

Modernizing North Dakota's Transportation System:

Progress and Challenges in Providing Safe, Efficient and
Well-Maintained Roads, Highways and Bridges



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Founded in 1971, [TRIP](#)® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with efficient and safe surface transportation.

Executive Summary

North Dakota's roads, highways and bridges form vital transportation links for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping, natural resources and recreation. The condition, efficiency and funding of North Dakota's transportation system are critical to quality of life and economic competitiveness in the Peace Garden State.

North Dakota has experienced a significant boom in energy extraction in its western counties that, since 2005, has resulted in a ten-fold increase in crude oil production, spurred by advancements in extraction technology and increases in fuel prices. While the state's energy boom has resulted in a tremendous increase in wear and tear on the state's roadways, it has also provided a significant boost in transportation funding. The modest decrease in energy extraction in North Dakota in 2016 and 2017, as a result of reduced energy prices, has significantly reduced the amount of additional energy-related revenue in North Dakota available for transportation investment. And despite the surge and subsequent drop in energy-related transportation revenues, North Dakota continues to face a significant backlog in needed funding for transportation, largely as a result of a lack of an adequate, dedicated state funding source for road, highway and bridge repairs and improvements.

This report examines the condition, use, safety and funding of North Dakota's roads, highways and bridges and the state's future mobility needs. Sources of information for this report include the North Dakota Department of Transportation (NDDOT), the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), the Bureau of Transportation Statistics (BTS), the U.S. Census Bureau, the Texas Transportation Institute (TTI), the American Road & Transportation Builders Association (ARTBA) and the National Highway Traffic Safety Administration (NHTSA).

TRANSPORTATION FUNDING AND NEEDED TRANSPORTATION PROJECTS

An increase in transportation investment in North Dakota, largely as a result of increased energy-related revenues, has allowed many needed road, highway and bridge projects to proceed. With the amount of energy-related revenues available for transportation decreasing, North Dakota faces a significant shortfall in funding for needed transportation improvements.

- From 2012 to 2018, \$3 billion in state energy-related revenues were spent on transportation improvements in North Dakota. Energy-related revenue in North Dakota used for transportation increased from \$216 million in 2012 to \$619 million in 2017 before dropping to \$194 million in 2018.

- The \$3 billion in energy-related revenue used for transportation in North Dakota represents 63 percent of the \$4.8 billion in state revenue provided to the North Dakota Department of Transportation (NDDOT), from 2012 to 2018.
- North Dakota faces a \$2.5 billion shortfall from 2018 to 2023 in transportation funding needed to improve road, highway and bridge conditions, support economic development opportunities, and improve roadway safety.
- Largely as a result of increased energy-related revenues, NDDOT has been able to proceed with numerous projects to improve the condition, safety and reliability of its roads, highways and bridges.
- The chart below details North Dakota transportation projects that have been completed, are underway or will be completed by 2021 because of increased state transportation funding, largely due to increased energy-related state revenue.

Route / Facility Description	Describe Improvement/Type of Work	Completion Date	Benefit of Project
US 85 - WILLISTON PERMANENT TRUCK RELIEVER ROUTE - Lake View Drive north to Jct. US Highway 2	New Construction	2018	Congestion, economic development, safety
ND 23 - WATFORD CITY BYPASS - SOUTHEAST (SE)	New Construction	2017	Congestion, economic development, safety
US 85 - WATFORD CITY BYPASS - SOUTHWEST (SW)	New Construction	2016	Congestion, economic development, safety
US 85 4-LANE WATFORD CITY TO 1/2 MILE WEST OF COUNTY ROAD 27 (REDWING ROAD)	New Construction / Widening	2018	Congestion, economic development, safety
US 85 4-LANE 1/2 MILE WEST OF COUNTY ROAD 27 (REDWING ROAD) TO SOUTH OF ALEXANDER	New Construction / Widening	2018	Congestion, economic development, safety
US 85 4-LANE - ALEXANDER BYPASS	New Construction	2018	Congestion, economic development, safety
US 85 4-LANE NORTH OF ALEXANDER TO Junction US 2	New Construction / Widening	2019	Congestion, economic development, safety
ND 22 - DICKINSON NW BYPASS	New Construction	2017	Congestion, economic development, safety
ND 22 -EXIT 56 - DICKINSON NW BYPASS	New Interchange	2016	Congestion, economic development, safety
DICKINSON RAILROAD GRADE SEPARATION	New Structure	2017	Congestion, economic development, safety
US 2 - WILLISTON INTERSECTION OF US 2 & 18TH ST	New Structure	2017	Congestion, economic development, safety
ND 23 - 7th St-Watford City-E to Near Jct. ND 22	Reconstruction	2018	Congestion, economic development, safety
ND 23 - KEENE CORNER - CO RD 10 & CO RD 55	Rehabilitation / Widening / Roundabout	2017	Congestion, economic development, safety, preservation
ND 23 - Jct ND 1804 to East Ave in New Town (Main St)	Reconstruction	2017	Congestion, economic development, safety
ND 23 - East Ave (New Town) to New Town NE TRR	Rehabilitation / Widening	2017	Congestion, economic development, safety
ND 23 - New Town NE TRR to ND 8	Rehabilitation / Widening	2016	Congestion, economic development, safety
ND 23 - ND 8 to Jct. 28 to Jct. ND 83	Rehabilitation / Widening	2015	Congestion, economic development, safety
ND 1804 - JCT ND 23 TO County Road 5	Reconstruction	2016	Congestion, economic development, safety
ND 1804 - CNTY RD 5 TO JCT TIOGA RD - CNTY RD 21	Rehabilitation / Widening	2020	Congestion, economic development, safety, preservation
ND 1804 - JCT TIOGA RD W TO County Road 42 - Epping	Rehabilitation / Widening	2021	Congestion, economic development, safety, preservation
ND 1804 - CO Rd 42 (123rd Ave NW)-Epping W to 131st Ave NW	Rehabilitation / Widening	2019	Congestion, economic development, safety, preservation
ND 1804 - 131st Ave NW to Temporary NE TRR	Reconstruction	2019	Congestion, economic development, safety
US 85 - Long X Bridge	Structure Replacement	2021	Congestion, economic development, safety
ND 200 - JCT US 85 E TO JCT ND 22 - KILLDEER	Rehabilitation / Widening	2018	Congestion, economic development, safety, preservation
ND 22 - DICKINSON N TO ND 23	Rehabilitation / Widening	2018	Congestion, economic development, safety, preservation

- The chart below details needed transportation projects in the state that lack adequate funding to proceed.

Route / Facility Description	County	Improvement / Type of Work	Benefit of Project
I-94 (E ND 25 E TO GRANT MARSH BRIDGE)	Morton	Rehabilitation	Preservation
I-94 (CO LN E TO DAWSON)	Kidder	Rehabilitation	Preservation
1806 (NEAR FT RICE TO MANDAN)	Morton	Rehabilitation	Preservation
E DAWSON INTR TO CRYSTAL SPRINGS	Kidder	Rehabilitation	Preservation
US-281 (TWP LINE N ELLENDALE TO JCT ND 46)	Dickey	Rehabilitation	Preservation
US-281 (STATE LINE N TO TWP LINE)	Dickey	Rehabilitation	Preservation
ND 20 (N JCT 17 TO E JCT 5 - CLYDE)	Cavalier	Rehabilitation	Preservation
ND-1 (NEKOMA SEPARATION)	Cavalier	Rehabilitation	Preservation
ND 6 - ST LN TO SELFRIDGE	Sioux	Rehabilitation	Preservation
ND 6 -SELFRIDGE N TO W JCT BIA 7-PORCUPINE	Sioux	Rehabilitation / Widening	Preservation, Safety
US 83 - 9TH ST (BISMARCK EXPY TO FRONT AV)	Burleigh	Rehabilitation	Preservation
US 83 - 7TH ST (FRONT AV TO BISMARCK EXPY)	Burleigh	Reconstruction	Preservation
ND 200 - E JCT 52-CARRINGTON E TO JCT 20	Foster	Rehabilitation / Widening	Preservation, Safety
I-94 - SOUTH HEART TO E DICKINSON INTR	Stark	Rehabilitation	Preservation
I-29 - N BOWESMONT TO CANADIAN LINE	Pembina	Rehabilitation	Preservation
URBAN ROADS CITYWIDE SIGNAL REHAB	N/A	Signal Revision	Preservation
REGIONAL CITYWIDE SIGNAL REHAB	N/A	Signal Revision	Preservation
ND 73 - JOHNSONS CORNER E TO JCT 22	McKenzie	Rehabilitation / Widening	Preservation, Safety
US 2 W FRONTAGE RD(CHINAMAN COULEE)	Williams	Structure	Preservation
I-94 - NEAR W FARGO E TO W HORCE RD - WB	Cass	Rehabilitation	Preservation
I-94 - NEAR W FARGO E TO W HORCE RD - EB	Cass	Rehabilitation	Preservation
ND-5 (E JCT 40-COLUMBUS-E TO W JCT 52)	Burke	Rehabilitation	Preservation
I-94 (I-29 TO 25TH ST. INTERCHANGE)	Cass	Rehabilitation	Preservation, Operations

POPULATION, ECONOMIC AND TRAVEL TRENDS

Largely as a result of the state's energy boom and subsequent decline, North Dakota experienced the nation's greatest rate of economic and vehicle travel growth from 2000 to 2014 and the nation's greatest rate of reduction in economic output and vehicle travel from 2014 to 2016.

- North Dakota's population reached approximately 755,000 residents in 2017, an 18 percent increase since 2000. North Dakota had 555,935 licensed drivers in 2016.
- North Dakota's population is expected to increase by 38 percent by 2040 to 1,045,000, an increase of 290,000 people.
- From 2000 to 2014, North Dakota's gross domestic product (GDP), a measure of the state's economic output, increased by 133 percent, when adjusted for inflation, the highest rate in the nation during that time. From 2014 to 2016, North Dakota's GDP decreased by seven percent, when adjusted for inflation, the greatest rate of decline in the nation during that time.

- Crude oil production in North Dakota increased from 98 thousand barrels a day in 2005 to 1.17 million barrels per day in 2015 before declining to 1.03 and 1.06 million barrels per day in 2016 and 2017, respectively.
- Vehicle miles traveled (VMT) in North Dakota increased by 46 percent from 2000 to 2014, the greatest rate of increase in the nation during that time. VMT in North Dakota decreased by seven percent between 2014 and 2016, the greatest decrease in the nation during that time.

NORTH DAKOTA ROAD CONDITIONS

A lack of adequate state and local funding has resulted in approximately one-third of major urban roads and highways in North Dakota having pavement surfaces in poor or mediocre condition, providing a rough ride and costing motorists in the form of additional vehicle operating costs.

- The pavement data in this report, which is for all arterial and collector roads and highways, is provided by the Federal Highway Administration (FHWA), based on data submitted annually by the North Dakota Department of Transportation (NDDOT) on the condition of major state and locally maintained roads and highways.
- Thirty-six percent of North Dakota's major locally and state-maintained urban roads and highways have pavements in poor condition and 28 percent are rated in mediocre condition. Eleven percent of major urban roads are in fair condition and the remaining 25 percent are rated in good condition.
- Eight percent of North Dakota's major locally and state-maintained rural roads and highways have pavements in poor condition and 15 percent are rated in mediocre condition. Thirteen percent of major rural roads are in fair condition and the remaining 64 percent are rated in good condition.
- The average annual miles of roads resurfaced or reconstructed by the North Dakota Department of Transportation (NDDOT) will decrease by 24 percent from 2015-2018 to 2019-2022, largely due to reduced energy-related revenue.
- NDDOT estimates that the miles of state-maintained roads in poor condition will nearly double between 2018 and 2021, from 443 miles to 872 miles.
- TRIP estimates that additional vehicle operating costs borne by North Dakota motorists as a result of driving on deteriorated roads is \$250 million annually, or \$449 per driver

BRIDGE CONDITIONS IN NORTH DAKOTA

Approximately one-in-seven locally and state-maintained bridges in North Dakota show significant deterioration and are rated structurally deficient. This includes all bridges that are 20 feet or more in length.

- Fourteen percent of North Dakota's bridges are structurally deficient. A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Structurally deficient bridges are often posted for lower weight or closed to traffic, restricting or redirecting large vehicles, including commercial trucks and emergency services vehicles.

- The average number of bridges that NDDOT is able to reconstruct or replace annually will decrease by 46 percent from 2015-2018 to 2019-2022, largely due to reduced energy-related revenue.
- The Federal Highway Administration estimates that it would cost \$164 million to replace or rehabilitate all structurally deficient bridges in North Dakota.
- Most bridges are designed to last 50 years before major overhaul or replacement, although many newer bridges are being designed to last 75 years or longer. In North Dakota, 46 percent of the state's bridges (2,030 of 4,377) were built in 1969 or earlier.
- A recent [survey of states by the U.S. General Accountability Office](#) (GAO) found that more than half of states surveyed (14 out of 24) reported that inadequate funding was a challenge to their ability to maintain bridges in a state of good repair.

TRAFFIC SAFETY AND FATALITY RATES IN NORTH DAKOTA

Improving safety features on North Dakota's roads and highways would likely result in a decrease in the number of traffic fatalities and serious crashes.

- A total of 643 people were killed in North Dakota traffic crashes from 2013 to 2017, an average of 128 fatalities per year.
- North Dakota's overall traffic fatality rate in 2016 of 1.16 fatalities per 100 million vehicle miles of travel is below the national average of 1.18.
- The fatality rate on North Dakota's non-interstate rural roads in 2016 is more than four times higher than on all other roads in the state (1.79 fatalities per 100 million vehicle miles of travel vs. 0.42).
- Several factors are associated with vehicle crashes that result in fatalities, including driver behavior, vehicle characteristics and roadway features. TRIP estimates that roadway features are likely a contributing factor in approximately one-third of fatal traffic crashes.
- Where appropriate, highway improvements can reduce traffic fatalities and crashes while improving traffic flow to help relieve congestion. Such improvements include removing or shielding obstacles; adding or improving medians; the use of high-friction surfacing treatment to improve skid resistance; improved lighting; adding rumble strips, wider lanes, wider and paved shoulders; upgrading roads from two lanes to four lanes; improved road markings; improved signage and delineation at curves; and, improved intersection design.

FEDERAL TRANSPORTATION FUNDING IN NORTH DAKOTA

The current federal surface transportation program, which expires in 2020, falls far short of providing the level of funding needed to meet the nation's highway and transit needs. Boosting federal surface transportation spending will require that Congress provide a long-term and sustainable source of funding to support the federal Highway Trust Fund.

- Signed into law in December 2015, the [Fixing America's Surface Transportation Act \(FAST Act\)](#), provides modest increases in federal highway and transit spending, allows states greater long-term funding certainty and streamlines the federal project approval process. But, the FAST Act, which

expires in 2020, does not provide adequate funding to meet the nation's need for highway and transit improvements and does not include a long-term and sustainable funding source.

- Crafting a long-term federal highway and transit program to replace the expiring FAST Act in 2020 would likely require Congress to identify a long-term, sustainable source of funding to support increased funding for the federal Highway Trust Fund, which currently has a balance of \$44 billion, but which is expected to reach a negative balance by 2021.

TRANSPORTATION AND ECONOMIC GROWTH IN NORTH DAKOTA

The efficiency of North Dakota's transportation system, particularly its highways, is critical to the state's economy. A key component in business efficiency and success is the level and ease of access to customers, markets, materials and workers. The design, construction and maintenance of infrastructure in North Dakota are significant sources of employment in the state.

- Annually, \$106 billion in goods are shipped to and from sites in North Dakota, mostly by truck.
- Seventy-four percent of the goods shipped annually to and from sites in North Dakota are carried by trucks and another 11 percent are carried by courier services or multiple mode deliveries, which include trucking.
- The design, construction and maintenance of transportation infrastructure in North Dakota support 13,258 full-time jobs across all sectors of the state economy. These workers earn \$667 million annually.
- Approximately 215,200 full-time jobs in North Dakota in key industries like energy, tourism, retail sales, agriculture and manufacturing are completely dependent on the state's transportation infrastructure network.
- Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system. Highway accessibility was ranked the number one site selection factor in a 2017 survey of corporate executives by [Area Development Magazine](#). Labor costs and the availability of skilled labor, which are both impacted by a site's level of accessibility, were rated second and third, respectively.

Sources of information for this report include the Federal Highway Administration (FHWA), the North Dakota Department of Transportation (NDDOT), the American Association of State Highway and Transportation Officials (AASHTO), the Bureau of Transportation Statistics (BTS), the U. S. Census Bureau, the Congressional Budget Office (CBO), the General Accounting Office (GAO), the Texas Transportation Institute (TTI), the American Road & Transportation Builders Association (ARTBA) and the National Highway Traffic Safety Administration (NHTSA). All data used in the report are the most recent available.

Introduction

North Dakota's roads, highways and bridges form vital transportation links for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping, natural resources and recreation. Modernizing North Dakota's transportation system will be critical to support future economic development in the Peace Garden State.

Supporting quality of life and a robust economy in North Dakota requires that the state provide a safe, efficient and well-maintained transportation system. Inadequate transportation investment, which will result in deteriorated transportation facilities and diminished access and safety, will negatively affect economic competitiveness and reduce access and mobility in North Dakota.

To maintain its level of economic competitiveness and achieve further economic growth, North Dakota will need to maintain and modernize its roads, highways and bridges by improving the physical condition of the transportation network and enhancing the system's ability to provide efficient, reliable and safe mobility for residents, visitors and businesses. Making needed improvements to North Dakota's roads, highways, and bridges could also provide a significant boost to the state's economy by creating long-term jobs as a result of enhanced mobility and access.

This report examines the condition, use and safety of North Dakota's roads, highways and bridges and future mobility needs. Sources of information for this report include the North Dakota Department of Transportation (NDDOT), the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), the Bureau of Transportation Statistics (BTS), the U.S. Census Bureau, the Texas Transportation Institute (TTI), the American Road & Transportation Builders Association (ARTBA), the General Accounting Office (GAO) and the National Highway Traffic Safety Administration (NHTSA).

Population, Travel and Economic Trends

North Dakota residents and businesses require a high level of personal and commercial mobility.

Population increases and economic growth in North Dakota have resulted in an increase in vehicle miles of travel (VMT) and an increase in the demand for mobility. To foster quality of life and spur continued economic growth in North Dakota, it will be critical that the state provide a safe and modern transportation system that can accommodate future growth in population, tourism, business, recreation and vehicle travel.

North Dakota's population grew to approximately 755,000 residents in 2017, an 18 percent increase since 2000.¹ North Dakota had 555,935 licensed drivers in 2016.² North Dakota's population is expected to increase by 38 percent by 2040 to 1,045,000, an increase of 290,000 people.³

Largely as a result of the state's energy boom and its subsequent modest decline, North Dakota experienced the nation's greatest rate of economic and vehicle travel growth from 2000 to 2014 and the nation's greatest rate of reduction in economic output and vehicle travel from 2014 to 2016.

As a result of advancements in energy extraction techniques combined with increasing energy prices, Western North Dakota experienced a significant energy boom that resulted in a ten-fold increase in crude oil production in the state from 2005 to 2015. Crude oil production in North Dakota increased from 98 thousand barrels a day in 2005 to 1.17 million barrels per day in 2015 before declining to 1.03 and 1.06 million barrels per day in 2016 and 2017, respectively.⁴

From 2000 to 2014, North Dakota's gross domestic product (GDP), a measure of the state's economic output, increased by 133 percent, when adjusted for inflation, the highest rate in the nation during that time.⁵ From 2014 to 2016, North Dakota's GDP decreased by seven percent, when adjusted for inflation, the greatest rate of decline in the nation during that time.⁶

Vehicle miles traveled (VMT) in North Dakota increased by 46 percent from 2000 to 2014, the greatest rate of increase in the nation during that time.⁷ From 2014 to 2016, VMT in North Dakota decreased by seven percent, the greatest decrease in VMT during this period in the nation.⁸

Condition of North Dakota's Roads

The life cycle of North Dakota's roads is greatly affected by the state and local governments' ability to perform timely maintenance and upgrades to ensure that road and highway surfaces last as long as possible.

The pavement data in this report, which is for all arterial and collector roads and highways, is provided by the Federal Highway Administration (FHWA), based on data submitted annually by NDDOT on the condition of major state and locally maintained roads and highways. Pavement data for Interstate highways and other principal arterials is collected for all system mileage, whereas pavement data for minor arterial and all collector roads and highways is based on sampling portions of roadways as prescribed by FHWA to insure that the data collected is adequate to provide an accurate assessment of pavement conditions on these roads and highways.

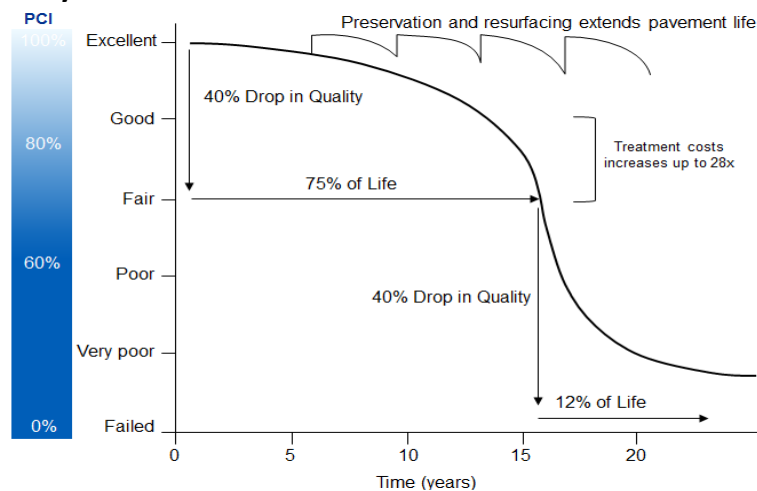
Statewide, more than one-third of North Dakota's major urban roads are in poor condition. Thirty-six percent of North Dakota's major locally and state-maintained urban roads are in poor condition and 28 percent are in mediocre condition.⁹ Eleven percent are in fair condition and the remaining 25 percent are in good condition.¹⁰

Eight percent of North Dakota's major locally and state-maintained rural roads and highways have pavements rated in poor condition and 15 percent are in mediocre condition.¹¹ Thirteen percent of North Dakota's major rural roads are rated in fair condition and the remaining 64 percent are rated in good condition.¹²

The average annual miles of roads resurfaced or reconstructed by the NDDOT will decrease by 24 percent from 2015-2018 to 2019-2022 from 749 miles to 566 miles, largely due to the lack of an adequate, dedicated state funding source for roadways.¹³ NDDOT estimates that the miles of state-maintained roads in poor condition will nearly double from 2018 to 2021, from 443 miles to 872 miles.¹⁴

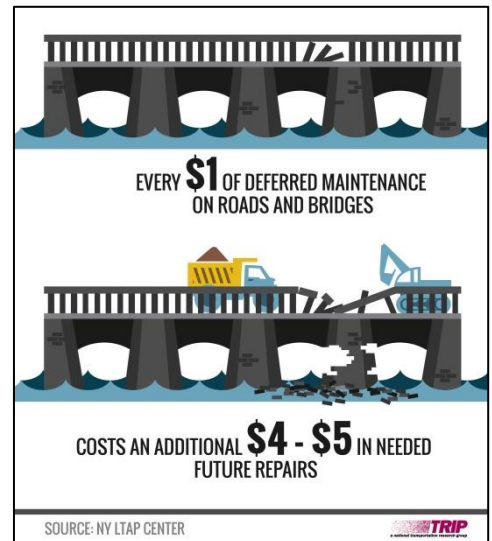
Pavement failure is caused by a combination of traffic, moisture and climate. Moisture often works its way into road surfaces and the materials that form the road's foundation. Road surfaces at intersections are even more prone to deterioration because the slow-moving, turning or stopping loads occurring at these sites subject the pavement to higher levels of stress. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.¹⁵ As roads and highways continue to age, they will reach a point of deterioration where routine paving and maintenance will not be adequate to keep pavement surfaces in good condition and costly reconstruction of the roadway and its underlying surfaces will become necessary.

Chart 1. Pavement Condition Cycle Time with Treatment and Cost



Source: North Carolina Department of Transportation (2016). 2016 Maintenance Operations and Performance Analysis Report

Long-term repair costs increase significantly when road and bridge maintenance is deferred, as road and bridge deterioration accelerates later in the service life of a transportation facility and requires more costly repairs. A [report on maintaining pavements](#) found that every \$1 of deferred maintenance on roads and bridges costs an additional \$4 to \$5 in needed future repairs.¹⁶



The Costs to Motorists of Roads in Deteriorated Condition

TRIP has calculated the additional cost to motorists of driving on roads in poor, mediocre or fair condition. When roads are in poor, mediocre or fair condition – which may include potholes, rutting or rough surfaces – the cost to operate and maintain a vehicle increases. These additional vehicle operating costs (VOC) include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear. TRIP estimates that additional VOC borne by North Dakota motorists as a result of deteriorated road conditions is \$250 million annually, or \$449 per driver.¹⁷

Additional vehicle operating costs have been calculated in the Highway Development and Management Model (HDM), which is recognized by the U.S. Department of Transportation and more than 100 other countries as the definitive analysis of the impact of road conditions on vehicle operating costs. The HDM report is based on numerous studies that have measured the impact of various factors, including road conditions, on vehicle operating costs.¹⁸

The HDM study found that road deterioration increases ownership, repair, fuel and tire costs. The report found that deteriorated roads accelerate the pace of depreciation of vehicles and the need for repairs because the stress on the vehicle increases in proportion to the level of roughness of the pavement surface.

Similarly, tire wear and fuel consumption increase as roads deteriorate since there is less efficient transfer of power to the drive train and additional friction between the road and the tires.

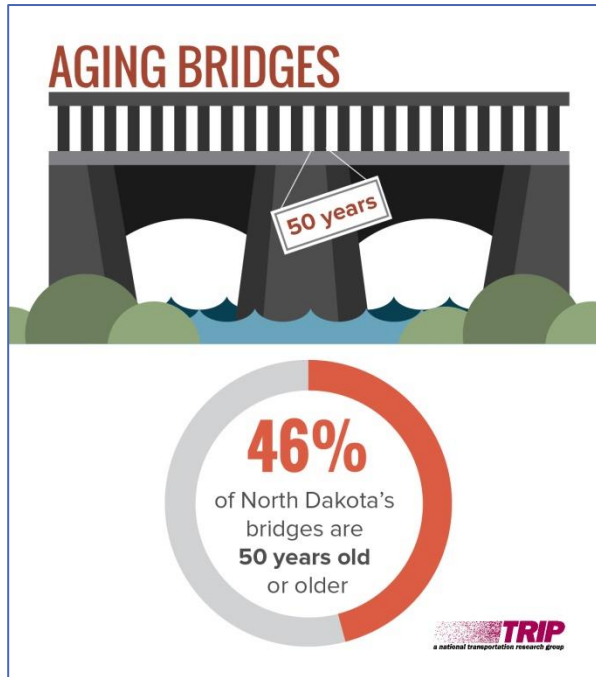
TRIP's additional VOC estimate is based on taking the average number of miles driven annually by a motorist, calculating current VOC based on AAA's 2017 VOC and then using the HDM model to estimate the additional VOC paid by drivers as a result of substandard roads.¹⁹ Additional research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored in to TRIP's vehicle operating cost methodology.

Bridge Conditions in North Dakota

North Dakota's bridges form key links in the state's highway system, providing communities and individuals access to employment, schools, shopping and medical facilities, and facilitating commerce and access for emergency vehicles.

Fourteen percent of North Dakota's locally and state-maintained bridges are rated as structurally deficient.²⁰ A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are structurally deficient may be posted for lower weight limits or closed if their condition warrants such action. Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid posted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy. The Federal Highway Administration estimates that it would cost \$164 million to replace or rehabilitate all structurally deficient bridges in North Dakota.²¹

The average number of bridges that NDDOT is able to reconstruct or replace annually will decrease by 46 percent from 2015-2018 to 2019-2022 (from an average of 16.75 bridges annually to an average of nine), largely due to reduced energy-related revenue.²²



Most bridges are designed to last 50 years before major overhaul or replacement, although many newer bridges are being designed to last 75 years or longer. In North Dakota, 46 percent of the state's bridges (2,030 of 4,377) were built in 1969 or earlier.²³

The service life of bridges can be extended by performing routine maintenance such as resurfacing decks, painting surfaces, insuring that a facility has good drainage and replacing deteriorating components. But, most bridges

will eventually require more costly reconstruction or major rehabilitation to remain operable.

A recent survey conducted for a [report by the US. General Accountability Office](#) (GAO) found that more than half of states surveyed (14 out of 24) indicated that inadequate funding was a challenge to their ability to maintain their bridges in a state of good repair.²⁴ The GAO report found that the increase in the number and size of bridges that are approaching the limits of their design life will likely place a greater demand on bridge owners in the near future, making it more difficult to mitigate issues in a cost-effective manner.²⁵

Traffic Safety in North Dakota

A total of 643 people were killed in North Dakota traffic crashes from 2013 to 2017, an average of 128 fatalities per year.²⁶

Chart 2. Traffic Fatalities in North Dakota from 2013 – 2017.

Year	Fatalities
2013	148
2014	135
2015	131
2016	113
2017	116
TOTAL	643

Source: National Highway Traffic Safety Administration, North Dakota Department of Transportation.

Three major factors are associated with fatal vehicle crashes: driver behavior, vehicle characteristics and roadway features. It is estimated that roadway features are likely a contributing factor in approximately one-third of fatal traffic crashes. Roadway features that impact safety include the number of lanes, lane widths, lighting, lane markings, rumble strips, shoulders, guard rails, other shielding devices, median barriers and intersection design.

North Dakota's overall traffic fatality rate of 1.16 fatalities per 100 million vehicle miles of travel in 2016 is lower than the national average of 1.18.²⁷ The traffic fatality rate on the state's rural roads is disproportionately high. The fatality rate on North Dakota's non-interstate rural roads in 2016 was more than four times higher than on all other roads in the state (1.79 fatalities per 100 million vehicle miles of travel vs. 0.42).²⁸

Improving safety on North Dakota's roadways can be achieved through further improvements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and a variety of improvements in roadway safety features.

The severity of traffic crashes could be reduced through roadway improvements, where appropriate, such as removing or shielding obstacles; adding or improving medians; the use of high-friction surfacing treatments to improve skid resistance; improved lighting; adding rumble strips, wider lanes, wider

and paved shoulders; upgrading roads from two lanes to four lanes; improved road markings; improved signage and delineation at curves; and, improved intersection design.

Roads with poor geometry, with insufficient clear distances, without turn lanes, having inadequate shoulders for the posted speed limits, or poorly laid out intersections or interchanges, pose greater risks to motorists, pedestrians and bicyclists.

Investments in rural traffic safety have been found to result in significant reductions in serious traffic crashes. A [2012 report by TTI](#) found that improvements completed recently by TxDOT that widened lanes, improved shoulders and made other safety improvements on 1,159 miles of rural state roadways resulted in 133 fewer fatalities on these roads in the first three years after the improvements were completed (as compared to the three years prior).²⁹ TTI estimates that the improvements on these roads are likely to save 880 lives over 20 years.³⁰

Transportation Funding and Needed Projects in North Dakota

Additional transportation investment made available in North Dakota, largely due to increased energy-related state revenues, have allowed many needed road, highway and bridge projects to proceed. But, with the amount of energy-related revenues available for transportation decreasing combined with the lack of an adequate, dedicated state funding source for roadways, North Dakota faces a significant shortfall in funding needed for further transportation improvements.

From 2012 to 2018, \$3 billion in state energy-related revenue was spent on transportation improvements in North Dakota.³¹ Energy-related revenue in North Dakota used for transportation increased from \$216 million in 2012 to \$619 million in 2017, then dropped to \$194 million in 2018.³² The \$3 billion in energy-related revenue used for transportation in North Dakota represents 63 percent of the \$4.8 billion in state revenue for the North Dakota Department of Transportation (NDDOT), from 2012 to 2018.³³

North Dakota faces a \$2.5 billion shortfall from 2018 to 2023 in transportation funding needed to improve road, highway and bridge conditions, support economic development opportunities, and improve roadway safety.³⁴ NDDOT expects to have \$1.25 billion dollars available for road, highway and bridge repairs and improvements from 2018 to 2023 but should be spending \$3.79 billion during this period to adequately improve the condition of its roads, highways and bridges, make improvements needed to support economic development, and improve roadway safety.³⁵

Largely as a result of increased funding, NDDOT has been able to proceed with numerous projects to improve the condition, safety and reliability of its roads, highways and bridges.

The chart below details North Dakota transportation projects that have been completed, are underway, or will be completed by 2021 because of increased state transportation funding.

Chart 3. Projects that have been completed, are underway, or will be completed by 2021, largely due to increased energy-related state revenue

Route / Facility Description	Describe Improvement/Type of Work	Completion Date	Benefit of Project
US 85 - WILLISTON PERMANENT TRUCK RELIEVER ROUTE - Lake View Drive north to Jct. US Highway 2	New Construction	2018	Congestion, economic development, safety
ND 23 - WATFORD CITY BYPASS - SOUTHEAST (SE)	New Construction	2017	Congestion, economic development, safety
US 85 - WATFORD CITY BYPASS - SOUTHWEST (SW)	New Construction	2016	Congestion, economic development, safety
US 85 4-LANE WATFORD CITY TO 1/2 MILE WEST OF COUNTY ROAD 27 (REDWING ROAD)	New Construction / Widening	2018	Congestion, economic development, safety
US 85 4-LANE 1/2 MILE WEST OF COUNTY ROAD 27 (REDWING ROAD) TO SOUTH OF ALEXANDER	New Construction / Widening	2018	Congestion, economic development, safety
US 85 4-LANE - ALEXANDER BYPASS	New Construction	2018	Congestion, economic development, safety
US 85 4-LANE NORTH OF ALEXANDER TO Junction US 2	New Construction / Widening	2019	Congestion, economic development, safety
ND 22 - DICKINSON NW BYPASS	New Construction	2017	Congestion, economic development, safety
ND 22 -EXIT 56 - DICKINSON NW BYPASS	New Interchange	2016	Congestion, economic development, safety
DICKINSON RAILROAD GRADE SEPARATION	New Structure	2017	Congestion, economic development, safety
US 2 - WILLISTON INTERSECTION OF US 2 & 18TH ST	New Structure	2017	Congestion, economic development, safety
ND 23 - 7th St-Watford City-E to Near Jct. ND 22	Reconstruction	2018	Congestion, economic development, safety
ND 23 - KEENE CORNER - CO RD 10 & CO RD 55	Rehabilitation / Widening / Roundabout	2017	Congestion, economic development, safety, preservation
ND 23 - Jct ND 1804 to East Ave in New Town (Main St)	Reconstruction	2017	Congestion, economic development, safety
ND 23 - East Ave (New Town) to New Town NE TRR	Rehabilitation / Widening	2017	Congestion, economic development, safety
ND 23 - New Town NE TRR to ND 8	Rehabilitation / Widening	2016	Congestion, economic development, safety
ND 23 - ND 8 to Jct. 28 to Jct. ND 83	Rehabilitation / Widening	2015	Congestion, economic development, safety
ND 1804 - JCT ND 23 TO County Road 5	Reconstruction	2016	Congestion, economic development, safety
ND 1804 - CNTY RD 5 TO JCT TIOGA RD - CNTY RD 21	Rehabilitation / Widening	2020	Congestion, economic development, safety, preservation
ND 1804 - JCT TIOGA RD W TO County Road 42 - Epping	Rehabilitation / Widening	2021	Congestion, economic development, safety, preservation
ND 1804 - CO Rd 42 (123rd Ave NW)-Epping W to 131st Ave NW	Rehabilitation / Widening	2019	Congestion, economic development, safety, preservation
ND 1804 - 131st Ave NW to Temporary NE TRR	Reconstruction	2019	Congestion, economic development, safety
US 85 - Long X Bridge	Structure Replacement	2021	Congestion, economic development, safety
ND 200 - JCT US 85 E TO JCT ND 22 - KILLDEER	Rehabilitation / Widening	2018	Congestion, economic development, safety, preservation
ND 22 - DICKINSON N TO ND 23	Rehabilitation / Widening	2018	Congestion, economic development, safety, preservation

Source: North Dakota Department of Transportation

The chart below details needed transportation projects in the state that lack adequate state funding to proceed.

Chart 4. Needed projects that lack sufficient funding to proceed.

Route / Facility Description	County	Improvement / Type of Work	Benefit of Project
I-94 (E ND 25 E TO GRANT MARSH BRIDGE)	Morton	Rehabilitation	Preservation
I-94 (CO LN E TO DAWSON)	Kidder	Rehabilitation	Preservation
1806 (NEAR FT RICE TO MANDAN)	Morton	Rehabilitation	Preservation
E DAWSON INTR TO CRYSTAL SPRINGS	Kidder	Rehabilitation	Preservation
US-281 (TWP LINE N ELLENDALE TO JCT ND 46)	Dickey	Rehabilitation	Preservation
US-281 (STATE LINE N TO TWP LINE)	Dickey	Rehabilitation	Preservation
ND 20 (N JCT 17 TO E JCT 5 - CLYDE)	Cavalier	Rehabilitation	Preservation
ND-1 (NEKOMA SEPARATION)	Cavalier	Rehabilitation	Preservation
ND 6 - ST LN TO SELFRIDGE	Sioux	Rehabilitation	Preservation
ND 6 -SELFRIDGE N TO W JCT BIA 7-PORCUPINE	Sioux	Rehabilitation / Widening	Preservation, Safety
US 83 - 9TH ST (BISMARCK EXPY TO FRONT AV)	Burleigh	Rehabilitation	Preservation
US 83 - 7TH ST (FRONT AV TO BISMARCK EXPY)	Burleigh	Reconstruction	Preservation
ND 200 - E JCT 52-CARRINGTON E TO JCT 20	Foster	Rehabilitation / Widening	Preservation, Safety
I-94 - SOUTH HEART TO E DICKINSON INTR	Stark	Rehabilitation	Preservation
I-29 - N BOWESMONT TO CANADIAN LINE	Pembina	Rehabilitation	Preservation
URBAN ROADS CITYWIDE SIGNAL REHAB	N/A	Signal Revision	Preservation
REGIONAL CITYWIDE SIGNAL REHAB	N/A	Signal Revision	Preservation
ND 73 - JOHNSONS CORNER E TO JCT 22	McKenzie	Rehabilitation / Widening	Preservation, Safety
US 2 W FRONTAGE RD(CHINAMAN COULEE)	Williams	Structure	Preservation
I-94 - NEAR W FARGO E TO W HORCE RD - WB	Cass	Rehabilitation	Preservation
I-94 - NEAR W FARGO E TO W HORCE RD - EB	Cass	Rehabilitation	Preservation
ND-5 (E JCT 40-COLUMBUS-E TO W JCT 52)	Burke	Rehabilitation	Preservation
I-94 (I-29 TO 25TH ST. INTERCHANGE)	Cass	Rehabilitation	Preservation, Operations

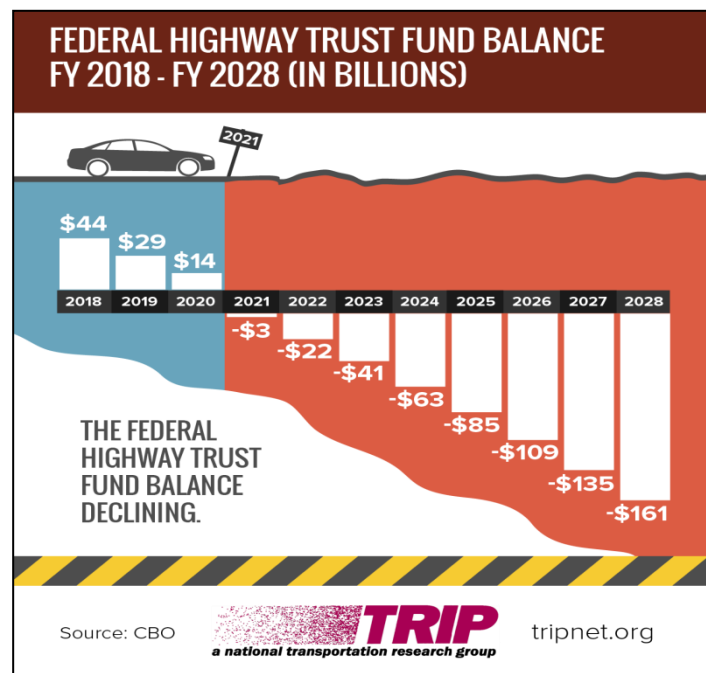
Source: North Dakota Department of Transportation

Federal Transportation Funding

Investment in North Dakota's roads, highways and bridges is funded by local, state and federal governments. A lack of sufficient funding at all levels will make it difficult to adequately maintain and improve the state's existing transportation system.

The federal government is a critical source of funding for North Dakota's roads, highways, bridges and transit systems and provides a significant return in road and bridge funding based on the revenue generated in the state by the federal motor fuel tax.

Most federal funds for highway and transit improvements in North Dakota are provided by federal highway user fees, largely an 18.4 cents-per-gallon tax on gasoline and a 24.4 cents-per-gallon tax on diesel fuel. Since 2008 revenue into the federal Highway Trust Fund has been inadequate to support legislatively set funding levels so Congress has transferred approximately \$53 billion in general funds and an additional \$2 billion from a related trust fund into the federal Highway Trust Fund.³⁶



Signed into law in December 2015, the [Fixing America's Surface Transportation Act \(FAST Act\)](#), provides modest increases in federal highway and transit spending. The five-year bill also provides states with greater funding certainty and streamlines the federal project approval process. But, the FAST Act does not provide adequate funding to meet the nation's need for highway and transit improvements and does not include a long-term and sustainable funding source. Crafting a long-term federal highway and transit program to replace the FAST Act, which expires in 2020, would likely require Congress to identify a long-term, sustainable source of revenue to support increased funding for the federal Highway Trust Fund. The federal Highway Trust Fund currently has a balance of \$44 billion, but is expected to reach a negative balance by 2021.³⁷

The five-year, \$305 billion FAST Act will provide a boost of approximately 15 percent in highway funding and 18 percent in transit funding over the duration of the program, which expires in 2020.³⁸ In addition to federal motor fuel tax revenues, the FAST Act will also be funded by \$70 billion in U.S. general

funds, which will rely on offsets from several unrelated federal programs including the Strategic Petroleum Reserve, the Federal Reserve and U.S. Customs.

President Trump's \$1.5 trillion infrastructure plan, released in February 2018, called for \$200 billion in new federal grants and loans over 10 years but would require state and local governments and the private sector to raise the additional \$1.3 trillion. Congress has not yet crafted a transportation program in response to the Trump proposal and would need to identify a long-term, sustainable source of funding to support increased funding for the federal Highway Trust Fund.

Importance of Transportation to Economic Growth

Today's culture of business demands that an area have well-maintained and efficient roads, highways and bridges if it is to remain economically competitive. Global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement, making the quality of a region's transportation system a key component in a business's ability to compete locally, nationally and internationally.

Businesses have responded to improved communications and the need to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and e-commerce. The result of these changes has been a significant improvement in logistics efficiency as firms move from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. These improvements have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

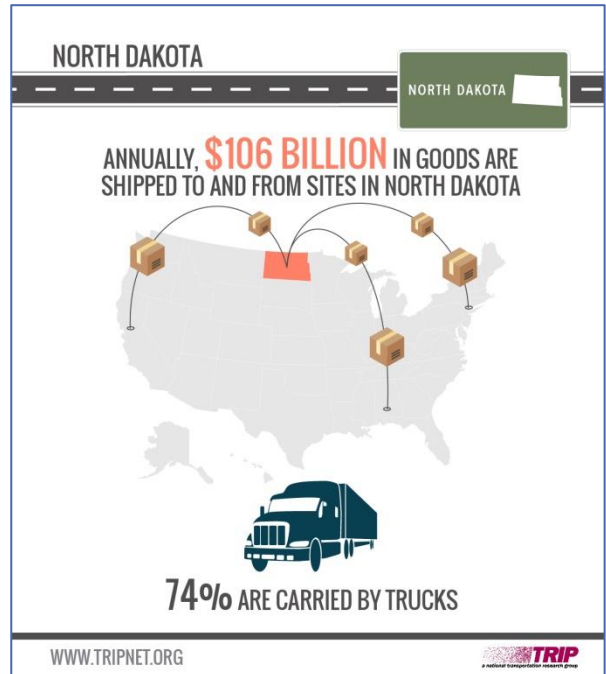
Highways are vitally important to continued economic development in North Dakota, particularly to the state's manufacturing, agriculture and tourism industries. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn,

manufacturers ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads.

Every year, approximately \$106 billion in goods are shipped to and from sites in North Dakota, mostly by trucks.³⁹ Seventy-four percent of the goods shipped annually to and from sites in North Dakota are carried by trucks and another 11 percent are carried by courier services or multiple-mode deliveries, which include trucking.⁴⁰

The design, construction and maintenance of transportation infrastructure in North Dakota play a critical role in the state's economy, supporting the equivalent of 13,258 full-time jobs across all sectors of the state economy, earning these workers approximately \$667 million annually.⁴¹ These jobs include 6,605 full-time jobs directly involved in transportation infrastructure construction and related activities as well as 6,653 full-time jobs as a result of spending by employees and companies in the transportation design and construction industry.⁴²

Transportation construction in North Dakota annually contributes an estimated \$122 million in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.⁴³ Approximately 215,200 full-time jobs in North Dakota in key industries like energy, tourism, retail sales, agriculture and manufacturing are completely dependent on the quality, safety and reliability of the state's transportation infrastructure network. These workers earn \$10 billion in wages and contribute an estimated \$1.8 billion in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.⁴⁴



The cost of road and bridge improvements are more than offset by the reduction of user costs associated with driving on rough roads, the improvement in business productivity, the reduction in delays and the improvement in traffic safety. The [Federal Highway Administration estimates](#) that each dollar spent on road, highway and bridge improvements results in an average benefit of \$5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.⁴⁵

Local, regional and state economic performance is improved when a region's surface transportation system is expanded or repaired. This improvement comes as a result of the initial job creation and increased employment created over the long-term because of improved access, reduced transport costs and improved safety.

Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system. Highway accessibility was ranked the number one site selection factor in a 2017 survey of corporate executives by [Area Development Magazine](#). Labor costs and the availability of skilled labor, which are both impacted by a site's level of accessibility, were rated second and third, respectively.⁴⁶

Conclusion

North Dakota's ongoing energy boom, despite its recent modest slowdown, has resulted in a tremendous increase in economic activity in the state that has provided North Dakota with both tremendous opportunities and tremendous challenges. Providing a modern transportation system in North Dakota will require that investment in the state's roads, highways and bridges is increased to close the significant shortfall in needed funding. With energy-related transportation revenue decreasing and the Trump

administration's funding proposal calling for additional state and local funding to be leveraged by federal funding, North Dakota will be called on to increase its investment in its transportation system.

If North Dakota is unable to provide an adequate level of transportation investment, it risks threatening the state's quality of life with a transportation system that lacks adequate resources to ensure that the growing economy is supported by an efficient, safe and well-maintained transportation system.

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ENDNOTES

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