

**TIGER/BUILD Discretionary Grant Program
Performance Measurement Biennial Report**

2018

**US Department of Transportation
Office of the Undersecretary of Transportation for Policy**

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Executive Summary

Following a Congressional appropriation of \$1.5 billion in 2009, the Department of Transportation (DOT) developed the Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grants Program to provide funding for capital investments to improve the nation's highway, bridge, public transportation, rail, and port infrastructure. Although Congress did not stipulate that TIGER grant recipients should report performance measurements as part of the grant agreement, the Office of the Secretary began to require grant recipients to develop performance plans and measures for each project. Recognizing that the program enables the Department to award funding to a vast array of projects, performance measures allow the Department the ability to examine the benefits of each project based on concrete data. Over the previous nine rounds and current first round of the Better Utilizing Investments to Leverage Development (BUILD) program administration, performance measurement has been a goal of the program. As performance measurement has been implemented over time, various challenges have been identified including the purpose of performance measures, measure uniformity, selection of measures, data monitoring and mining, and data analysis. As the performance measurement process develops, the Department continually makes improvements to the development, collection, and analysis of performance measures.

Despite the difficulties in the selection of measures, data collection and data analysis, the TIGER grant recipients and the Department have made great strides in using performance measure data to show benefits of TIGER/BUILD projects. As work continues with previous TIGER projects and as the first round of BUILD project applications are currently under evaluation, the Department is continually refining the performance measurement development process. In conjunction with this refinement, the Modal Administrations (modes) will continue to work with grantees to develop appropriate performance measures as well as follow the Performance Measurement Guidance document for collection and reporting of that data. The Department is currently working towards making performance measurement data available online and streamline performance measurement data reporting through the creation of the Performance Data Portal.

Background

Program Inception

Congress appropriated \$1.5 billion through the American Recovery and Reinvestment Act (ARRA) of 2009, charging the Department of Transportation (DOT) with implementing a new program to dispense funds for surface transportation improvements. The Better Utilizing Investments to Leverage Development, or BUILD Transportation Discretionary Grant program, provides a unique opportunity for the DOT to invest in road, rail, transit and port projects that promise to achieve national objectives. Previously known as Transportation Investment Generating Economic Recovery, or TIGER Discretionary Grants, Congress has dedicated nearly \$5.6 billion for nine rounds of National Infrastructure Investments to fund projects that have a significant local or regional impact.

Performance Measurement Incorporation

While ARRA did not require TIGER grant recipients to report performance measurements as part of the stipulations of the agreement, the Office of the Secretary implemented a requirement that the grantee develop performance plans and measures for each project.

Recognizing that the TIGER program enables the Department to award funding to a vast array of projects, performance measures allow the Department the ability to examine the benefits of each project based on concrete data specific to that project. Rather than set targets at the onset of an awarded project – which often requires trend data for appropriate target-setting – DOT set forth instructions to develop measures based on data collected both before project construction and for a number of years post project completion. Thus, TIGER grant recipients collaborate with the DOT in the development of a project-specific performance plan, track progress, and report on the effectiveness of each project in achieving the benefits stated in the application. In developing the TIGER program, the focus of performance measures and project outcomes were focused on, but at the time not directly linked to, five Departmental strategic goals (Safety, State of Good Repair, Environmental Sustainability, Quality of Life, and Economic Competitiveness). However, the Department did not direct the recipient towards specific performance measures, instead directing the recipient to hold collaborative discussions with the grant administering mode to choose performance measures for their specific project. As the TIGER program has evolved, so has the process for choosing and developing performance measures and thus the Department's capabilities to determine if projects achieved their desired outcomes.

Next Steps for TIGER/BUILD Performance Measurement and Assessment

As a new round of BUILD project applications is currently under evaluation, previous rounds of TIGER projects undergoing grant agreement development, and still others in data submission phases, the Department is continually refining the performance development process. In conjunction with this refinement, the Modal Administrations will continue to work with grantees to develop appropriate performance measures as well as follow the Guidance document for collection and reporting of that data.

The Department looks to additional actions regarding the reporting and review of performance measurement data.

- The Department is currently constructing ways to make TIGER/BUILD performance measurement data available online. Release of such information would be through the BUILD website.
- Development and implementation of streamlined performance measurement data-reporting approaches for simplifying submission of performance data for TIGER grant recipients.
- The Department is considering ways to better organize data across modes and track submission.

Conclusion

The BUILD/TIGER program is currently in its tenth round of awards and has already seen nearly \$5.6 billion put towards improvements to the nation's transportation systems. To both encourage the TIGER/BUILD grant recipients to monitor progress and changes associated with the project as well as allow the Department to quantify benefits, each project is responsible for setting up performance measures. Throughout the program, the Department and TIGER/BUILD grant recipients have experienced various challenges, but with each round, those experiences set forth positive change and improved processes. Overall, reporting of baseline data and post-completion measures has been positive. While aggregating the performance measures to show quantitative program benefits proves to be a continued challenge, individual review of projects shows program successes. The Department will continue efforts to implement improved performance measurement data collection and reporting processes.

- TIGER PROJECT CASE STUDIES -

OTAY MESA STATE ROUTE 905 /I-805 INTERCHANGE

TIGER I PROJECT—CASE STUDY

Project Funding:

Total Project: \$20.2 million

Transportation Investments Generating Economic Recovery (TIGER) Contribution: \$20.2 million grant (final cost - \$17.8 million)

Location:

San Diego Region, California

Project Type and Purpose:

Highway Improvement – The State Route (SR) 905/I-805 Interchange project was financed through a \$20.2 million TIGER I grant. The project provides a critical “last mile” connection to the Otay Mesa Port of Entry (POE) with Mexico, which is part of the San Diego, CA region’s cross-border system.

It is Phase 2 of the larger \$449 million SR 905 project that includes the necessary improvements and widening of the connector from westbound SR 905 to northbound I-805 and an auxiliary lane between SR 905 and Palm Avenue. The overall SR-905 project purpose is to improve traffic flows, particularly for trucks moving goods between the Otay Mesa POE and California, other destinations in the U.S., and Mexico. Congestion and delays at the Otay Mesa POE and Otay Mesa Road disrupted the supply chain and impacted operations both for finished goods imports and exports as well as for manufacturing/production timelines.

The San Diego Association of Governments (SANDAG) was the sponsoring agency for this project and the California Department of Transportation (Caltrans) was the implementing agency.

Additional Project Background:

The SR 905/I-805 Interchange TIGER project scope consisted of the following:

- Widen the main line of SR 905 to 3 lanes from I-805 to approximately one mile east of the I-805 interchange.
- Widen the connectors from westbound SR 905 to northbound I-805 and from southbound I-805 to the eastbound SR 905 entrance ramp to two lanes.
- Construct an auxiliary lane along northbound I-805 between SR 905 and Palm Avenue.
- Widen the Del Sol Boulevard undercrossing structure.
- Install permanent erosion control (planting) to stabilize several steep slopes.

A map of the SR905 project is presented in **Figure 1**. The TIGER funded project is the Interstate 805/State Route 905 Interchange circled in the figure.



Figure
TIGER I - State Route 905 Phase 2

1

Interstate 805/State Route 905 Interchange

Anticipated Benefits:

The project was selected to meet the strategic TIGER goal areas of state of good repair, economic competitiveness, quality of life, sustainability, and safety. The information below highlights and describes how the grant recipient sponsor anticipated that the projects would achieve these goals prior to award.

Safety

Safety was expected to be enhanced as the SR 905 corridor would provide a faster, safer way to travel to and from the Otay Mesa border crossing. The rate of fatal accidents was twice as that of the average rate for comparable state highways. This higher-than-average rate was expected to decrease due to the design features of the new SR 905 and the added capacity the freeway would provide. Otay Mesa Road

would revert to an arterial road once construction of the SR 905 project was completed, and the volume of truck traffic using Otay Mesa Road would be reduced by the elimination of through interregional traffic.

Quality of Life

The project was intended to advance quality of life goals. The Otay Mesa Community Plan encompasses more than 5,000 acres of existing and planned industrial, commercial, and residential land uses. The SR 905 corridor project was envisioned to improve the quality of living and working environments for the community by reducing congestion and improving reliable travel times in the region. In addition, it would provide local driving safety by reducing truck traffic on Otay Mesa Road, and returning the arterial for community and local business use.

State of Good Repair

The State Route 905 project was expected to improve the state of good repair of an existing highway (Interim 905) and minimize its life-cycle cost. The six-lane freeway portion of the project replaced Otay Mesa Road—the only east-west local arterial road currently serving the Otay Mesa area and the POE. Completion of SR 905 Phase 2 would channel the growing cross-border commercial traffic to the 905 and Otay Mesa Road would serve solely as a local arterial (as it was initially intended) for the Otay Mesa community and business district. The SR 905 project would alleviate congestion and improve reliable travel times for people and goods. The project benefits would be measured by improved levels of service (LOS) and operating speeds in the region.

Environmental Sustainability

Sustainability of the cross-border transportation system will be increased by improving the Level of Service of the roadways. As the level of service improves by reducing the number of at-grade intersections and uphill gradients, the average traffic operating speeds would increase and emissions would be reduced. The improved efficiency would reduce fuel consumption and air quality would be enhanced as congestion would decrease and less pollution, specifically diesel particulates would be generated.

Economic Competitiveness

Investment potential in the San Diego-Baja California region has been curbed due to the existing transportation conditions. SR-905, along with proposed Otay Mesa East POE/SR 11 project, will lead to opportunities for increased throughput and cross border trade.

The SR 905 project is projected to stimulate economic activity and preserve/create jobs by facilitating commercial development. The project is within a major Foreign Trade Zone that allows American businesses to reduce, defer or eliminate payment of U.S. Customs duties. SR 905 will maximize the use of this land as a Foreign Trade Zone by providing high throughput infrastructure connecting the region to Mexico and the interstate system. The project also provides a reliable transportation artery serving the Maquiladora manufacturing assembly industry just across the border.

Analyzed Benefits:

After completion of the SR 905/I-805 Interchange project (Phase 2 of the SR 905 project that includes the necessary improvements and widening of the connector from westbound SR 905 to northbound I-805 and an auxiliary lane between SR 905 and Palm Avenue) performance metrics demonstrate an increase in traffic volumes and throughput, improved levels of Service and reduced accidents. The measured benefits are presented in the Table 1 and illustrated in the Figure 2 below.

Table
Measured Project Benefits

1.

Performance Measure	Pre-Project	Post-Project	Percentage Change	Strategic Goal Area
Average Daily Traffic (ADT)	55,500	65,333	18%	Economic Competitiveness, Quality of Life, Sustainability
Average Daily Truck Traffic (ADTT)	3,886	8,446	117%	Economic Competitiveness, Quality of Life, Sustainability
Average Roadway Speeds	14 mph ¹	68.5 mph ²	489%	Economic Competitiveness, Quality of Life, Sustainability
Level of Service: SR 905 Eastbound SR 905 Westbound	C D	A B	+2 Levels of Service	State of Good Repair, Quality of Life
Annual Average Vehicle Crash Rate per Million Vehicle Miles Traveled	0.38	0.25	-34%	Safety

¹ Caltrans, Project Report, 2004: SR 905 and Otay Mesa Road Operating Speeds. Estimated operating speed for Otay Mesa Road by 2012 (no-build).

² Measured average post-opening SR905 speeds.

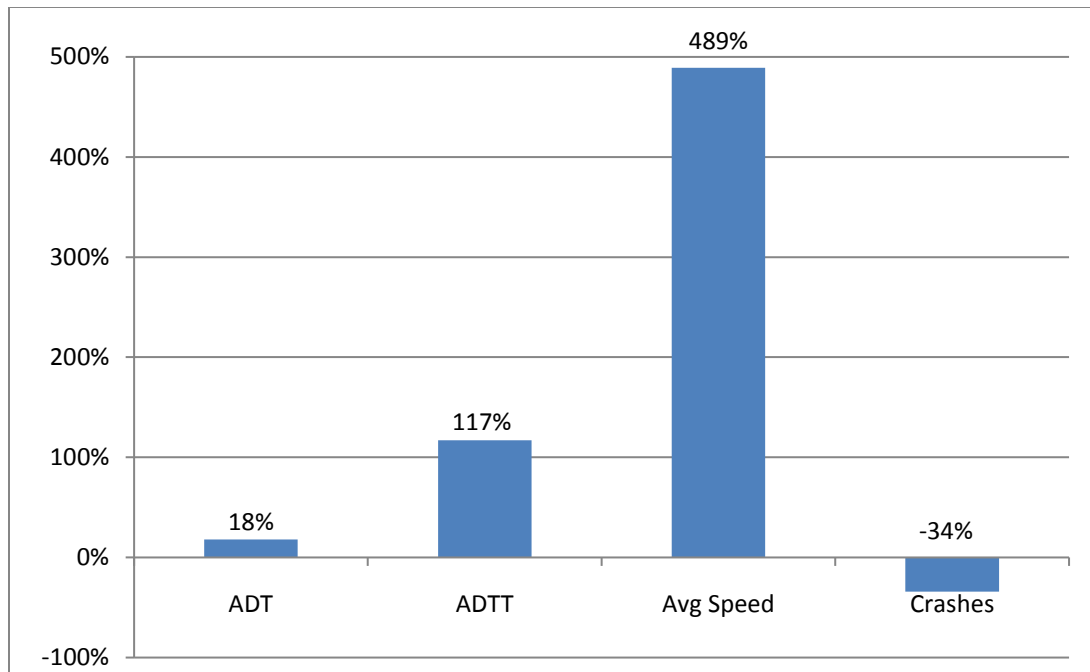


Figure
Measured Project Benefits

2.

Safety

Annual crash data were collected on I-805 between the 805/905 separation and Palm Ave and on SR 905, between the 805/905 separation and Caliente Blvd. The data provided indicates a 34 percent reduction in crashes per Million Vehicle Miles Traveled. The new facility decreases the number of accidents due to modern design features of the new SR 905 which include: standard shoulders, increased sight distance, less-steep grades to enable trucks to travel at higher speeds with the flow of traffic, thus providing more uniform flow of traffic, which is historically shown to be safer. Also, contributing to improved safety is that Otay Mesa Road has reverted to an arterial road and the volume of truck traffic using the road is reduced by the elimination of through interregional traffic.

Economic Competitiveness

The SR 905 corridor is a significant improvement to the region's transportation infrastructure that allows for growth in the California/Mexico border region. Along with the future Otay Mesa East POE/SR 11 project, this trade corridor increases throughput and velocity of cross-border trade. The economic vitality of the California/Mexico border region already has been diminished due to current congested transportation conditions. Improvements in velocity and reliability coupled with congestion relief are anticipated to result in increased cross-border economic opportunities, including growth in output and jobs.

Reflective of the improved velocity, reliability and reduced congestion are increased traffic volumes, cars and trucks, and average speeds. Performance measurements were collected through vehicle

detection systems (loops and/or radar), obtained through PeMS or other internal databases (or from the City of San Diego's traffic count database where applicable), and augmented with ground counts (including vehicle classification). Average Daily Traffic (ADT) increased 18 percent; Average daily Truck Traffic (ADTT) increased 117 percent; and, average speeds increased 489 percent on average post project compared to pre-project measures.

State of Good Repair

The Level of Service for SR 905 Eastbound and SR 905 Westbound both increased by 2 levels (from C to A eastbound and from D to B westbound).³ The increased Level of Service on SR 905 is the result of the design features described under "Safety".

Environmental Sustainability

While no specific metrics were selected, data on travel speeds and traffic could be used to extrapolate whether there were any emissions reductions. In addition, significant reductions in interregional traffic on Otay Mesa Road will reduce local congestion and its impact on air quality is expected.

Quality of Life

While no data was collected specifically for quantifying quality of life, the project will impact the border region and its peoples and businesses by improving the overall efficiency of the cross-border movement of goods and people resulting in increased economic opportunities, reduced traffic congestion and improved safety and environmental quality.

Success Factors, Lessons Learned, and Other Considerations:

The State Route 905 Phase 2: Interstate 805/State Route 905 Interchange project was successful due to several factors. These include:

- High levels of support for the project existed among local jurisdictions and entities via the San Diego Association of Governments (SANDAG) and the Otay Mesa Chamber of Commerce.
- Engineering design was in final design. Environmental Approvals were in place.
- Caltrans had developed a comprehensive Financial Plan for the SR 905 Project and the Financial Plan Guidance issued by the Federal Highway Administration-showing that the TIGER grant would leverage another \$429 million in federal, state and local funds for the entire SR 905 project.

³ Level of Service A – Highest quality of service. Free traffic flow, low volumes and densities. Little or no restrictions on maneuverability or speed;

Level of Service B – Stable traffic flow, speed becoming slightly restricted. Low restriction on maneuverability. No delay.

Level of Service C – Stable traffic flow, but less freedom to select speed, change lanes, or pass. Density increasing. Minimal delay.

Level of Service D – Speed tolerable but subject to sudden and considerable variation. Minimal delay.

- All improvements would be done within the existing state-owned right-of-way.
- Complementary portions of State Route 905 were constructed or were currently under construction.

I-95 PROVIDENCE VIADUCT PROJECT – PHASE I – SOUTHBOUND

TIGER IV PROJECT—CASE STUDY

Project Funding:

Total Project: \$78.7 million (Phase I)

Transportation Investments Generating Economic Recovery (TIGER) Contribution: \$10.0 million grant

Other Contributions: \$68.7 million in federal, state and local funds (Phase I)

Location:

Providence, Rhode Island

Project Type and Purpose:

Highway Improvement – The I-95 corridor in the Providence, Rhode Island area, which includes the I-95 Providence Viaduct, is the third most traveled section on the entire I-95 corridor carrying 220,000 vehicles on an average day. The entire Providence Viaduct project, in which construction began in 2013, is a major project to replace two (north- and south- bound) functionally obsolete and rapidly deteriorating bridges built in 1964 that carry Interstate 95 through the heart of Providence. The structures had deteriorated to the point that it is no longer economically feasible to continue to maintain and/or rehabilitate them. The Federal Highway Administration (FHWA) would no longer authorize funding for the continued rehabilitation of the structure.

Construction to replace the bridges was planned to be done in phases to minimize traffic disruptions. Phase I of the project involves the replacement of the south bound bridge. This phase is the subject of the TIGER grant providing \$10 million to the funding for the approximately \$79 million southbound bridge replacement. The TIGER Grant was made to cover the cost of building the substructure, superstructure and retaining walls of the new southbound bridge and portions of the Exit 21 and 22 off-ramp bridges. Figure 1 illustrates the entire Providence Viaduct replacement project and highlights the Phase I southbound project.

Additional Project Background:

The I-95 Providence Viaduct is so heavily traveled that the continued deterioration of the structure and delay in completion of the project would potentially result in lane shutdowns, emergency lane and/or weight restrictions to avoid weakened steel members or collapsed deck section and ultimately significant delays if an entire direction requires closure. The traffic and economic impacts would be dramatic, affecting local and regional trucking and commuting, reducing air quality and safety. Roadway crash rates could increase up to five times. The Rhode Island employment community, with a state unemployment rate of 11% at the time, the third highest in the nation, would be further crippled without this artery.

The opportunity to expedite the project was seen to impact the state economy with increased economic activity and direct employment. Also, without TIGER funding, construction would not likely have begun until 2014 and would proceed at a much slower pace due to limited funding programmed for 2012 through 2016. RIDOT was also concerned that ongoing maintenance costs would erode funding sources for other projects which were part of the state's transportation rehabilitation program.



Figure
I-95 Providence Viaduct Project

1

Anticipated Benefits:

Replacing the rapidly deteriorating I-95 Providence Viaduct is a top priority for Rhode Island Department of Transportation as the bridge is critical in keeping open one of the most important transportation links in the Northeast. Failure of the structure or the imposition of restrictions would have severe adverse impacts on the economy, mobility, air quality, safety in the region. The TIGER grant accelerated the start of the project and thus reduced the negative impacts of trying to maintain an obsolete facility for several more years. The project was selected to meet the strategic TIGER goal areas of state of good repair, economic competitiveness, quality of life, sustainability, and safety. The information below highlights and describes how the grant recipient sponsor anticipated that the projects would achieve these goals prior to award.

State of Good Repair

The Project improves the overall State of Good Repair by replacing the rapidly deteriorating 45-year-old structure that carries I-95 through the heart of downtown Providence. The new viaduct was constructed with modern materials and contemporary construction techniques and replaces the outdated structure which required constant inspection and repair investments. The new and modern structure has a 100-year anticipated service life and the project was delivered with a minimized life-cycle cost.

Economic Competitiveness

The Project improves the critical link to the I-95 network along the East Coast and guarantees its long term contribution to the region's economic competitiveness. The bridge replacement provides a safe and reliable connection to jobs in downtown Providence and throughout the region; it also creates the ability for workers to better use the transportation system with reliable connections to other modes of transportation on the network. It supplies a reliable route for transit buses and access to Amtrak and MBTA commuter rail. Construction on the project was also expected to generate jobs and wages for a state with one of the worst levels of unemployment in the country.

The new I-95 Providence Viaduct increases the efficiency and effectiveness of the transportation system. Without the TIGER funding, it is conceivable that a series of unfortunate events (such as lane restrictions or closures, weight limitations, or complete direction closures) might have occurred on the structure resulting in a rapid decline in Rhode Island's economic competitiveness, which the local and regional economy could not bear.

Quality of Life

The viaduct allows freight shipments to reach destinations in and around the Providence metropolitan area without degrading city streets and impacting neighborhood traffic patterns. The acceleration of the Providence Viaduct Project through TIGER grant funding helped ensure that bus and commercial traffic depending on the Viaduct to bypass secondary roads could continue to traverse the urban core.

Throughout the region, an improved I-95 system will enhance user mobility – the new viaduct will allow easier travel, as well as access into Providence for work, recreation and intermodal connections. Without the viaduct, the financial, cultural, educational, medical, industrial, government, and historic resources located in this corridor would most certainly suffer at a time when government is pouring resources into rebuilding the economy.

The project will improve transportation choices. As part of the Project, RIDOT is including and improving bicycle and pedestrian connections. Furthermore, streetscape improvements along Promenade Street and Kinsley Avenue, as well as Exchange Street will help visually connect the communities on the two sides of I-95. In addition, economically disadvantaged persons depend on public transportation that travels over the I-95 Providence Viaduct. Access to Amtrak or MBTA commuter rail is via the bridge, and RIPTA buses also use the bridge. Without the viaduct, public transportation is stalled, and economically

disadvantaged persons are unable to get to work. Cutting off this link would add over 100,000 vehicles to mostly non-interstate type facilities adding to congestion and creating unsafe conditions

Environmental Sustainability

The State of Rhode Island is classified as a “Moderate” nonattainment area for ozone. The City of Providence is designated as a CO “Maintenance” area. Maintaining traffic flow along the I-95 corridor is important to ensuring that Rhode Island continues to improve air quality to meet the National Ambient Air Quality Standards (NAAQS). The project includes traffic improvements on the interstate and with the Routes 10 and 146 interchanges. Without the Viaduct replacement, a closure of I-95 would increase the regional emissions of ozone precursors of oxides of nitrogen (NOx) and volatile organic compounds (VOC). It would also increase congestion, especially near the I-95 ramps, that could cause carbon monoxide (CO) and particulate matter (PM) hot spots.

Safety

Without the TIGER funding, the reconstruction of the bridge would have been delayed. The delay in starting construction would allow the bridge to deteriorate further. The increased deterioration would potentially necessitate lane closures or a full bridge closure. Rhode Island Department of Transportation projected that restrictions to I-95 in Providence would create a tremendous volume of traffic diverted to surface streets that have much lower design standards. These surface streets would be unable to handle the huge influx of traffic from the viaduct and this shifting volume would have devastating consequences to safety. Data suggests that the fatal and injury rate could increase up to four times by traffic diverted from I-95 to a lower functionally classified roadway. Also, increased maintenance on the bridge would increase the dangers associated with work zones.

Analyzed Benefits:

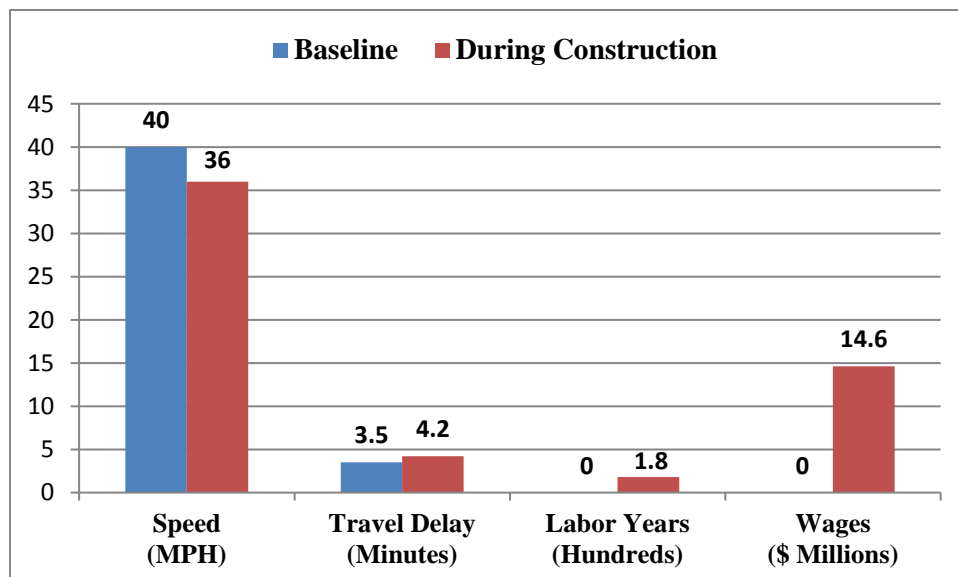
The projected benefits for the viaduct replacement project were primarily focused on avoiding the negative consequences of a delay in initiating and completing the project. They were also inclusive of all phases of the project, not just the Southbound Phase I for which the TIGER grant directly supported. The benefits analyzed in the following were based on measurements taken pre-project as a baseline and during the Phase I construction. As the overall project is still ongoing and too little time has elapsed since completion of Phase I, no pre- to post-project comparisons are made. This notwithstanding, the data does provide information on the wage and employment effects of Phase I, as well as indication of how well the construction process was managed to mitigate traffic impacts. The measured benefits are presented in the Table 1 and illustrated in Figure 2.

Table
Measured Project Benefits

1.

Performance Measure	Pre-Project	During-Project	Change	Strategic Goal Area
Jobs from Construction Spending	0	184 Job Years	184 Labor Years	Economic Competitiveness
Wage Impacts	0	\$14.6 million	\$14.6 million	Economic Competitiveness
Average Roadway Speeds	40 mph	36 mph	-4 mph (-10%)	Economic Competitiveness, Quality of Life, Environmental Sustainability
Travel Delay	3.5 minutes	4.2 minutes	+0.7 minutes (+20%)	Economic Competitiveness, Quality of Life, Environmental Sustainability

Figure 2.
Measured
Benefits



Economic Competitiveness

The immediate impact of the project is the creation of 184 labor years of employment over the Phase I construction of the southbound viaduct linkage.⁴ Associated wages for the construction were reported to be approximately \$14.6 million.⁵ Although of limited duration, the immediate employment and wage impacts were important to the Rhode Island economy as the state's unemployment rate at the time of its TIGER discretionary grant application was 11 percent, well above the national average of 8.3 percent, and as a result, the State was considered an "Economically Distressed Area."

Additionally, the importance of keeping I-95 open and as free-flowing as possible has economic implications for freight, businesses and travelers. The minimal disruption on traffic speeds and delays during the Phase I construction process was important to minimizing impacts on the region's economy.

Environmental Sustainability

While no specific metrics were selected, data on travel speeds and traffic could be used to extrapolate whether there were any emissions impacts. Due to the careful management of traffic during construction of Phase I, relatively minimal impacts on travel speeds (approximately four miles per hour slower travel speeds) and delays (less than one minute additional delays) occurred which reduced potential adverse effects on vehicle emissions and air quality.

Quality of Life

While no data was collected specifically for quantifying quality of life improvements, the project impacts the people and businesses reliant on I-95 by improving the overall efficiency of movement of goods and people. This results in increased economic opportunities, reduced traffic congestion and improved safety and environmental quality.

Success Factors, Lessons Learned, and Other Considerations:

The I-95 Providence Viaduct Phase I- Southbound project was successful due to several factors. These include:

- RIDOT partnered with stakeholders beginning with the initial planning and into design of the project. There were high levels of support for the project existed among a variety of city

⁴ Jobs from Construction Spending-is the estimate of the number of job-years created as a consequence of this project. Data collected will include the actual aggregate expenditures for the Project from notice to proceed date through final acceptance date. Aggregated expenditures are divided by \$76,923 to obtain the job-year impact. CEA determined that a job-year is created by every \$76,923 in transportation infrastructure. This estimate may be used as an appropriate indicator of direct, indirect and induced job-years created by TIGER Discretionary Grant spending. (See Federal Register I Vol. 77, No. 20 / Tuesday, January 31, 2012, page 4868).

⁵ Wage Impacts are the cumulative dollar amount of direct wages paid for job hours created or sustained during this project. These include wages for prime contractor and sub-contractor, utility, police detail and project management direct wages.

and state civic leaders who realize the immediate economic and transportation benefits of the project and the benefits afforded by TIGER funding.

- State-level funding plan was in place.
- Engineering design was in final design.
- Environmental Approvals were in place. RIDOT had been issued all six required federal, state and local permits and approvals to construct the Project.

YELLOWSTONE INTERNATIONAL AIRPORT INTERCHANGE PROJECT

TIGER IV PROJECT—CASE STUDY

Project Funding:

Total Project: \$54.3 million

Transportation Investments Generating Economic Recovery (TIGER) Contribution: \$9 million grant

Other Contributions: \$45.3 million in federal, state and local funds

Location:

Gallatin County, Montana

Project Type and Purpose:

Highway Improvement – The Yellowstone International Airport Interchange is located on Interstate 90 (I-90) between mile posts 298.8 and 300.2 and extends south to the Alaska/Frontage Road and North to the Frontage Road in Belgrade, Montana. Improvements for this project included adding a second interchange for Belgrade, direct access from the interstate to Bozeman Yellowstone International Airport and adding the only north and south crossing in Belgrade that will be unaffected by rail traffic.

The project included a new crossroad and connections, reconstruction of old Highway 10, two interstate bridges, a railroad shoofly and underpass structure, two-lane roundabouts at the proposed interchange ramp terminals, intersection signalization and street lighting, and extensive storm drainage improvements were undertaken. The project also included safety improvements which included re-grading the borrow pits adjacent to the project, widening, road shoulders and sidewalks in addition to other pedestrian improvements along Frontage Road and the newly connected Alaska Road. A map of the improvements is presented as Figure 1.

Additional Project Background:

The project was proposed as significant population growth and passenger growth at Bozeman Yellowstone International Airport was causing traffic congestion in the heart of Belgrade at the four-way stop intersection of Broadway and Main Street and the capacity of the existing interchange with I-90 was reaching saturation. Increased traffic was not the only issue facing local leaders, emergency service providers were frequently blocked by trains as there were no grade-separated crossings in Belgrade.

The project provided greater intermodal connectivity, to improved regional mobility, addressed public safety concerns caused by the lack of a grade-separated railroad crossing and over-burdened local roadways and created access to commercially viable properties for economic development and job creation. This project shifted traffic from local Belgrade streets onto Interstate 90, increasing safety, efficiency and reducing greenhouse gas emissions. It also enhanced safety by eliminating two at-grade rail crossings and creating a grade-separated interstate and rail crossing. The project created a south

connector roadway from the new interchange directing traffic more efficiently from the airport to Yellowstone National Park and Big Sky, improving the flow of goods and people, and increasing the economic competitiveness of the region.

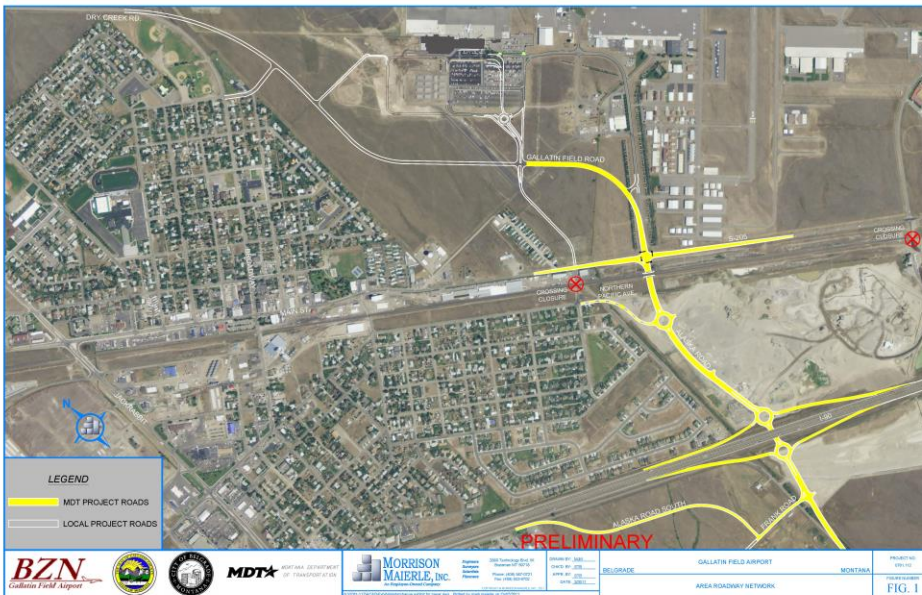


Figure 1.
TIGER IV – Yellowstone International Airport
Interchange Project

Anticipated Benefits:

The project sponsor anticipated benefits in the strategic goal areas of state of good repair, economic competitiveness, livability, environmental sustainability and safety. Though benefits were expected in each category, performance metrics collected and analyzed focus on livability and safety.

State of Good Repair

This project would address several key transportation congestion issues that limited intermodal accessibility, caused traffic and public safety concerns, and reduced the effectiveness of a multi-million-dollar airport terminal expansion and other highway improvements that anticipate the interchange. The new interchange would:

- Remove traffic congestion at a four-way stop at the intersection in the center of Belgrade.
- Create a grade separate crossing of the Montana Rail Link railroad line for first responders/public safety access to the Airport and North/South sections of Belgrade and the closure of two current at grade crossings.

- Create a south connector roadway from the interchange directing traffic in an effective and efficient manner to Yellowstone National Park and Big Sky.
- Create a bypass roadway to the new airport terminal expansion and the north side of Belgrade.
- Enable easy access to east and west travel on Interstate 90.

Economic Competitiveness

The primary purpose of this project was to improve intermodal connectivity in and around Bozeman Yellowstone International Airport and to reduce public safety hazards that affected users of this local infrastructure. The Airport was estimated to contribute an economic impact of over \$282 million in 2009. The airport provided the largest economic impact of any airport in the state and generated approximately 3,900 direct and indirect jobs in southwest Montana. This impact demonstrated the importance of this airport to local communities vying for position in the world market. The airport is one of the most important transportation services that any business community needs to be successful. The increase in intermodal connectivity provided by the project increased the productivity and competitiveness for moving workers and commercial goods within the region.

Quality of Life

The project would improve the overall quality of life for millions of travelers and regional residents in the south-central Montana region. The project addressed multiple goals and objectives such as improving access to intermodal facilities, reducing traffic congestion, improving safety and reducing air pollution. Improvements to the transportation system increase the efficiency of access for hospitals and emergency services, medical and fire first responders as well as access to schools, recreational activities and tourism destinations. The interchange also included the biking and walking infrastructure to move pedestrian travel safely throughout the corridor.

Environmental Sustainability

The local roadway system caused daily transportation gridlock that impacted environmental quality. Many drivers traveled back roads and out of direction routes to their destinations to avoid congested areas and drive longer miles to reduce travel times. The project was expected to significantly reduce travel times and lower greenhouse emissions from a projected decrease in daily vehicle hours.

Safety

Aggressive growth and development in the surrounding area, as well as increasing levels of airline travelers, put a strain on the existing roadway network in study area. Traffic congestion, overburdened and aging infrastructure and increasing conflicts between automobiles, rail and pedestrians created increasingly unsafe conditions. The project was expected to reduce traffic impacts, remove at-grade rail crossings and improve facilities for pedestrians and as such, would reduce crash rates.

Analyzed Benefits:

Performance metrics were developed for the project to measure benefits associated with the construction of the interchange and other associated improvements. Pre- and post-project measurements were made for the following dimensions:

- Average Daily Traffic Counts—this measure tracks the reduction in traffic congestion that occurs from intermodal improvements and grade-separated railroad crossings at the Belgrade four-way stop intersections.
- Annual Vehicle Crash Rates—this data set includes the number and categorization of vehicle crash rates on Interstate 90 and Main Street in Belgrade, MT (S-205).
- Average Daily Bike and Pedestrian Counts—this measure consists of average daily bicycle and pedestrian counts by conducting hourly counts at key locations in the study area.
- Annual Non-Vehicle (Bike and Pedestrian) Number of Crashes by Type and Severity—these data include the number and categorization of crashes at the interchange involving bicyclists and pedestrians.¹⁰

Following completion of the project, lower traffic volumes were observed locally, crashes were reduced and pedestrian/bicyclist counts increased. The measured benefits are presented in the following text, summarized in Table 1 and illustrated in Figure 2.

Economic Competitiveness

While no data was collected specifically for quantifying Economic Competitiveness, the project impacts the region by reducing traffic congestion and improving intermodal accessibility which in turn creates a more competitive environment for attractive and retaining businesses.

Environmental Sustainability

While no specific Environmental Sustainability metrics were collected, the 7 percent reduction in local traffic volume concurrent with increased local population and tourism related travel points towards reduced local congestion with the resultant negative air quality impacts.

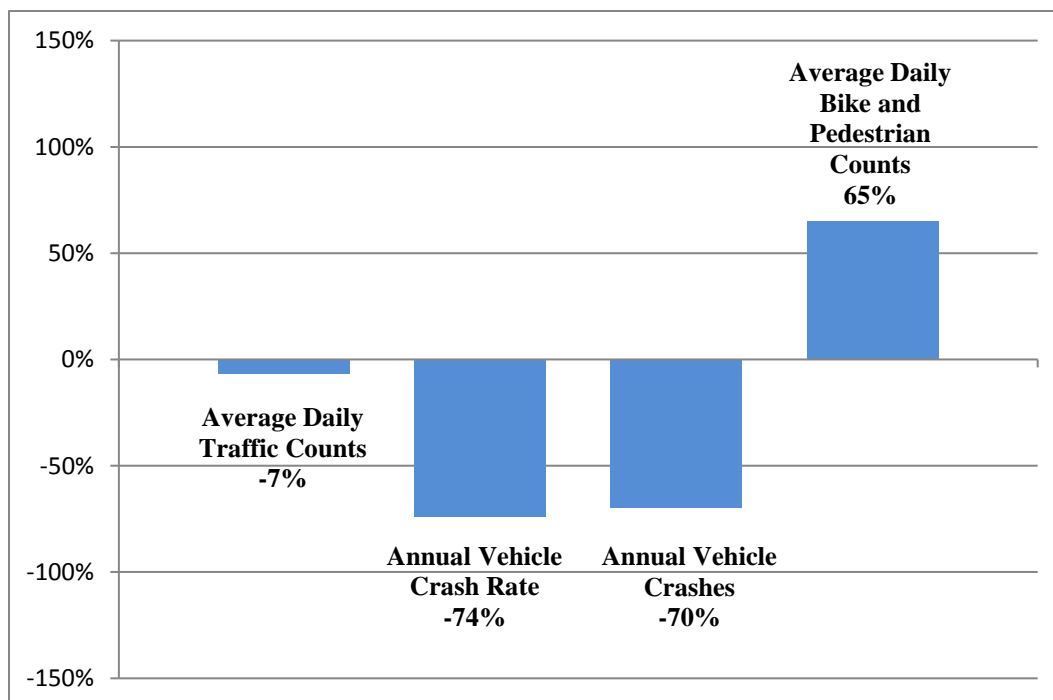
Table 1.
Measured Project Benefits

Performance Measure	Pre- Project 2013	Post- Project 2016	Change	Strategic Goal Area
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¹⁰ The occurrence of pedestrian and bicycle crashes averaged one or less per year and therefore, no statistically significant difference exists between pre- and post-project occurrences.

Average Daily Traffic	7,025	6,511	-7%	Economic Competitiveness, Quality of Life, Environmental Sustainability, Safety
Annual Vehicle Crash Rates	1.25	0.33	-74%	Safety
Annual Vehicle Crashes	123	37	-70%	Safety
Average Daily Bike and Pedestrian Counts	45	75	+65%	Quality of Life

Figure 2.
Measured Project Benefits



Quality of Life

Quality of life, though not directly captured, can be reflected in measured elements associated with the transportation improvements. Reduced local traffic congestion and the safety dangers associated with

it, accommodation for pedestrian/bicycle usage on facilities can be indicative of an improved quality of life. The 7 percent reduction in local traffic and 65 percent increase in pedestrian and bicyclist counts show definite improvements.

Safety

The reductions in crashes and crash rates post- versus pre-construction of the interchange and associated transportation improvements of 70 and 74 percent, respectively, are dramatic. These are the result of moving traffic off local roads and improving the safety qualities of the facilities.

Success Factors, Lessons Learned, and Other Considerations:

The Yellowstone International Airport Interchange project was successful due to several factors. These include:

- There were high levels of support for the project among a variety of state, county and city civic leaders and businesses who realized the immediate benefits of the project and the benefits afforded by TIGER funding.
- Non-TIGER funding sources were in place.
- Engineering was in final design.
- Environmental Approvals were in place.

US 491 SAFETY IMPROVEMENTS

TIGER I PROJECT—CASE STUDY

Project Funding:

Total Project: \$147 million

Transportation Investments Generating Economic Recovery (TIGER) Contribution: \$31 million grant

Other Contributions: \$116 million in federal, state and local funds

Location:

State of New Mexico: San Juan and McKinley Counties and the Navajo Nation

Project Type and Purpose:

Highway Improvement – US 491 is the primary north-south highway in this extremely rural area of northwest New Mexico. The road connects the local Navajo Nation to other parts of New Mexico, Colorado, and the Four Corners area. It is a major trucking route with increasingly high volumes of commercial traffic. The project, located in northwest New Mexico, expanded the roadway width over a corridor length of approximately 69 miles by constructing two new lanes adjacent to two existing lanes in this rural section, in addition to other traffic system improvements. Additional safety improvements included constructing turn lanes for acceleration and deceleration in commercial and high-traffic areas, and improving intersections, signage, markings and drainage facilities. The entire corridor improvement project consisted of nine construction segments. The TIGER grant of \$31 million covered the construction costs for Segment 6, as shown in Figure 1, which runs from milepost 46 to milepost 59.

Additional Project Background:

The project work included the following: addition of two lanes with a forty-foot wide median adjacent to the existing two lanes creating a four-lane rural highway, six-foot shoulders that taper to twelve feet with a sixty-foot school bus pad approaching existing access points, drainage structure extensions, rehabilitation of an existing bridge, and the construction of a new adjacent bridge to accommodate the new lanes. "Rural-Urban" sections included acceleration and deceleration lanes, access control, street lighting at major intersections and commercial areas. Utility relocation included sewer, water, power, and commercial areas. The 4-lane facility has a 70-mph design speed and a 65-mph posted speed limit.

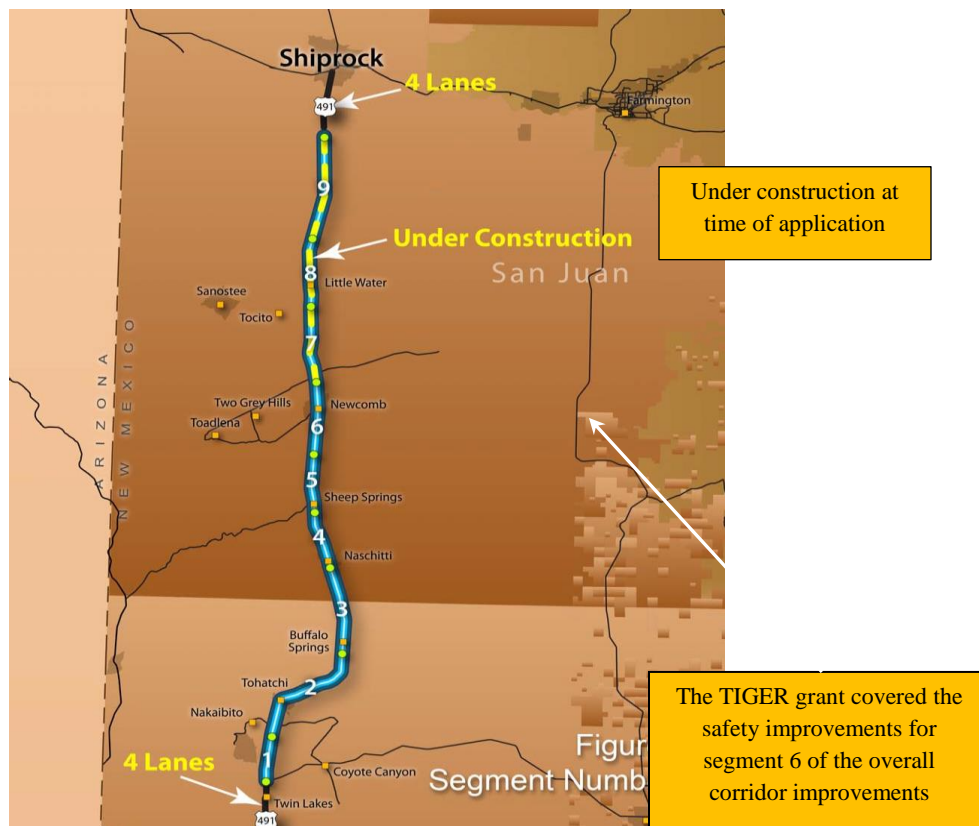


Figure 1.
US-491 Corridor Improvement Project

Anticipated Benefits:

The project sponsors anticipated benefits in the strategic goal areas of state of good repair, economic competitiveness, quality of life, environmental sustainability and safety. Though benefits were expected in each category, performance metrics collected and analyzed focused on safety.

State of Good Repair

This project improves the physical condition of an existing US 491 rural transportation system, and designed to provide optimized services with minimized life-cycle costs. Most importantly, the corridor was considered unsafe given the hilly terrain, limited sight distances and volumes and mix of traffic on the roadway. The existing 2-lane highway lacked acceleration, deceleration, and separate turning lanes, which could result in conflicts with through traffic. Inadequate clear zone and median widths result in little room for avoidance or recovery. Providing a consistent typical section along US 491 was expected to enhance drivers' anticipation of upcoming roadway conditions, reduce conflict points that require driver decisions and decrease the likelihood of potential accidents.

Additionally, over the next 10 to 20 years, regional growth was expected to continue, which would result in increased traffic volumes that depend on this highway and would further exasperate the constraints imposed by the existing roadway.

Economic Competitiveness

The area served by the corridor, the Navajo Nation and San Juan County and McKinley County New Mexico, are in areas with severe unemployment and/or low wage/salary rates. The improvement of the US 491 roadway would provide a key component in improving economic activity and expansion in the area. The project would make improvements that allow for net new investments in expansion, hiring or other growth of private production at specific Economically Disadvantaged Area (EDA) locations. The intersection improvements would result in investments in greater industry production of goods and services, requiring increases in hiring levels, within an EDA. The project would increase the efficiency and effectiveness of the transportation system through better use of existing infrastructure, including I-40, US 64, I-70, etc. This project would also benefit varying transportation modes such as local public transportation entities having the opportunity to improve service on a safer corridor.

Quality of Life

The project would improve the quality of living (predominantly safety), accessibility and working environments and the experience for people in this community. Additionally, it would provide a more welcoming experience for travelers from outside the region into the life of the Navajo Nation and the Four Corners Region.

The corridor traverses the extremely rural area of New Mexico. It is the life link of the Navajo Nation and numerous outlying communities between the Four Corners and Gallup. This includes links to emergency, medical, commercial, education, and other vital services. A major emphasis of the US 491 project was to improve connections between residential and commercial areas. The rural nature of the region has commercial nodes on either end or connectivity to major commercial areas in New Mexico, Arizona, Utah, and Colorado, and across the nation.

The improvements would provide for transport service to non-drivers, senior citizens, and persons with disabilities, and make goods and services more readily available to those groups. It would also provide enhanced access to Chapter Houses in the area, the traditional gathering place for most (infants through seniors) in the Navajo Community. The US 491 Corridor also has many pedestrians due to the economic status of the residents. An improved biking and walking infrastructure was included in the project which incorporated a pedestrian-bicycle and horseback route along the proposed shoulder.

Environmental Sustainability

The increased efficiency and maintenance of optimal travel speeds along the corridor were expected to reduce overall fuel consumption, related operating costs and air quality impacts within the project area. The project was designed to maintain, protect, and enhance the environment. An Environmental Assessment (EA) was conducted to determine the potential environmental impacts of the project. The EA resulted in the issuance of a Finding of No Significant Impact (FONSI) that states the proposed project will have no significant impact on the human or natural environment.

Safety

Safety was by far the most important feature of this transportation improvement. Historically, US 491 had a reputation as one of the most dangerous routes in New Mexico. The diverse mix of vehicles, user types, and hilly terrain resulted in a substantial speed differential between traffic using this highway. As such, numerous crashes occurred because of passing maneuvers and improper turns. Around half of the documented fatal collisions were head-on crashes, and many of the accidents each year involved tractor-trailer trucks.

The severity index and fatality rate for this two-lane segment of US 491 were substantially higher than national and statewide averages. With an alarming fatality rate between 2.2 and 3.7 times the regional average (depending on corridor segment), the safety of the travelling public was paramount in the undertaking of this project. Across the entire corridor, it was expected that the upgrade would result in a 57 percent reduction in the average yearly number of fatalities and injuries and a 55 percent reduction in property damage only accidents.

Analyzed Benefits:

Performance metrics were developed for the project to measure benefits associated with the construction of the additional lanes and other safety-related improvements. Pre- and post-project measurements were made for the following dimensions:

- Average Daily Traffic Counts— Average Annual Daily Traffic (AADT) and Average Annual Daily Truck Traffic (AADTT) was collected for Segment 6 of the corridor that was funded via the TIGER grant. These measurements can indicate increases in the level of service (state of good repair) for the roadway and increased economic activity.
- Annual Vehicle Crash Rates—this data set includes the vehicle crash rates for Segment 6 of the corridor per million vehicle miles of travel, categorized by fatal, injury or property damage only crashes.

The measured benefits are summarized in Table 1 and illustrated in Figure 2.

Table 1.
Measured Project Benefits

Performance Measure	Pre- Project 2005- 2009	Post- Project 2015-2016	Change	Strategic Goal Area
Average Annual Daily	4087	5127	1040	Economic

Traffic			+25%	Competitiveness, State of Good Repair
Average Annual Daily Truck Traffic	899	925	26 +3%	Economic Competitiveness, State of Good Repair
Fatal Crash Rate per million vehicle miles	3.09	2.51	-0.58 -19%	Safety
Injury Crash Rate per million vehicle miles	23.72	10.23	-13.49 -57%	Safety
Property Damage Only Crash Rate per million vehicle miles	31.97	21.23	-10.74 -34%	Safety

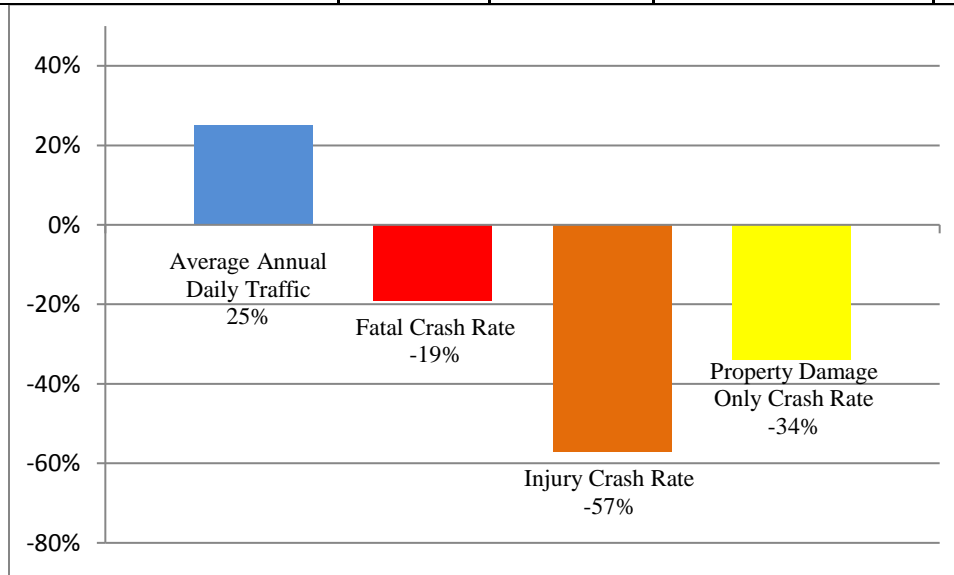


Figure 2.
Measured Project Benefits

Economic Competitiveness / State of Good Repair

The data shows that traffic volumes for all vehicles increased pre- to post construction by 25 percent. The increase in traffic could in part be attributed to the improvements to the corridor, making it a more attractive route for travelers.

Safety

Increasing the roadway from two to four lanes; adding a median between directions of travel; providing adequate shoulders; and, other significant safety improvements to bring the roadway up to modern standards showed reductions in crash rates which are dramatic. The rate of crashes per million vehicle miles declined 19 percent for fatal crashes and 57 percent for injury crashes. There was a 34 percent reduction in property damage only crashes per million vehicle miles. The overarching goal of improving safety along the corridor was confirmed by the data.

Success Factors, Lessons Learned, and Other Considerations:

The US 491 Safety Improvement project was successful due to several factors. These include:

- There were high levels of support for the project among a variety of stakeholders who realized the immediate benefits of the project and the benefits afforded by TIGER funding.
- Non-TIGER funding sources were in place.
- Engineering was in final design.
- Environmental Approvals were in place.

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