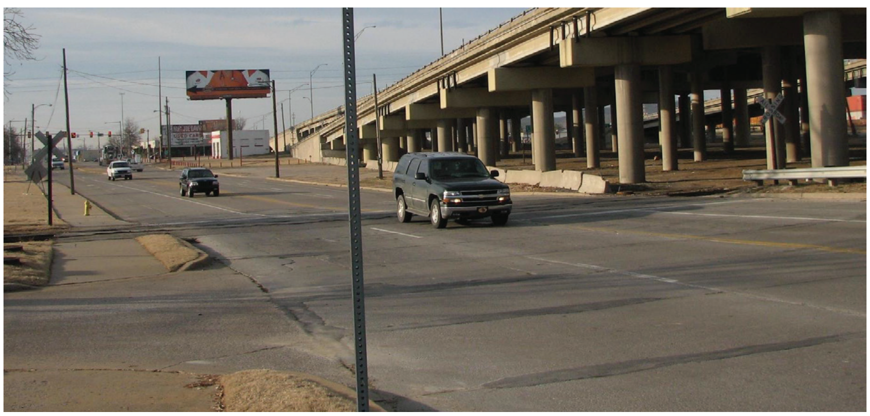
TRANSPORTATION INVESTMENT GENERATING ECONOMIC RECOVERY (TIGER)

DISCRETIONARY GRANT APPLICATION

OKLAHOMA

Oklahoma Urban Railroad Crossing Safety Improvement Project



TIGER

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PROJECT TYPE:
Freight Rail

CFDA # 20.933
FY2015 National Infrastructure Investments

LOCATION:
Oklahoma City metropolitan region and Tulsa metropolitan region, Oklahoma

AREA: Urban

REQUESTED AMOUNT:
$10,048,000

TOTAL PROJECT COST:
$12,560,000

DUNS NUMBER:
824700074

PROJECT WEB ADDRESS:
http://www.okladot.state.ok.us/tiger/index.htm

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Executive Summary

America's railroads are carrying quantities of crude oil that were unimaginable just ten years ago, bringing crude from wells in remote areas across the continent to refineries concentrated in a few locations (e.g., the Gulf Coast). Strikingly, nearly one out of every five carloads of crude oil shipped on America's railroads crosses Oklahoma, and much of that passes through either Oklahoma City or Tulsa. There is every reason to expect the continued growth of rail transportation. Moreover, we must anticipate that the volume of rail shipments for other products, particularly agricultural, will likewise increase in the foreseeable future.

The Sooner State is proud to be one of the Nation's essential rail crossroads. However, the welcomed increase in rail traffic comes with costs as well, and nowhere is this clearer than in Oklahoma City and Tulsa, the State's two largest metropolitan areas. Urban crossings that just a few years ago saw little rail traffic are today experiencing volumes that require more than yesterday's safety measures. The issue is all the more pressing because of the ongoing population growth of these two cities and the associated rise in motor vehicle traffic. Simply put, Oklahoma City and Tulsa need to modernize their key urban rail crossings now so that we may continue to protect our citizens and ensure the swift transit of commerce.

The Oklahoma Department of Transportation is submitting this Oklahoma Urban Railroad Crossing Safety Improvement Project application for TIGER VII funding to the United States Department of Transportation. This project will upgrade and install safety equipment at 23 critical railroad crossings in Oklahoma City and Tulsa. The primary benefit will be accident reduction, with additional benefits including an enhanced state of good repair, improved economic competitiveness, environmental sustainability and livability. We respectfully ask for your consideration.

Project Description

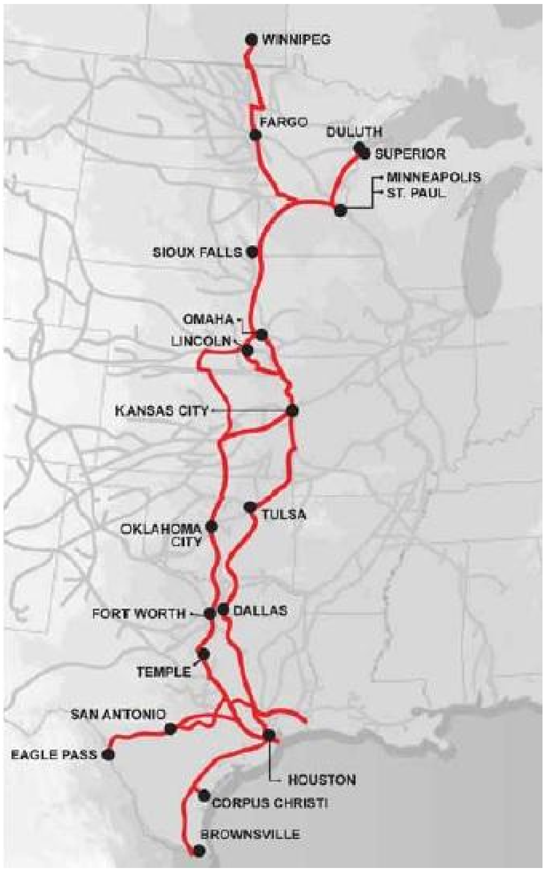
Background

This project will modernize and improve rail safety infrastructure at 23 urban railroad crossings in the Oklahoma City and Tulsa Metro areas that either experience high volumes of unit trains transporting crude oil, or which intersect with highway routes that serve Native American health service centers.

U.S. crude oil production has risen sharply in recent years, with much of the increased output moving by rail. In 2008 U.S. Class I railroads originated 9,500 carloads of crude oil. In 2014 they originated 493,126 carloads of crude oil. Approximately 20% of these carloads passed through Oklahoma last year on Burlington Northern Santa Fe Railway (BNSF), Union Pacific Railroad (UP), Kansas City Southern Railway (KCS) and various shortline railroads throughout the state.

A majority of the increased oil production shipped by rail is coming from North Dakota shale oil fields to refineries in Texas, often passing through Oklahoma. Not only has the number of trains increased significantly, but the trains are longer, with crude currently being shipped in "unit trains" of 100 to 120 carloads. The increased volume and density has increased the number of accidents involving oil trains within both the U.S. and Canada in recent years. Coupled with the high volatility of Bakken Crude, this has had a profound effect on the safety of the general public in the general vicinity of rail corridors. The railroads have taken numerous steps to improve operations, and the federal government is currently in the process of increasing tank car safety requirements.

Figure 1: BNSF Mid-Con Transportation Corridor



Additional factors anticipated to impact rail operations in Oklahoma include the development of the BNSF "Mid-Con Corridor" from Houston to Canada (see Figure 1), which will increase traffic and service on Oklahoma railroads. The Mid-Con Corridor will have two routes traversing the state, one through Oklahoma City and another through Tulsa. These improvements are expected to enhance the flow of oil, as well as other energy and agricultural products southward, and increase the northward movement of intermodal traffic from the Gulf and Mexico.

Road traffic is also increasing in the vicinity of the project crossings. The metropolitan planning organizations (MPOs) for Oklahoma City and Tulsa predict a 33% to 39% increase in population in their respective metropolitan areas, with an associated increase in motor vehicle traffic (cars and trucks) of between 35% and 40% by 2035. In light of these projected increases for both railroad and motor vehicle traffic, The Oklahoma Department of Transportation is submitting this application to improve the safety of our most critical railroad/road crossings while reducing the potential for crude shipment related incidents.

Project Components

The State of Oklahoma, through the Oklahoma Department of Transportation (ODOT) plans to address the growing potential hazards associated with increased train/motor vehicle conflicts by upgrading railroad crossing warning devices, enhancing crossing geometry and addressing sight distance issues to provide safer operations for the traveling public, railroad operators, and residents living near these crossings.

The proposed multi-location, multi-jurisdictional project will upgrade 13 urban railroad crossings in the Oklahoma City metropolitan area (Figure 2), and 10 urban railroad crossings in the Tulsa metropolitan area (Figure 3) with new gated signal installations and other crossing improvements to enhance the safety of motor vehicle and railroad operations. These locations are listed in Figure 4.

Figure 2: Proposed Grade Crossing Improvements in the Oklahoma City Urban Area

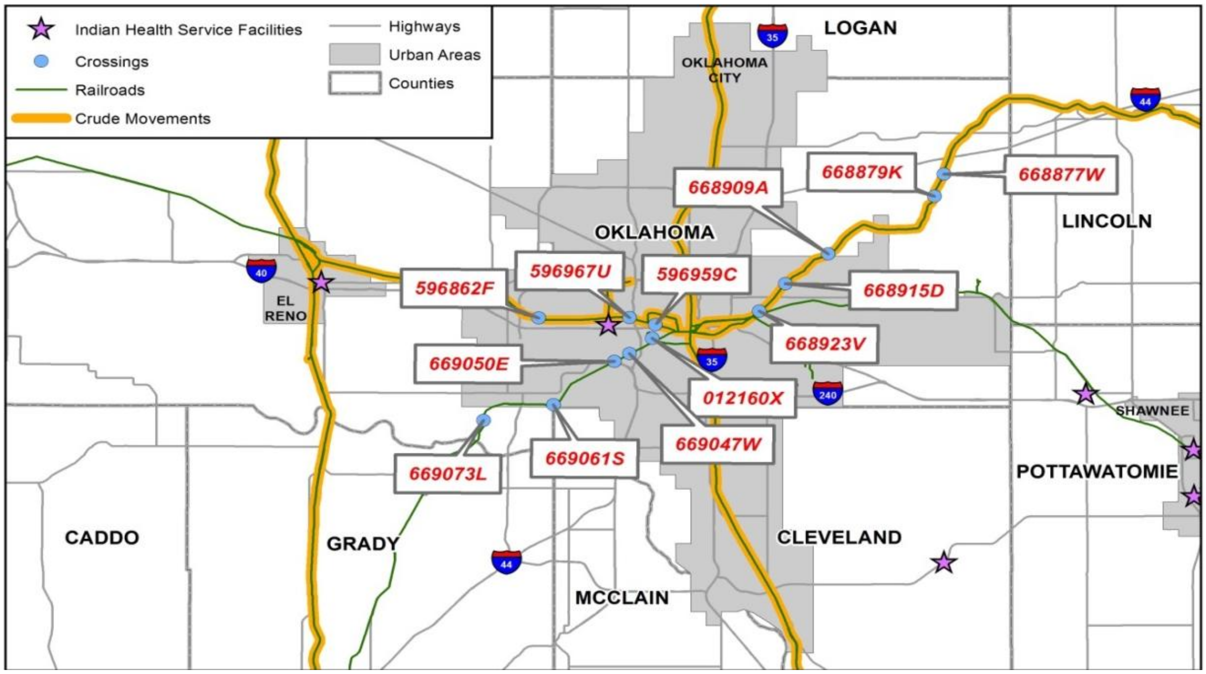


Figure 3: Proposed Grade Crossing Improvements in the Tulsa Urban Area

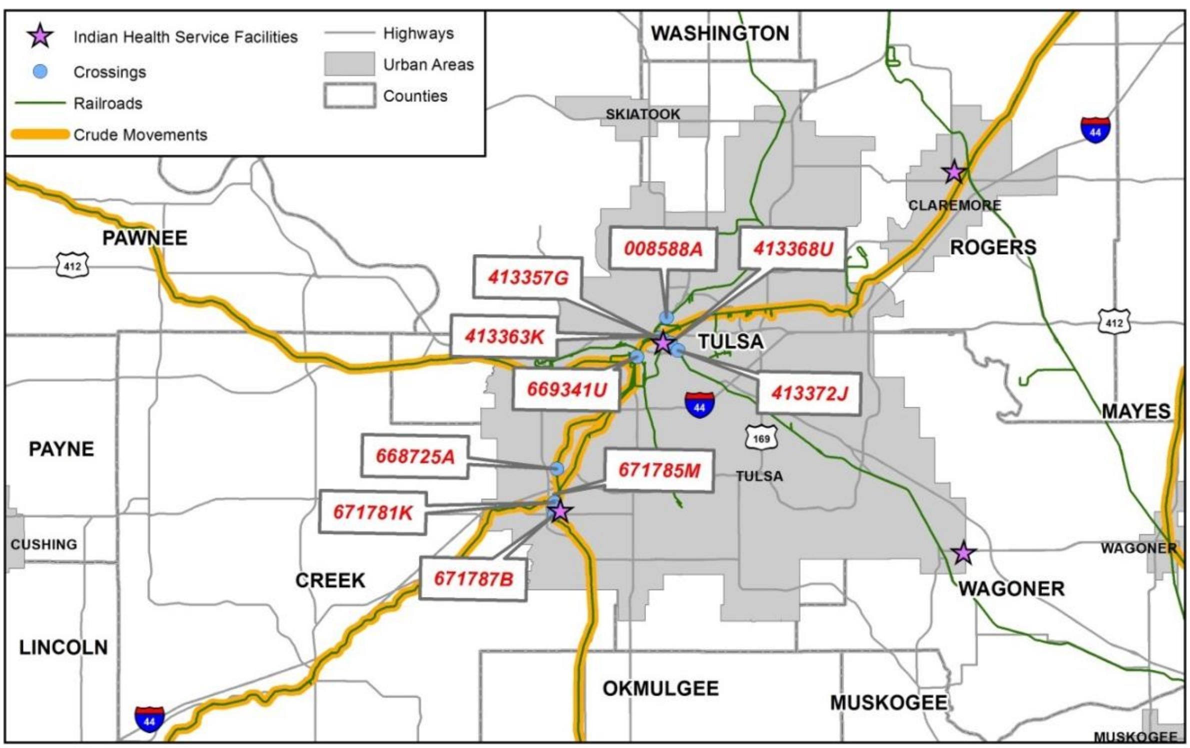


Figure 4: Crossing Improvement Locations and Details

County	# of Xings	DOT#	Railroad	DTI Date	Location	Description	Project Total	R-O-W Requirements
TULSA	1	008588A	SKOL	03/21/10	PINE STREET	Signal & Surface Improvements on the SKOL at Pine St in Tulsa. Sketch on file.	$675,000	No
OKLAHOMA	4	596862F	UP	05/13/14	MORGAN ROAD	Signal & Surface Improvements on the UP at Morgan Road in Oklahoma City. Sketch on file.	$525,000	No
OKLAHOMA	79	668877W	SLWC	05/05/15	NE 150TH SE 33RD	Signal & Surface Improvements on the SLWC at NE 150th in OKC, Oklahoma County. Sketch on file.	$470,000	No
OKLAHOMA	5	669047W	SLWC	05/17/10	PORTLAND AVENUE	Signal & Surface Improvements on the SLWC at Portland Avenue in Oklahoma City, Oklahoma County. Sketch on file.	$620,000	No
OKLAHOMA	6	669050E	SLWC	06/25/98	MERIDIAN AVENUE	Signal & Surface Improvements on the SLWC at Meridian Avenue in Oklahoma City, Oklahoma County. Sketch on file.	$620,000	No
TULSA	7	669341U	BNSF	06/08/10	SOUTHWEST BLVD	Signal & Surface Improvements on the BNSF at Southwest Boulevard in Tulsa. Sketch on file.	$610,000	No
CREEK	8	671785M	BNSF	10/29/13	EAST LINCOLN AVENUE	Signal Improvements on the BNSF at East Lincoln Avenue in Sapulpa, Creek County. Sketch on file.	$475,000	No
CREEK	9	671787B	BNSF	07/28/02	SH-117	Signal & Surface Improvements on the BNSF at SH-117/Taft Street In Sapulpa, Creek County. Sketch on file.	$520,000	No
OKLAHOMA	11	596967U	UP	05/13/14	NORTH PORTLAND AVENUE	Signal & Surface Improvements on the UP at North Portland Avenue in Oklahoma City. Sketch on file.	$485,000	No
TULSA	12	668725A	BNSF	04/22/14	W 91ST STREET	Signal Improvements on the BNSF at West 91st Avenue in Tulsa. Sketch on file.	$470,000	No
OKLAHOMA	166	668879K	SLWC	5/5/2015	TRIPLE X ROAD	Signal & Surface Improvements on the SLWC at Triple X Road in OKC, Oklahoma County. Sketch on file.	$490,000	No
OKLAHOMA	15	669073L	SLWC	04/08/14	S 104TH	Signal & Surface Improvements on the SLWC at SW 104th Street in Oklahoma City. Sketch on file.	$460,000	No
CREEK	16	671781K	BNSF	10/29/13	HOBSON AVENUE	Signal & Surface Improvements on the BNSF at Hobson Ave in Sapulpa, Creek County. Sketch on file.	$690,000	No
TULSA	17	413357G	UP	10/14/14	E 2ND STREET	Signal & Surface Improvements on the UP at East 2nd Street in Tulsa, Tulsa County. Sketch on file.	$485,000	No
TULSA	18	413363K	UP	10/14/14	PEORIA AVENUE	Signal & Surface Improvements on the UP at Peoria Avenue in Tulsa, Tulsa County. Sketch on file.	$510,000	No
TULSA	19	413368U	UP	10/14/14	SOUTH UTICA AVENUE	Signal, Surface and Preemption improvements on the UP at the intersection of South Utica Avenue and South 6th Street in Tulsa. Sketch on file.	$695,000	No
TULSA	20	413372J	UP	10/14/14	SOUTH LEWIS AVENUE	Signal & Surface Improvements on the UP at South Lewis Avenue in Tulsa, Tulsa County. Sketch on file.	$485,000	No
OKLAHOMA	21	596959C	UP	05/13/14	WEST RENO AVENUE	Signal & Surface Improvements on the UP at West Reno in Oklahoma City. Sketch on file.	$690,000	No
OKLAHOMA	22	668909A	SLWC	05/21/10	POST ROAD	Signal & Surface Improvements on the SLWC at Post Road in Oklahoma City. Sketch on file.	$465,000	No
OKLAHOMA	23	668915D	SLWC	04/08/14	NE 36TH STREET	Signal & Surface Improvements on the SLWC at NE 36th Street in Midwest City. Sketch on file.	$460,000	No
OKLAHOMA	24	668923V	SLWC	04/08/14	NE 10TH STREET	Signal & Surface Improvements on the SLWC at N E 10th Street in Oklahoma City. Sketch on file.	$520,000	No
OKLAHOMA	25	669061S	SLWC	12/16/1997	COUNTY LINE ROAD	Signal & Surface Improvements on the SLWC at County Line Road in Oklahoma City, Oklahoma County. Sketch on file.	$445,000	No
OKLAHOMA	26	012160X	SLWC	07/20/04	SW 15TH STREET	Signal & Surface Improvements on the SLWC at SW 15th in Oklahoma City. Sketch on file.	$695,000	No
TOTAL							$12,560,000	

Figure 5: Pine Street on the SKO in Tulsa (DOT#-008588A)

In developing the criteria to establish a methodology to objectively and equitably determine which crossings were most in need of improvement, ODOT utilized the U.S. DOT Accident Prediction Model, and considered characteristics of the existing crossing geometry and additional site distance criteria recently collected for the national initiative to place Stop and/or Yield signs at passive grade crossing locations. None of the 23 crossings are currently equipped with gates, and 7 of the crossings rely solely on passive warning devices (crossbuck signs). Each of these crossings is located either in an area of significant growth with high levels of residential development or within commercial areas experiencing high growth rates. The traffic counts for the selected locations vary from 1,500 to 30,000 annual average daily traffic (AADT).

Each of these crossings will be provided with safety improvements that include the installation of gates to physically separate rail and road traffic. Four of the project crossings, located along the SLWC Sooner Subdivision linking Tulsa and Oklahoma City, will also be equipped with lengthened circuit approaches which have the additional benefit of facilitating train speeds of 10 mph higher than present over approximately 20 miles of track.

Project Timeline

Figure 4 above shows that each crossing location has had a diagnostic team inspection (DTI) and as such is immediately ready to progress. Each location lies within existing railroad right of way and will require no additional environmental documentation to proceed with construction. ODOT, along with our partners at the local public agencies, as well as the railroad operators, are ready to proceed with construction upon notice of award.

The average project timeframe for each crossing improvement is anticipated to be between 18 and 24 months. Overall, the project will be implemented over a three year period (2016-2018). While the projects are ready and able to be constructed in a shorter time-frame, the additional time will be required as a result of coordination between the partners to ensure that construction does not occur in a manner that unduly disrupts roadway or rail traffic within a single corridor or local public agency area.

Project Parties

Oklahoma Department of Transportation (ODOT) is the official state executive agency for administration and implementation of federal and state transportation spending. It is authorized by state statute. ODOT is an eligible grant applicant under TIGER, and will be providing 15% in matching funds and administering the federal funding.

The Burlington Northern Santa Fe Railway (BNSF), Union Pacific Railroad (UP), Kansas City Southern Railway Company (KCS), South Kansas and Oklahoma Railroad (SKO) and Stillwater Central Railroad (SLWC) are the owners of the various crossings considered in this application. These railroads support the improvements discussed in this application and are planning to provide a 5% match of the project costs, as well as administering the construction contracts.

Grant Funds

The project match will be provided predominantly by the Oklahoma Department of Transportation, using state funding as shown in Figure 6 below.

Figure 6: State funding sources

Source	Amount	Share of Project Total
ODOT (State Funding)	$1,884,000	15%
Private Railroads	$628,000	5%
TIGER Request	$10,048,000	80%

Long-Term Outcomes

The project's benefits are derived primarily from the reduction in accident potential at the 23 grade crossings, as well as the reduction in crossing time that would result from improved rail operations. The project provides benefits in each of the five primary benefit areas identified in the TIGER guidelines, as described below.

Safety

Figure 7: Accident reductions

Total Benefit Value		
NPV @7%	$32,993,442	

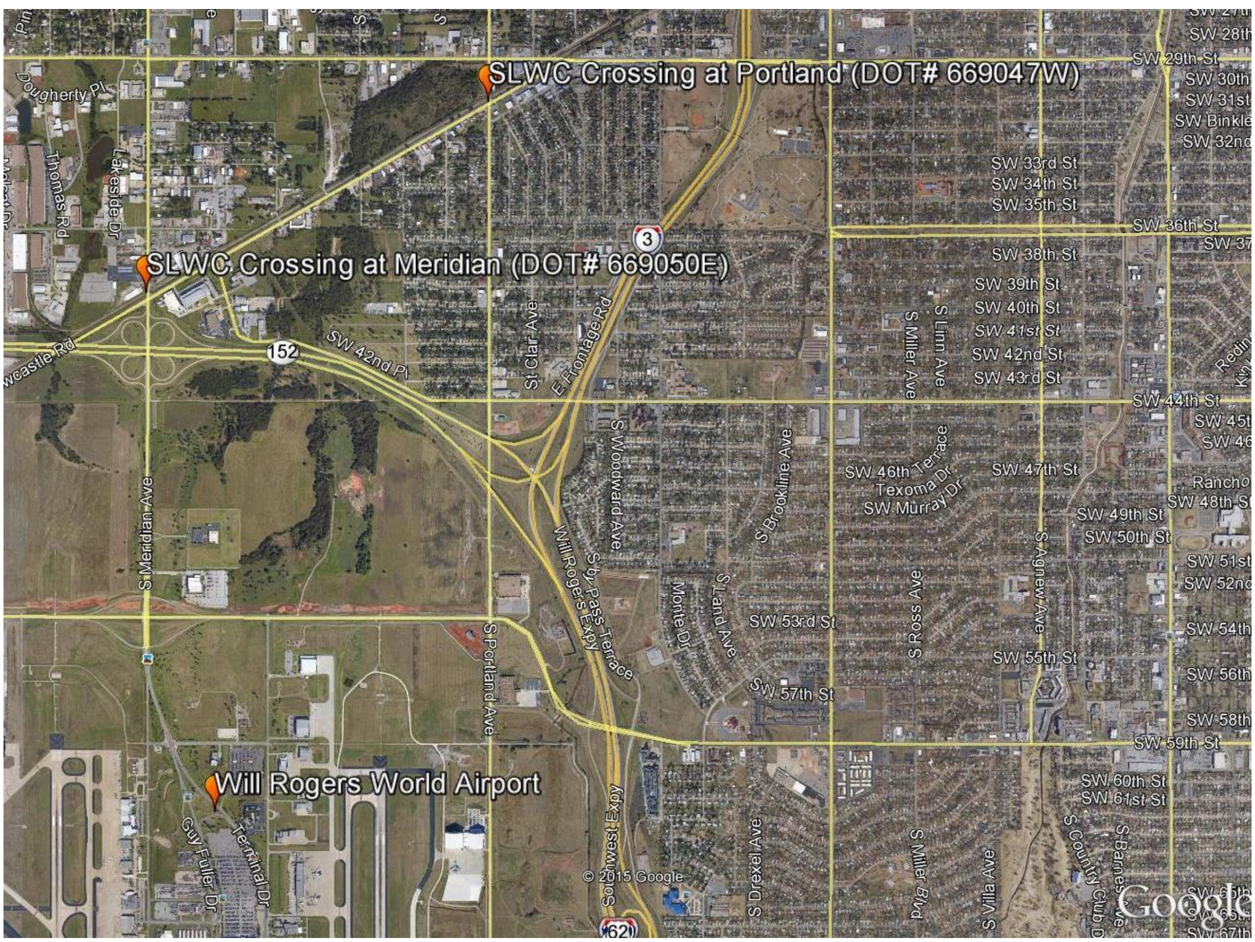
None of the 23 identified crossings in Tulsa and Oklahoma City currently have gates. The improvements included in this application would place gates at each of these crossings, thereby greatly increasing the safety of both the rail and roadway traffic. The benefit to the public and the railroad operators is a reduction in accidents valued at $33 million. The overall benefit/cost ratio for the proposed improvements is 3.79, and the Accident Reduction value represents 86% of the total evaluated benefits.

Two illustrative examples of the need for these safety improvements are the crossings at South Portland (AADT of 19,000) and South Meridian (AADT of 22,000) in Southwest Oklahoma City. These are both located in areas of growing commercial and industrial activity with correspondingly high levels of motor traffic, and increased train traffic serving those areas. These crossings also serve a significant amount of traffic to and from Will Rogers International Airport, as well as commuter traffic for Southwest Oklahoma City and Mustang, regions of the Oklahoma City metroplex that are currently experiencing high population growth. As the photos illustrate, these are major, four-lane urban roads with substantial traffic, and no gate arms. Particularly for unfamiliar drivers coming to and from the airport, this presents an obvious accident hazard.

Figure 8: Portland Avenue on the SLWC in Oklahoma City (DOT#-669047W)

Figure 9: Meridian Avenue on the SLWC in Oklahoma City (DOT#-669050E)

Figure 10: Will Rogers World Airport, Meridian Avenue (DOT#-669050E) & Portland Avenue (DOT#-669047W) Crossings on the SLWC in Oklahoma City



In the Tulsa metropolitan area, one of the project crossings is located on Southwest Boulevard. This road, part of historic Route 66, handles 20,000 cars per day. This crossing location is currently equipped only with passive warning devices (crossbuck signs) and has very limited sight distance, as is clearly shown in Figure 11.

Figure 12 illustrates that this crossing serves Tulsa's largest and busiest refineries. Southwest Boulevard provides access to the refineries, while the rail line serves the nearby BNSF Cherokee Yard, Tulsa's largest rail yard, which has experienced a dramatic increase in rail movements over the last three years. The significant increase in the potential for incidents at this crossing vividly illustrates the time-critical need for the safety upgrades being proposed. If this application is unsuccessful, improvements at this location and others in this project will be delayed under the current grade crossing safety program because of the limited amount of Section 130 Funding available on an annual basis.

Figure 11: Southwest Boulevard on the BNSF in Tulsa (DOT#-669341U)

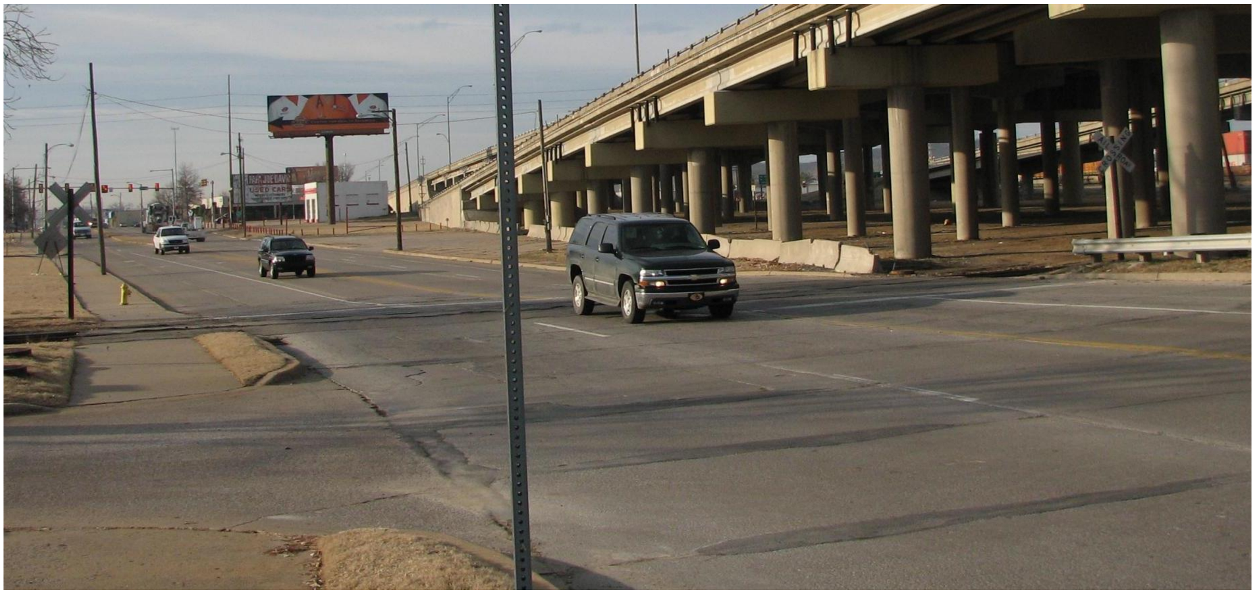
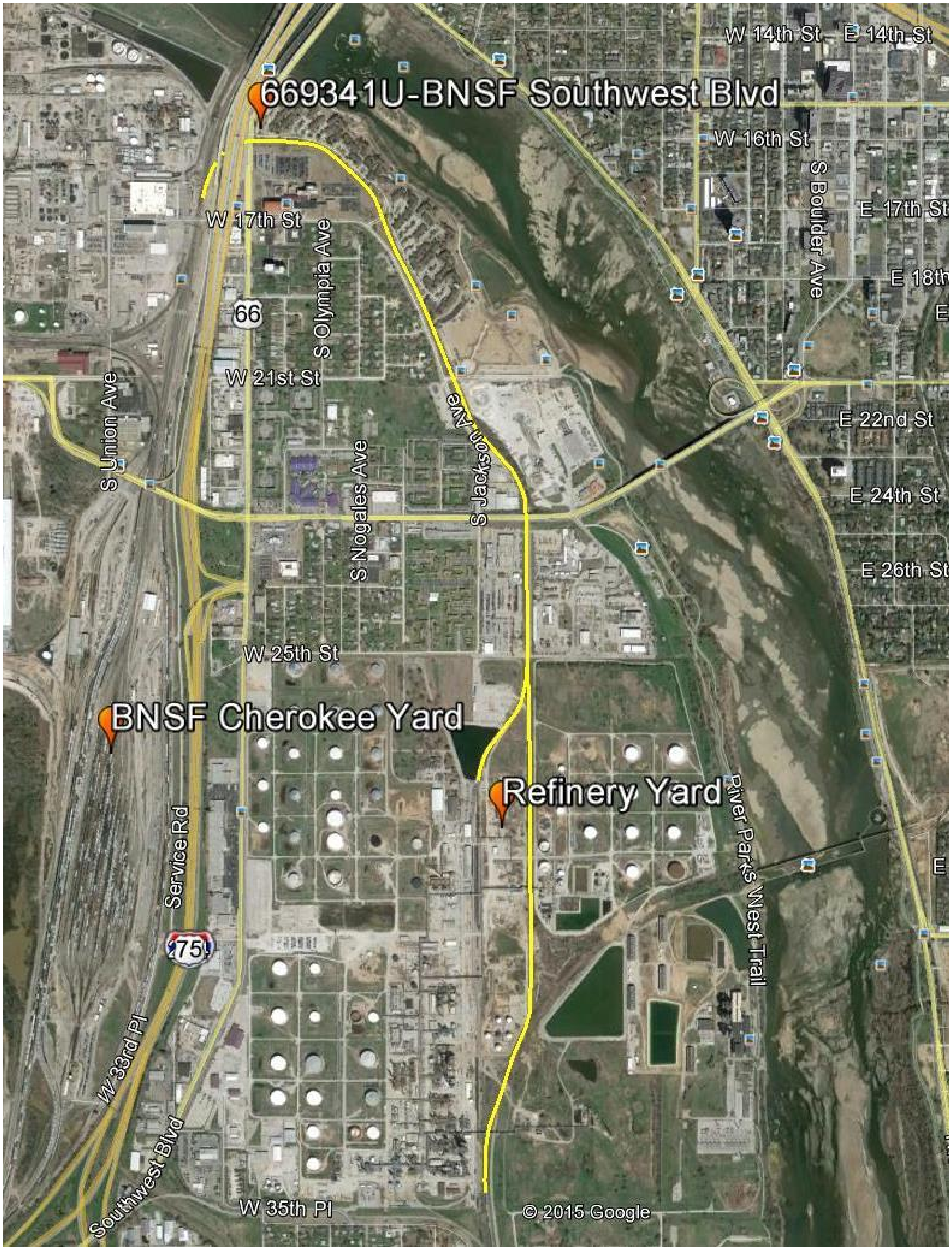


Figure 12: Refinery, Cherokee Yard and Southwest Boulevard Crossing on the BNSF in Tulsa (DOT#-669341U)



The installation of new signals with gates and enhanced crossing improvements will decrease the probability of collisions occurring, leading to fewer fatalities, injuries and unnecessary suffering in the two largest urban areas of Oklahoma. The Indian health centers at 4913 W. Reno, OKC, 550 S. Peoria Avenue Tulsa and 1125 E Cleveland, Supulpa will also benefit from safer road crossings near these centers.

An additional public safety benefit could result from the project's improvement to rail operations. Smoother operations and reduced costs for railroad operators should allow for a shift of freight shipping away from truck modes. Operations that facilitate and further enhance the safe and efficient transport of hazardous cargo via rail will reduce highway congestion and limit the exposure of the general population to oil shipments by placing these volatile shipments in more manageable and confined transportation corridors, compared to truck shipments which travel along multiple highways and other roads.

The grade crossing signal and surfacing improvements may also have further impacts – specifically, there may be a reduced likelihood of train derailment. Train derailments can be devastating, and cargo such as Bakken crude can create a fireball that can destroy the surrounding area, causing massive property damage and loss of life. In July 2013, a 74-car freight train carrying Bakken crude oil derailed in the town of Lac-Mégantic, Québec causing the loss of dozens of lives and destroying a good portion of the downtown area. More recently in May 2015, a crude oil train derailed in Wells County, North Dakota igniting the surrounding area. Luckily no deaths occurred as the accident occurred in a field. As track obstructions are a potential cause for train derailment, it can be reasoned that with accident reduction following the safety improvements at each crossing, the probability of derailment also decreases.

The benefits of this improvement were not quantified as it is unlikely in reality that this benefit will materialize. Train derailments are rarely caused by track obstructions and the probability of a crossing accident causing derailment is a small fraction of a percent. Derailments are unlikely to occur in either the No Build or the Build case, particularly as new reforms are passed to improve the safety of crude oil shipments.

An additional possible impact brought by the crossing improvements is cost savings for railroads in the form of reduced litigation. With certain incidents occurring at the crossings, it is possible that a third party may take legal action against the railroad on grounds of poor maintenance of their corridor, whether or not the railroad is indeed the party at fault. With the addition of gates and more generally the improvement of safety at each crossing, third parties will have fewer grounds on which to press charges against the railroad. If the crossing improvements do in fact reduce litigation, the railroads' cost savings can be invested in expanding operations and potentially reducing shipping prices, bringing economic benefits through reduced shipping costs.

State of Good Repair

Figure 13: Maintenance Costs

Total Benefit Value (Present Value at 7% over the 20-year analysis period)		
Reduced O&M Costs	$33,137	

Improving the 23 crossings will reduce operating and maintenance costs for existing infrastructure that is carrying increasing volumes of crude oil shipments via rail. New signal, gate and surface infrastructure will decrease the expenditures necessary to maintain existing grade crossing warning devices that are currently several years old. The average age of the existing warning devices in urban areas where the initial safety improvements were deployed is over 30 years, and in many cases is approaching 50 years. The age of warning device installations can hinder safe and efficient operation because of the lack of adequate replacement parts to maintain acceptable operations. The BCA estimated the value of maintenance savings at $33,137 over the analysis period.

Economic Competitiveness

Figure 14: Economic competitiveness

Total Benefit Value (Present Value at 7% over the 20-year analysis period)		
Vehicle Travel Time Savings	$4,516,280	
Vehicle Operating Cost Savings	$210,961	
Rail Operating Cost Savings	$448,391	

The travel time savings for both vehicles and rail that will result from this project will have broad-based economic competitiveness benefits.

Travel time savings due to expedited rail throughput

Improvements at grade crossing warning devices will allow for higher average train speeds and reduced transportation time of goods. This brings the benefit of reduced costs for shippers currently using rail to transport goods.

Modal switch from truck to rail

With higher average train speeds, shipper rates may decrease, thereby enhancing the attractiveness of rail as a shipping mode. Benefits of a modal switch from highway to rail generally include reduced costs for shippers, but also result in public benefits such as reduced highway congestion, fewer vehicle accidents, reductions in public exposure to hazardous material releases from trucks, decreased highway maintenance costs and the enhanced ability to define transportation corridors with a greater need for emergency service planning and coordination during catastrophic events.

Travel time savings due to reduced automobile delays

Higher average train speeds will lead to decreased automobile wait times at the crossings for passing trains, and increased accessibility of amenities in urban areas. Reduced time wasted in traffic, whether for commuting, personal travel or business travel, increases the economic competitiveness of an area.

Environmental sustainability

Figure 15: Environmental sustainability

Total Benefit Value (Present Value at 7% over the 20-year analysis period)		
Reduced Rail Emissions	$1,082,160	
Reduced Vehicle Emissions	$54,379	

The project will result in reduced emissions though improved rail speeds, allowing for improved diesel fuel efficiencies during the operation of locomotives as well as through the reduction of automobile delay at the crossings. Reductions in delay at the crossings will reduce the amount of time motor vehicles set idling at grade crossings, resulting in a corresponding reduction of automobile emissions.

Figure 16: Reduction of Emissions in 2019 (short tons)

	Rail	Road	Total
CO_2	185.28	50.37	235.65
NOx	4.88	0.12	5.00
PM	0.18	0.002	0.18
VOC	-	0.06	0.06
Total	190.33	50.56	240.89

Livability

Figure 17: Livability

Total Benefit Value (Present Value at 7% over the 20-year analysis period)		
Road Vehicle Travel Time Savings	$4,516,280	
Vehicle Operating Cost Savings	$210,961	

The project will provide substantial livability benefits in these two metropolitan areas. The project will reduce the risk of accidents and reduce vehicle emissions, providing important safety and environmental benefits, particularly in the lower-income residential areas often sited near railroads. The project will also decrease the response times for emergency vehicles.

Figure 18: Livability Measures for the First Year of Benefits

	2019 (No Build)	2019 (Build)	Change
Persons delayed by passing trains (#)	4,451,674	4,240,484	▼ 211,190
Time spent idle at crossing (person-hrs)	265,278	240,705	▼ 24,573
Discounted value of idle time (2014 $)	2,827,350	2,565,451	▼ 261,900
Discounted value of vehicle O&M due to idling (2014 $)	146,635	133,052	▼ 13,583

Further, reduced idling at crossings will result in less money spent by drivers on fuel and O&M expenditures (less wear and tear on motor vehicle engines and brakes), as well as reduced travel times, providing benefits throughout the community. The estimated benefits for the first full year of the project (2019) are shown in Figure 18. Project benefits will increase in the years to follow, as population, road traffic and rail traffic continue to grow in Tulsa and Oklahoma City.

Project Readiness

This project is truly "ready to go," as no new right-of-way is required for any of the 23 grade crossing improvements. No additional environmental analysis, design, or permitting/approval is needed and there are no issues that will slow the advancement of this project.

While the project schedule shows a start date in 2016, this date was chosen simply based on the assumption that U.S. DOT commits TIGER funds late in 2015. Should TIGER awards move forward at an expedited pace, so too can this project be expedited, with the procurement process for some locations able to start immediately upon notice of award. While the project has been conservatively estimated to take three years to implement, with all of the crossing improvements being operational as of January 1, 2019, it is likely that many if not all of the crossing improvements will be serviceable by 2018 or sooner.

Innovation

Our specific project is not expected to result in any technological innovation, but it will result in the means to move crude oil and other volatile commodities more efficiently and safely. With fewer crashes, fewer resources need to be dedicated to accident management activities, and more resources can to be allocated to innovative transportation projects in the State of Oklahoma.

Partnerships and Disciplinary Integration

The State of Oklahoma is working together with the cities of Oklahoma City and Tulsa, the Association of Central Oklahoma Governments, the Indian Nations Council of Governments, federal government, and private railroads to make this project a model for cooperative public-private infrastructure efforts in America. Oklahoma has a long and rich history when it comes to energy transportation and safety, and this project will enhance the productivity and efficiency of both these sectors.

Our TIGER application website (www.okladot.state.ok.us/tiger/index.htm) includes letters of support from:

- Indian Nations Council of Governments (the Tulsa MPO)
- Association of Central Oklahoma Governments (the Oklahoma City MPO)
- Burlington Northern Santa Fe Railway
- Union Pacific Railroad
- Stillwater Central Railroad

Results of the Benefit Cost Analysis

A formal benefit-cost analysis (BCA) was conducted for this project using best practices for BCA in transportation planning, and reflecting all TIGER VII grant application guidelines. It is important to note that a formal BCA is not a comprehensive measure of a project's total economic impact, as many benefits cannot be readily quantified or occur under conditions of uncertainty.

The BCA for this project covers all five of the primary long-term impact areas identified in the TIGER VII grant application guidelines:

- Safety: With the addition of warning devices, including new gates at all crossings, driver awareness of oncoming trains will improve and accidents will become less frequent. Fatalities, injuries, and property damage will all be reduced if this project proceeds.
- Economic Competitiveness: As the crossing infrastructure is improved to facilitate higher train speeds along the Sooner Subdivision, there will be a benefit to local, regional, and national economic competitiveness as rail shipping costs are reduced. This allows oil shippers, farmers and industry to improve their logistics and grow their capabilities.
- Environmental Sustainability: The project will result in reduced emissions because the Sooner Subdivision improvements have a double benefit. Not only do these improvements allow for the optimization of train speeds, thereby reducing train emissions, but vehicle idling at the crossings is also reduced, decreasing auto emissions.
- Quality of Life: With reduced accidents and reduced vehicle wait times for passing trains, travel times are reduced. This is particularly important for individuals that require access to health facilities and other important amenities located on the opposite side of the crossing.
- State of Good Repair: With the surface improvements at the crossings, the overall quality of the existing infrastructure will improve. It is expected that fewer critical repairs will be needed in the future, allowing maintenance spending to be directed towards maintaining the state of good repair on other components of the railroads.

The computed benefit-cost ratio for the grade crossing project is estimated at 3.79 using a seven percent discount rate. The BCA compares the capital construction costs, along with the decrease in operating and maintenance costs, with the quantifiable benefits of the project for 20 years following construction.

The quantified project benefits are:

1. Accident reduction
2. Rail operating cost savings
3. Road vehicle travel time savings
4. Road vehicle operating cost savings
5. Rail emissions reduction
6. Road vehicle emissions reduction

Discount Rates

Federal TIGER VII guidance recommends applicants discount future benefits and costs to present values using a real discount rate of seven percent to represent the opportunity cost of money in the private sector, and a three percent discount rate when the funds dedicated to the project would be other public expenditures. This is largely the case for this project, which is five percent privately funded. The benefit-cost ratio at three percent is 5.69.

The project benefits are presented in Figure 19 using the more conservative seven percent discount rate to demonstrate that the project's long term benefits clearly outweigh the project's costs.

Figure 19: Benefit Cost Analysis Summary (in 2014 $)

Category	Present Value at 7%
Evaluated Costs	
Capital costs	$10,405,629
Maintenance costs	($33,137) [1]
Total Evaluated Costs	$10,372,493
Evaluated Benefits	
Accident reduction	$32,993,442
Rail operating cost savings	$448,391
Road vehicle travel time savings	$4,516,280
Road vehicle operating cost savings	$210,961
Rail emissions reduction	$1,082,160
Road vehicle emissions reduction	$54,379
Total Evaluated Benefits	$39,305,613
Net Present Value	$28,933,120
BENEFIT/COST RATIO	3.79

[1] Maintenance costs are negative as the project will result in net cost savings

Cost Benefit Results

Figure 19 summarizes the project's cost and the quantifiable benefits in terms of present value. Detailed analysis of costs and benefits, including data sources and methodology descriptions, are available on the project website in the BCA Technical Memo. As shown in the table, the present value of the project's capital and maintenance costs are $10.4 million. The benefits have an estimated present value of $39.3 million over the 20-year period, yielding the 3.79 benefit-cost ratio.

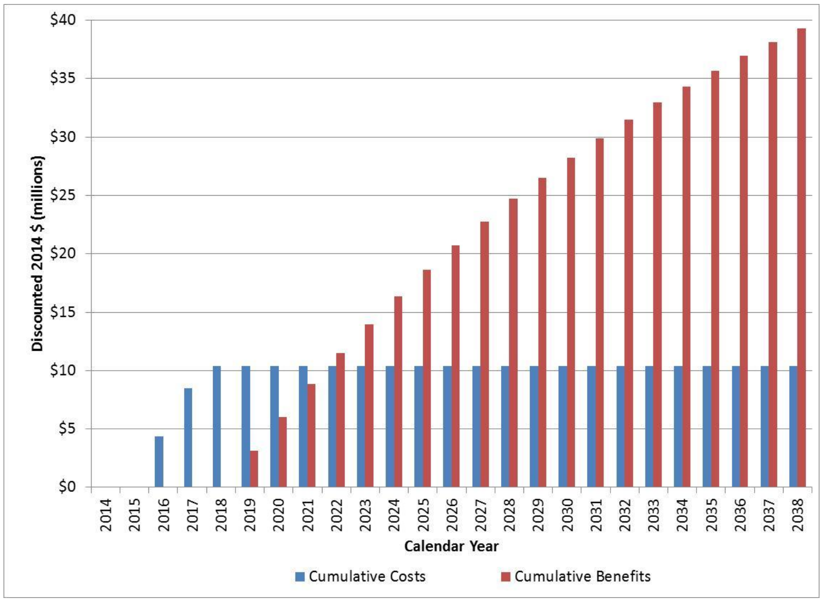
While the BCA assesses the project for a 20-year period, the project's assessed benefits are projected to cover the total project costs within 4 years of operation (before the end of 2022). This is illustrated in Figure 20.

Benefit Calculation Assumptions

The Benefit Cost Analysis is based on the difference between an assumed Build scenario and an assumed No Build scenario, both of which were developed conservatively.

Under the No Build scenario, routine maintenance expenditures are assumed to continue at $2,500 to $3,000 per year for each grade crossing with existing active warning devices, and at $50 per year for each grade crossing with passive warning devices. No major refurbishment or replacement of the existing infrastructure is anticipated, and it is expected that none of the crossings will be subject to grade separation before 2038.

Figure 20: Cumulative Benefits and Costs in 2014 Dollars (Discounted at 7 percent)



The analysis assumes that rail will continue to be an important mode of freight transportation within and through Oklahoma. For example, in the event new pipeline capacity is created to connect the Bakken region to its markets, it is assumed freed rail capacity through Oklahoma will be used to transport other commodities. Road and rail traffic are forecast to grow at a rate of 2 percent per year.

In the Build scenario, the same assumptions with respect to road and rail traffic growth are used. In addition, the proposed signaling and surfacing improvements will proceed at the 23 urban grade crossings as detailed in Figure 4. Crossings along the Sooner Subdivision will also be equipped with lengthened circuit approaches to facilitate train speeds of 10 mph higher than present, although there will be no impact to train volumes beyond what is assumed in the No Build scenario.

Capital expenditures and construction will take place during a three year period beginning in 2016, with the improvements yielding their first full year of benefits in 2019. Figure 21 illustrates the impact of the Build scenario on some key factors driving the benefit evaluation.

Figure 21: Project Impacts for Grade Crossing Improvements, Cumulative from 2019-2038 (inclusive)

Category	Quantity
Road vehicle travel time (person-hours)	▼ 735,326
Road vehicle travel time (vehicle-hours)	▼ 506,007
Rail travel time (train-hours)	▼ 4,605
Tons of rail vehicle emissions (tons of CO_2, NOx, and PM emitted)	▼ 3,880
Tons of road vehicle emissions (tons of CO_2, NOx, PM, and VOC emitted)	▼ 1,513
Total accidents (number)	▼ 67
Total fatalities (number)	▼ 8

Accident Reduction

With improved warning devices at each crossing, the frequency of accidents will decrease. The 23 crossings are presently equipped with passive devices and some have flashing lights, but all lack gates. These crossing characteristics served as inputs to the U.S. DOT Accident Prediction Model (APM), which was used to forecast accident frequency in the No Build scenario. Other inputs to the model include road and rail traffic volumes, and historical accident frequency as per the FRA Accident Reports for each crossing. As an output of the APM, the number of accidents in the base year (2014) was modeled as 5.08 accidents, gradually growing in line with road and rail traffic to 6.45 accidents in the final forecast year, 2038.

The APM was run a second time for the Build scenario. The key variable impacting the APM's outputs was the addition of gates at all crossings, which are proven to reduce the anticipated frequency of accidents. The Build scenario models 2.28 accidents in the first year of operation, 2019, which also grows slowly year over year to 2.78 accidents in 2038. These accident rates are less than half of the rates in the No Build scenario.

The TIGER BCA Resource Guide (2015) was used to monetize these forecasted accident rates. The present value of accident reduction is $33.0 million, which represents 84% of the total monetized benefits in this analysis. This dollar value is driven primarily by a reduction in fatalities, which makes up approximately 12% of the total accidents, a figure consistent with the accident counts reported by the Bureau of Transportation Statistics. As the safety engineering of vehicles continues to improve, it is possible that the share of fatalities will reduce in the future, although this condition applies to both the Build and No Build scenarios and therefore has minimal impact on the analysis.

Rail Operating Cost Savings

The hours of rail operation saved due to the 10 mph speed increases along the Sooner Subdivision translates into a reduction of rail operating costs. The benefits are fourfold – with fewer hours of service, employee wages, fuel expenditures, and railcar rental hourly costs all decrease and locomotives are utilized more efficiently. With reduced rail operating costs, railroads can either use the savings to reinvest in their business or pass on the benefit to their customers by offering lower prices.

The total hours saved was forecasted at 4,605 hours over the 20 year period. This results in a conservative estimate of rail operating cost savings at $448,000 using an assumed $251.75 per train-hour of operation, derived from a 2008 study by RailTEC at the University of Illinois at Urbana-Champaign. Other sources suggest hourly costs are on the order of $1,000 per train-hour. Given that this corridor services primarily bulk-goods trains, the smaller value seems more appropriate.

Road Vehicle Travel Time Savings

With improved train speeds, there is decreased blockage time at the crossing and road users realize travel time savings. The impact of this benefit varies from user to use. Many users make their trips outside of the scheduled times of passing trains and are unaffected, while others are delayed multiple times per day. It is the aggregated benefit for all users that is considered in the BCA.

Based on train speed and frequency, along with the lead/lag time associated with each passing train, the total change in blockage time per train is estimated at a little over 20 seconds per passing train. Although this number is relatively small, when considering the number of trains and road users that are blocked over a 20-year period, and that there are four urban crossings with lengthened circuit approaches, the result is 506,007 vehicle-hours of travel time saved. Following U.S. DOT and BTS data regarding passengers per vehicle and vehicles per mode (automobile, truck, and bus), this travel time savings translates into 735,326 person hours.

Based on the total person-hours saved along with an assumed dollar value of time per the TIGER BCA Resource Guide, the present value of travel time savings benefits was calculated to be $4.5 million. This benefit is the second-largest in terms of dollar value and accounts for over half of the benefits unrelated to accident reduction.

Road Vehicle Operating Cost Savings

An additional benefit of reduced vehicle-hours is reduced wear and tear on the engine, reduced fuel expenses, and more generally reduced vehicle operating costs. Reduced vehicle expenses bring economic benefits by way of freeing up more personal and corporate income for spending elsewhere. Vehicle users also have the ability to choose between more frequent vehicle use or less frequent fueling and servicing trips. In the case of the latter, there is an additional benefit of freed up personal time.

The 506,007 vehicle-hours of travel time saved were multiplied by all-inclusive hourly idling cost values found on the FHWA website to arrive at a present value of $211 thousand in benefits. While this value is relatively low compared to accident reduction it still bears significance in absolute terms. Similar to the road vehicle travel time savings benefit, many road users will individually realize minimal or no benefits, but collectively and over the 20-year analysis period, the benefits are noticeable.

Rail Emissions Reduction

With the train-hours saved from quicker speeds through the Sooner Subdivision in the Build scenario, there is an additional benefit of reduced rail emissions. Although the miles traveled are equal in the Build and No Build scenarios, train engineers in the Build scenario are able to operate at more optimal and consistent speeds throughout the corridor, and therefore utilize diesel fuel more efficiently. This benefit aligns closely with the long-term TIGER criteria of environmental sustainability, as fewer harmful pollutants are generated causing less strain on the ecosystem and on resident health and well-being.

A 2015 study by RailTEC at the University of Illinois at Urbana-Champaign describes train delays as costing $25.35, $103.02, and $175.42 per locomotive-hour for CO_2, NOx, and particulate matter emissions, respectively. These assumptions were used to arrive at a present value of $1.1 million in benefits for reduced emissions, making this the third-largest monetized benefit.

Road Vehicle Emissions Reduction

Similar to road vehicle operating costs, road vehicle emissions are also reduced as a result of the vehicle-hour savings from lesser idling. In this case it is gasoline combustion that is the primary source of emissions. Diesel combustion is secondary. The societal benefits are similar to those of rail emissions –

with fewer pollutants entering the atmosphere, there is a positive impact on the ecosystem and on resident health and well-being.

Road vehicle emissions were modeled slightly differently than rail emissions, which was necessary as the source of the benefit is reduced idling rather than optimized speed and fluidity. In this case, idling emissions rates in grams per hour were determined for CO_2, NOx, particulate matter, and volatile organic compounds from the EPA for automobiles and diesel-powered trucks and buses. These emissions rates were multiplied by the change in vehicle-hours and converted to short tons. It was determined that 1,513 tons of emissions will be reduced over the 20-year horizon, the majority of which are CO_2 emissions. This translates into a present value of $54 thousand for the benefit of reduced road vehicle emissions.

Other Non-Quantifiable Costs and Benefits

There are a number of other project benefits as well as costs that could not be reasonably quantified for the benefit-cost analysis. Among these were:

- Travel time savings resulting from fewer accidents: While accident reduction was monetized as was travel time savings resulting from reduced idling, there are also travel time savings due to fewer accidents as there will be less frequent lane closures and lane blockages. This benefit was not monetized as it is difficult to quantify the number of hours that would be saved. The standard deviation among quantity and duration of lane blockages per accident is very high, even among accidents of the same AIS level. There is also a large variance in road users' preferences as to whether or not to alter their route to escape any closures or congestion.
- Improved community connectivity: With fewer road blockages and smaller travel times, residents have improved access to amenities that are located on the opposite side of the crossing from which they live. This is more relevant in rural areas where, for example, access to Native American health facilities is of particular importance, but there is some benefit in urban settings as well.
- Improved emergency response times: With fewer blockages and quicker train speeds comes the benefit of improved emergency response times. While a 20 second reduction in idling time at a crossing may seem minimal, it could be the difference between life and death for an individual located on the opposite side of the crossing from the nearest emergency vehicle.
- Modal shift from trucking to rail: With the reduction in rail operating costs along the Sooner Subdivision, there are two possible outcomes – either the railroads will invest the cost savings in the business and grow their operations more quickly, or they will pass on the cost savings to the customers. The ultimate outcome is increased rail capacity, reduced shipper fees, or both. These outcomes could entice shipping companies to re-evaluate their choice mode of transport and it is possible that a shift from road to rail would result.
- Noise reduction: As a result of faster train speeds at the Sooner Subdivision crossings, there will be less road vehicle idling. There are public benefits in the form of noise reduction particularly as it relates to trucks, which can be noisy when idling. In addition, with a smaller probability of being

blocked by a passing train, it is expected that trucks will less frequently apply their engine brakes to come to a full stop at the crossings.

- Increased pedestrians and bicycles: Another possible outcome resulting from less congestion, fewer emissions, fewer accidents, and reduced noise is a greater incentive for walking and bicycling at and around the crossings. This brings health benefits in the form of increased pedestrian and bike miles, while likely further reducing automobile emissions.

Job Impacts

Introduction

The surfacing and signaling improvements of the Build scenario are expected to create near-term economic impacts for the State of Oklahoma. Economic impacts are driven by an increase in construction spending, with construction funds originating from outside the local economy being of particular significance (e.g., federal grant funding). These project expenditures would generate a short term increase in demand for engineering and technical services, as well as construction-related labor and materials.

To quantify the near-term economic impacts of this project, this analysis utilized an input-output modeling framework based on multipliers from MIG Inc., the developers of IMPLAN.[1] U.S. National factors were selected for the economic profile and multiplier set to enable simple comparison between projects for the purposes of TIGER grant funding. However, it is understood that local regions will generate employment and economic output at rates that may vary from the national average.

Two types of economic impacts are identified for the purpose of this analysis.

- Direct/Indirect Impacts: Direct impacts represent new spending, hiring, and production by civil engineering construction companies to accommodate the demand for resources in order to complete the project. Indirect impacts result from the quantity of inter-industry purchases necessary to support the increase in production from the construction industry experiencing new demand for its goods and services. All industries that produce goods and services consumed by the construction industry will also increase production and, if necessary, hire new workers to meet the additional demand.
- Induced Impacts: Induced impacts stem from the re-spending of wages and salaries earned by workers benefitting from the increase in direct and indirect expenditure activity within an area. For example, if an increase in construction demand leads to new employment and earnings in a set of industries, these workers will spend some portion of their increased earnings at local retail shops, restaurants, and other places of commerce and thereby further stimulate economic activity.

[1] http://implan.com/

Costs

The Build scenario forecasts total capital costs of $12.560 million (2014 $). The spending schedule for the project is provided below in Figure 22.

Figure 22: Capital Costs for Project (2014 $ millions)

2016	2017	2018	Total
5.024	5.024	2.512	12.560

Results

A summary of the short term economic impacts are shown in Figure 23.

Figure 23: Summary of Near-Term Economic Impacts

Direct + Indirect Impacts	
Employment (Person-Year Jobs)	124 jobs
Earnings (2014 $)	$7,549,656
Economic Output (2014 $)	$24,045,623
Induced Impacts	
Employment (Person-Year Jobs)	70 jobs
Earnings (2014 $)	$3,507,554
Economic Output (2014 $)	$10,735,159
Total Impacts	
Employment (Person-Year Jobs)	194 jobs
Earnings (2014 $)	$11,057,210
Economic Output (2014 $)	$34,780,782

Assuming the grant is awarded to complete construction funding, the crossing improvements project is expected to generate economic impacts for the region beginning in 2019 at the latest. In total, the project is projected to create employment of 194 person-year jobs, including 124 direct/indirect person-year jobs. A person-year is one person working full time for one year. As an example, 20 person years can represent 20 people each working one year, or ten people working for two years each. Figure 24 shows the number of persons directly and indirectly employed by the project per year.

Figure 24: Direct and Indirect Jobs by Year

	2016	2017	2018
Direct and Indirect Jobs	49	49	25
Induced Jobs	28	28	14

The project will generate an estimated average of 65 direct, indirect, and induced jobs per year over 3 years. This includes 41 direct and indirect jobs, and 23 induced jobs. Figure 25 shows the profile of annual employment generated by the project's expenditures.

Figure 25: Annual Employment During Construction

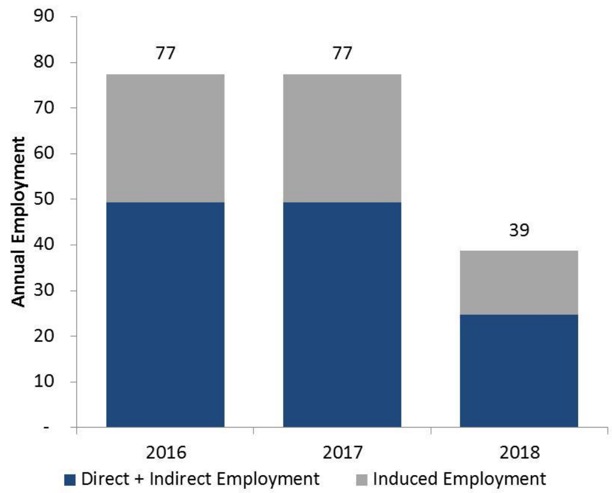
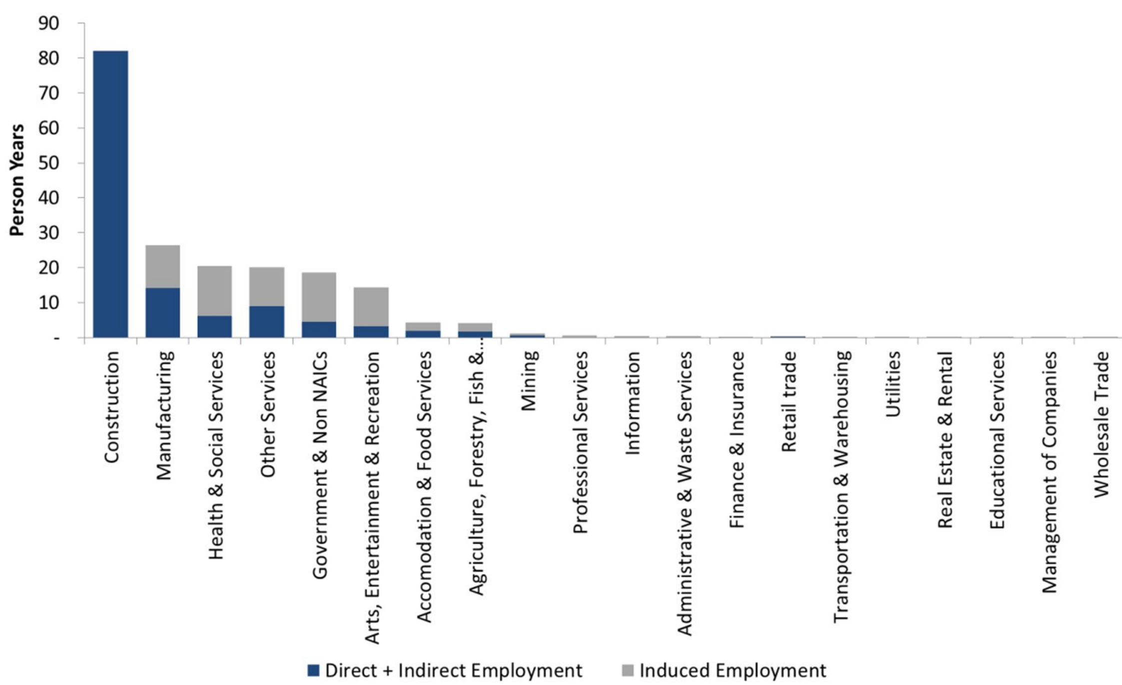


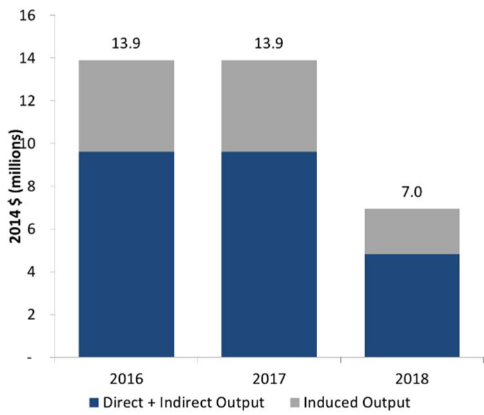
Figure 26 shows the breakdown of jobs created by industry and type of impact. As expected, the civil construction sector is estimated to receive the largest increase in employment from the project (82 person-years), almost all of which are direct jobs created. The other industries that will see the largest number of jobs created include manufacturing (26 person-year jobs), healthcare and social services (21 person-year jobs), other services (20 person-year jobs), government (19 person-year jobs), and arts, entertainment, and recreation (14 person-year jobs).

Figure 26: Breakdown of Job Creation by Industry Sector and Type of Impact



The amount of short term economic activity generated by the project is shown in Figure 27. In total, the project will generate $34.78 million in gross real economic output or activity (measured in 2014 dollars), with $13.91 million dollars of economic output generated in each of 2016 and 2017, and $6.96 million generated in 2018.

Figure 27: Breakdown of the Value of Economic Output/Activity Generated by the Project



Changes since Pre-Application Submission

The Pre-Application specified a total cost of the urban rail crossing safety improvements at $12,390,000. These costs were based on 2014 costs. In preparing the application we updated the urban crossing safety improvement cost estimates to $12,560,000. This increased the TIGER request to $10,048,000 and the Non-Federal Match to $2,512,000.

Wage Rate Certification

OKLAHOMA DEPARTMENT OF TRANSPORTATION

As required in the Notice of Funding Availability for the Department of Transportation's National Infrastructure Investments (Tiger FY 2015) Under the Full Year Continuing Appropriations, 2015: The Oklahoma Department of Transportation states and assures that I will comply with the requirements of Subchapter IV of Chapter 31 of Title 40 United State Code, the federal Wage requirements.

Mike Patterson, Executive Director
Oklahoma Department of Transportation

6/4/15

Date