the end of the 30-year benefit period.
- The Project construction is assumed to begin in March 2023 and end in 2027. Operational safety benefits are phased throughout the construction period based on percent completion, with full safety benefits beginning in 2028.

PROJECT COSTS

Major project costs are summarized in Table 6. The costs summarized in the table reflect capital improvements such as smoothing the crossing surface of all 52 at-grade crossings, installing flashing-light signals and audible bell sounds at all 52 at-grade crossings, and installing medians at 20 at-grade crossings.

Table 6. Build and No-Build Capital and Major Rehabilitation Cost Summary in Millions of 2020 Dollars

	No-Build	Build
Total Maintenance	NA	NA
Capital Costs*	NA	\$24.3

*Capital costs were deflated from 2022 \$ to 2020 \$. Original cost estimate in 2022 \$ is \$26.5 million.

Source: Oklahoma DOT and Poe & Associates.

CAPITAL COST

The estimated capital cost of the 52 at-grade rail improvements is \$24.3 million in 2020 dollars, which includes the engineering fees and contingency. The capital costs by year are shown in Table 7 and total cost by municipalities are shown in Table 8.

Approximately \$21.8 million of the total capital costs are allocated toward rural areas and \$4.6 million toward urban areas.

Table 7. Capital Costs by Year (2020 Dollars)

	Total	2023	2024	2025	2026	2027
Total Capital Cost	\$24,268,685	\$3,086,806	\$5,534,963	\$5,960,730	\$5,534,963	\$4,151,222
Discounted at 7 Percent	\$18,816,064	\$2,746,026	\$4,601,784	\$4,631,558	\$4,019,376	\$2,817,320

Table 8. Capital Cost by Municipality in 2020 Dollars

City	Cost
Guthrie	\$2,235,274
Marland	\$2,554,598
Mulhall	\$851,533
Newkirk	\$1,383,741
Oklahoma City	\$4,257,664
Orlando	\$425,766
Perry	\$6,280,054
Ponca City	\$4,576,989
Red Rock	\$1,703,066
Total	\$24,268,685

OPERATIONS AND MAINTENANCE COSTS

It is assumed that the Project will not generate any additional operating and maintenance costs above and beyond the existing no-build because the at-grade rail crossing improvements are capital improvements to upgrade existing infrastructure that will not generate any operational changes alone.

PROJECT BENEFITS

MONETIZED BENEFITS INCLUDED IN THE BCA

As no major operational changes are envisioned from improving the 52 at-grade rail crossings, the primary benefit is safety. The safety upgrades and surface improvements for the 52 at-grade rail crossings will support future Amtrak service, allow higher freight and rail speeds, and potentially reduce vehicular delay at crossings. However, without any operational changes, rail speeds will remain the same and therefore freight and logistics costs, vehicular delay, emissions, and other benefits are consistent with the no-build. In summary, there are a range of future benefits that will be unlocked due to this project, but to ensure the analysis demonstrates the independent utility of the capital investment in the at-grade rail crossing, only the safety benefits were captured. Project benefits not captured in this analysis include:

- Future freight and logistics cost savings from future freight rail speed increases;
- Potential time savings for vehicles at crossings; and
- Emissions from reduced vehicle idling at crossings.

CRASH REDUCTIONS

It is anticipated that there may be a significant increase in the potential crashes at these at-grade crossings due to growth in roadway and rail traffic, which illustrates the time-critical need for the safety upgrades being proposed. The installation of new signals with gates and enhanced crossing improvements may decrease the probability of incidents occurring, leading to fewer fatalities, injuries, and unnecessary property loss. In addition, the public safety benefits that result from the Project improvements to rail operations on the Red Rock Subdivision create smoother operations and reduced costs for roadway and railroad operators, which will allow for safer freight and future passenger rail operations.

Of the 52 at-grade rail crossings, 17 of the crossings only have crossbucks, 15 have pedestals with flashing lights, 9 of the crossing locations have flashing lights on pedestals with gates, and 11 of the crossings are fitted with flashing lights, cantilevers and gates. Much of the forementioned safety equipment is out of date and difficult to repair or even find replacement parts when need. Over the last 20 years there have been 8 deaths, 17 injuries, and 23 incidents along this section of the Red Rock subdivision.^{xxvi}

The highway-rail crossings identified in this grant along the Red Rock subdivision see operating train speeds range from 25 to 55 mph. The current average daily traffic counts range from 25,000 vehicles daily in Oklahoma City to 10,000 in Guthrie, 3,200 in Perry and 9,500 in Ponca City, all with traffic volumes expected to continue to increase. Given the growth of vehicular traffic in recent years, the historic crash rates used in this analysis are likely conservative under the no-build scenario as a greater volume of future vehicular traffic will be using these at-grade crossings.

To estimate safety benefits of the improvements, Federal Railroad Administration (FRA) "Highway-Rail Grade Crossing Accident/Incident Reports" for each crossing were obtained from the years 2000-2020 to tabulate the total number of crashes, the severity of the crash (i.e., uninjured, injured, or killed), and the type of warning or safety technology at each crossing. The total crashes by severity and existing safety technology were then divided by 20 years to create annual crash rates for the no-build scenario. The existing no-build safety technology in place for the 52 at-grade crossings are described below in Table 9.

Table 9. At-Grade Crossings by Type, No-Build Scenario

At-Grade Crossing Type (Safety Technology in Place – No-Build)	Crossing Type Count	Share of Crossings
Cantilever, Flashing Lights, & Gates	11	21%
Flashing Lights and Gates	9	17%
Flashing Lights	15	29%
Crossbucks	17	33%
Total	52	100%

Source: FRA

For the build scenario the following crossing improvements are going to be made as shown in Table 10.

Table 10. At-Grade Capital Safety Improvements, Build Scenario

Cross Improvements	Crossings Affected	Share of Crossings
Replace, Repair, Add Flashing Lights	52	100%
Audible Warnings	52	100%
Medians	20	38%

Source: Poe & Associates

For the build scenario, the overall crash rates will decline due to the new safety improvement upgrades to the 52 at-grade crossings. To estimate the change in at-grade crash rates after the improved safety measures are in place, Federal Highway Administration’s (FHWA) Crash Modification Factors (CMFs) by safety technology were selected to adjust future crash rates following the safety implementation.

The Crash Reduction Factors^{xxvii} (CRFs) were then calculated and applied to the existing crash rates to estimate the reduced crash rate for all crossings in the future build scenario. Table 11 summarizes CFRs, crossing distribution, and type of crossings the CFRs are applied to.

Table 11. Crash Rate Reduction Calculations

Investments by Upgrade Type	CRF % Improvement	Share of Crossings	Type of Crossing Applied	CFM ID #
Medians	25.8%	38%	Cantilevers, Flashing Lights, and Gates	8800
Audio and Flashing Lights	0.4%	62%	Crossbucks and Flashing Lights	11058, 11054

Source: FHWA CFM, Poe & Associates, and FRA.

Calculations: EBP.

These CFRs were then applied to the annual no-build crash rates for each type (i.e., uninjured, injured, and killed) to estimate the new crash rates for the 20 crossings receiving median upgrades and the remaining 32 at-grade crossings receiving audio

and flashing light upgrades. The crash rates were then monetized using the most recent factors from the 2022 USDOT guidance for BCAs, which are \$3,900 for no injury (property damage), \$151,100 non-capacitating injury, and \$11.6 million for fatal injuries all in 2020 dollars. These benefits were estimated for a 30-year operational period from 2023 to 2053 and are shown below in Table 12.

Table 12. Monetized Crash Savings 2023-2053 by Severity

Severity	In 2020 Dollars	Discounted at 7 Percent	Crashes Avoided
No Injury (PDO Equivalent)	\$24,114	\$6,715	5.8
Non-Incapacitating Injury (OK Severity 3)	\$738,263	\$205,592	4.5
Fatal	\$34,716,480	\$9,667,865	2.8
Total	\$35,478,857	\$9,880,173	13.1

Calculations: EBP.

The Heartland Flyer At-Grade Rail Safety Improvements will generate significant savings in the human costs of crashes. Over the 30 years, it is estimated that about 13 lives will be saved and that another five serious injury-crashes will be avoided.

PROJECT BENEFITS NOT INCLUDED IN THE BCA

The future benefits estimated in this analysis represent only a sliver of the overall benefits from upgrading the surface and safety systems at these 52 at-grade crossings. While the safety benefits are robust, other benefits like vehicular delay, environmental improvements, and freight logistics costs are important to consider but could not be monetized to demonstrate the independent utility of these necessary improvements. The benefits of this analysis are very conservative since these improvements are necessary steps to enable future quality Amtrak passenger rail service and other potential operational freight improvements whose benefits are not monetized in this BCA.

BCA RESULTS

Based on the assumptions, methodology, and other information presented above, the project yields a Benefit-Cost Ratio of 1.1 and a Net Present Value of \$1,570,000. The results are summarized in Table 13. As described earlier, crash reductions account for the entirety of the benefits estimated for this analysis and are likely on the conservative side as the CRFs for audio and flashing lights appear to be quite small – but certifiable alternative estimates were not available.

Table 13. BCA Results in Thousands of Dollars

Benefit-Cost	Amount
Discounted Initial Capital Costs	\$17,266
Discounted Life Cycle Cost Savings	\$0
Facilities Residual Value	\$0
Total Discounted Costs	\$17,266
Crash Reduction Benefits	\$18,836
Total Discounted Benefits	\$18,836
Benefit Cost Ratio	1.1
Net Present Value	\$1,570

Calculations: EBP

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^{xxiv} Oklahoma State House representatives Ken Luttrell, John Pfeiffer, and Garry Mize

^{xxv} Carbon emissions are discounted at 3%, however, for this analysis emissions benefits were excluded because there were no changes in vehicle delay, speeds, or travel distances.

^{xxvi} Tabulated from Federal Railroad Administration, "Highway-Rail Grade Crossing Accident/Incident Reports" for each crossing. Data was available from 1979, but crashes used in this analysis to develop rates are from the years 2000 through 2020

^{xxvii} Calculated as $(1-CMF)*100$