North Texas Multimodal Operations, Velocity, Efficiency, and Safety (MOVES) Program

FY2019

Attachment 1 – Cover Page and Project Narrative

North Central Texas Council of Governments

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1.0 Project Description

The North Central Texas Council of Governments (NCTCOG) and its partners, Dallas Area Rapid Transit (DART), Trinity Metro (TM) and Trinity Railway Express (TRE) are pleased to submit this application for a Better Utilizing Investments to Leverage Development (BUILD) discretionary grant for rail improvements on the commuter rail network owned by DART and operated by DART, TM and the Trinity Railway Express commuter service. ***The North Texas Multimodal Operations, Velocity, Efficiency, and Safety Program (NT MOVES) is a long-range plan for increasing freight and passenger mobility in Dallas–Fort Worth (DFW) through strategic investment in rail capacity to improve multimodal transportation.***

NT MOVES is an emerging program of road and railway improvements in the DFW region intended to enhance freight and passenger mobility across all modes. Projects in NT MOVES have been identified by NCTCOG and their regional rail partners. The projects, the subject of this application, are located on the DART/TM-owned corridor between Dallas and Fort Worth on TRE rail line. NT MOVES also contemplates future grade separations and capacity improvements on the roads and highways across the region, with which those rail lines interact. The deliberate, technical approach via rail simulation computer modeling that yielded this portfolio of projects has been adopted by the regional rail partners and demonstrates the interdependency of these projects. Rail Traffic Controller (RTC) software was used with input from the Texas Department of Transportation (TxDOT) and the regional rail partners in addition to model simulations completed by the NCTCOG Travel Demand Model. Rail operation simulations were completed to determine the projects most needed to relieve freight congestion. By modeling current and future freight and passenger demands along regional corridors, the highest priority projects were identified that would allow the best path forward.

The following **NT MOVES** projects highlight four components in a commuter and freight rail corridor connecting Dallas and Fort Worth in North Central Texas. The project's components include:

- **Double-tracking and replacement of three single-tracked bridges** that are past their useful life;
- **2.5 miles of second track** in two locations in the corridor;
- **A new station** as an anchor for new transit-oriented development;
- **New Technology** to design and develop a concept of operations for this traffic management application; and
- **Shore Connection System** to power locomotives in the yard to prevent idling.

The components will be completed through the following projects:
Double track TRE near new Trinity Lakes Station and Construct Station. Please see **Exhibit 1**. Construct 1.3 miles of a new second track from existing TRE Richland Hills Station (MP 618.7) to just east of proposed Trinity Lakes Station (MP 620.0). There are no bridges or at-grade crossings in this segment. Construct new station platforms and canopies, install ticket vending machines and associated pedestrian components. This cost does not include parking and other

station access components that will be funded outside of the grant. See photo of future transit-oriented development site that follows. *This project has been pursued previously as part of a BUILD grant submitted by NCTCOG in 2018.*

Exhibit 1: Future Trinity Lakes Station Transit-Oriented Development

- **Double Track Medical Market Center to Stemmons Freeway (Exhibits 2, 3, and 4)** Replace existing culvert and Obsession Bridge, Inwood Bridge, and Knight's Branch Bridge with new doubletrack structures and construct 1.2 miles of doubletrack from Medical Market Center (MP 640.7) to Stemmons Freeway Bridge (MP 639.5). ***This project has been pursued previously as part of a BUILD grant submitted by NCTCOG in 2018 and is being submitted for simultaneous consideration under the 2019 State of Good Repair and INFRA Grant Program.*** Preliminary engineering of this project is complete, and it is eligible for a NEPA Categorical Exclusion.

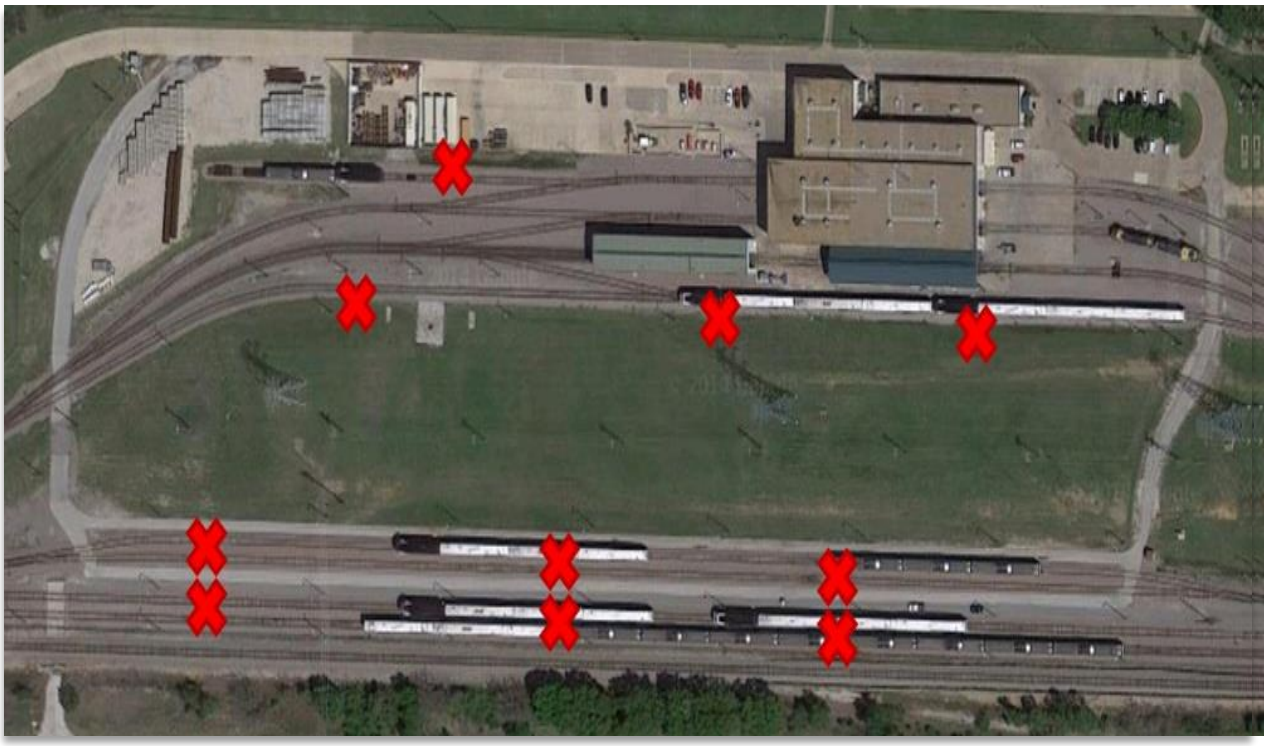
Exhibit 2: DT Medical Market Center to Stemmons Freeway, Inwood Bridge

Exhibit 3: Medical Market Center to Stemmons Freeway, Knights Branch Bridge

Exhibit 4: Medical Market Center to Stemmons Freeway, Obsession Bridge

Shore Connection System (also known as wayside power or yard power) that allows nine (9) locomotives to "plug into" an electrical power source instead of using the diesel engines while in the rail yard. Please see **Exhibit 5**. This project entails the installation of 10 wayside cabinets along the tracks at TRE's equipment maintenance facility that will provide electrical power to the Head End Power (HEP) engines.

Exhibit 5: 10 Wayside Cabinet Locations at TRE's Equipment Facility



- **ClearPath™ - Design and develop a concept of operations for this rail traffic management application** and implement the hardware and software backbone structure of ClearPath™ Technology, enormously successful in the nation's busiest freight rail hub, Chicago. ClearPath™ Technology will empower all agencies and users of the DFW metroplex rail system to exchange timely, accurate, and actionable information on train movements in the terminal complex. This project was previously included in the 2019 INFRA grant application.

The **NT MOVES** projects are being submitted by the Regional Transportation Council (RTC) of the North Central Texas Council of Governments. The RTC is the independent policy body of 44 elected or appointed officials for the Metropolitan Planning Organization (MPO) of the DFW region. The RTC is coordinating with DART and the Fort Worth Transportation Authority (Trinity Metro) to complete the components of the NT MOVES projects to improve service in this rail corridor, consistent with the MPO's transit improvement recommendations in Mobility 2045: The Metropolitan Transportation Plan for North Central Texas.

The TRE is a 34-mile **commuter rail corridor** in the Dallas–Fort Worth Metroplex established by an interlocal agreement between DART and Trinity Metro. Please see **Exhibit 6**. Each transit authority owns approximately a 50% stake in the joint commuter rail system, which began operating in December 1996. The TRE currently provides passenger rail services to more than

two million annual riders. The TRE serves passengers between an eastern terminus in Downtown Dallas at Union Station to a western terminus in Downtown Fort Worth at the Fort Worth Intermodal Transportation Center and T&P Stations. As reported in the 2017 American Public Transportation Association Public Transportation Fact Book, the TRE is the fifteenth most-ridden commuter rail system in the United States. In 2016, the TRE carried 2,054,001 passengers.

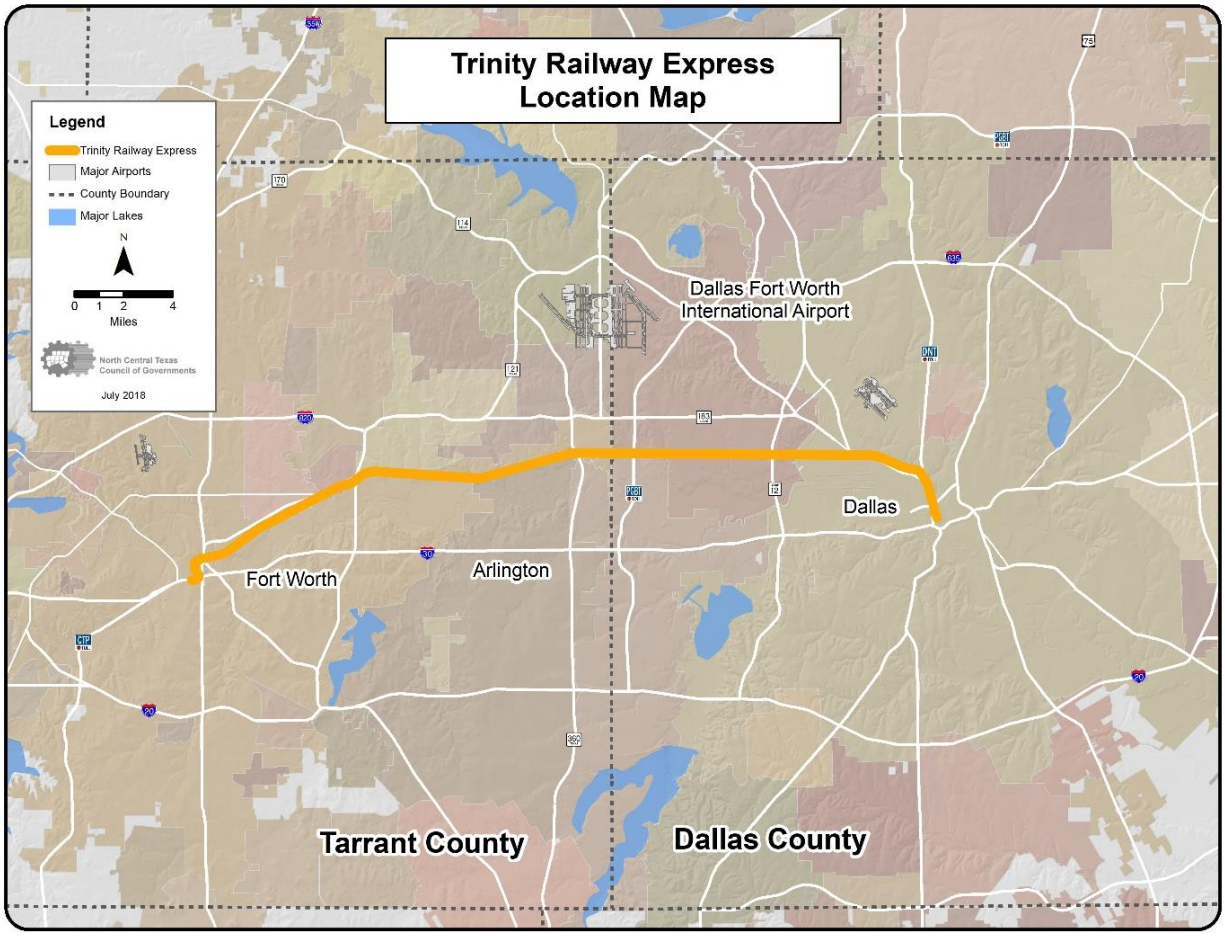


Exhibit 6: Location of the TRE Corridor

The TRE corridor also **accommodates Amtrak and freight movement** in the region. BNSF Railway (BNSF), Union Pacific Railroad (UPRR) and regional short-line carriers Fort Worth & Western (FWWR) and Dallas Garland Northeastern (DGNO) operate freight on the TRE commuter line through agreements with the TRE. The corridor is a mix of single- and double-track and has limited sidings. Rail traffic on the TRE is bidirectional with an average daily train count of 95, of which approximately 70 are passenger trains.

The multiple components of the NT MOVES Program have been combined into one application as the components are interdependent and provide a foundation for the benefits outlined in

this grant application. Where possible, the benefits and costs for each component have been calculated separately. However, so that we may provide a benefit significant to the region, the components do not have independent utility sufficient to warrant a standalone application. All components impact the same corridor and improvements to headway and connectivity, described below, rely on all components of the project proceeding at the same time.

1.2 Project History and Context

The North Texas MOVES program is a unique multimodal public-private funding partnership to improve rail and roadway transportation in the region. The program was born from the Texas Freight Mobility Plan and a TxDOT initiative to improve freight and passenger rail mobility in the DFW region. The computer simulation modeling completed by NCTCOG and the computer simulation modeling performed under the TxDOT study indicates the necessity of the rail capacity improvements identified in this application to ensure near-term fluidity of freight movement across the publicly-owned rail network. TxDOT's modeling indicates the public network investment must accompany BNSF's planned capacity improvements to protect the public benefits generated by the BNSF investment. It is also appropriate to consider the DFW complex as a central node in BNSF's Texas freight network, with fluidity of freight operations over the publicly-owned network as vital to its overall health and successful growth.

1.3 Transportation Challenges Addressed

The NT MOVES program creates a unique opportunity for the Dallas-Fort Worth region to implement an innovative and efficient means for addressing urban transportation needs while balancing costs and impacts to the community and to the environment. ***The projects are anticipated to significantly help relieve congestion; enhance mobility, connectivity, and reliability; improve regional air quality; and improve safety along the TRE/BNSF corridors***.

1.3.1 Relieving Congestion

Rail congestion is an ongoing and critical issue impacting the movement of goods and passengers in the DFW region. NT MOVES projects submitted in this grant focus on the congestion entangling the TRE and DFW rail subdivisions. This subdivision is already experiencing high levels of congestion due to the unique capital investment and operating environment of a Class I railroad on a publicly-owned commuter route. Rail improvements on the public network are needed now to curb future congestion issues. The proposed projects for NT MOVES begin the process of reducing congestion by adding capacity, signaling and technology that benefits all users of these corridors.

The components of this project will address needs for additional capacity on track infrastructure and bridges in this shared passenger and freight rail corridor. Some portions of the corridor are single-tracked while others have already been double-tracked. The project components strategically address the capacity constraints of a few locations and will have a positive impact on passenger and freight travel in this corridor by reducing passenger and freight delay. This corridor is important as a central connection between the downtowns of Dallas and Fort Worth and between key north-south freight corridor connections in the region.

1.3.2 Enhancing Mobility, Connectivity, and Reliability

The TRE and DFW subdivisions are a vital component of the regional long-range transportation plan (*Mobility 2045*, www.nctcog.org/trans/plan/mtp/2045). This corridor provides opportunities for a more efficient use of existing rail network and is a more appropriate response to growing environmental and fiscal constraints in addressing transportation needs. Improving freight rail mobility and reliability are important freight planning initiatives for the North Central Texas region. It is what lead to the creation of the NT MOVES program and is a notable component of *Mobility 2045*. As congestion grows and reliability of the roadways worsens, the role that rail plays in moving goods will become a greater economic driver in the future. Improvements to these corridors would 1) make higher speed movements available to all corridor users; 2) create opportunities to add new freight and passenger services; and 3) create revenue generation (from additional freight movement over the public network as well as passenger rail) to pay for ongoing corridor operation and maintenance needs.

1.3.3 Improving Air Quality

Ten counties in the Dallas-Fort Worth area are classified as nonattainment for ozone. While regional air quality has improved, the region still does not meet the federal standard. Failure to meet federal standards for air quality could result in additional emission control requirements that negatively affect local businesses. Transportation and diesel-powered locomotives are a significant source of air pollutants. The Shore Connection System would reduce locomotive idling in the TRE yard thereby reducing pollutants in the area.

The NT MOVES Program will improve the operations of both freight and passenger rail movements that will reduce emissions from traditional vehicle trips due to the mode shift. As congestion along the corridors is decreased, locomotive idling time can decline by several hours every day.

1.3.4 Enhancing Safety

Safety is a significant driver of all projects, both highway and rail. NT MOVES is focused on rail operational improvements that will reduce accidents and increase safety by upgrading older rail infrastructure and inducing a mode shift through additional passenger service. The improvements will also lessen the interaction between passenger and freight rail trains on a single shared-use track.

There are no planned grade separations in this application, however, the double tracking will result in more efficient movements throughout the corridor. A major benefit is the reduction in dwell time occupying at-grade crossings. The proposed improvements mean fewer encounters between cars, pedestrians and trains and faster response times for emergency vehicles that must cross the tracks to reach their destination. This is critical in smaller cities because of the limited number of rail crossings.

The planned improvements will result in mode shifts for both passenger and freight rail, resulting in fewer crashes on the surrounding highways. Streamlined freight operations, through rail expansion, are anticipated throughout the region, not just in the project corridor. This means more freight rail movements and fewer trucks on the highways, lessening the number of truck-involved incidents in the areas served by freight rail, near project improvement locations. Improved passenger rail operations will shift rail travel appeal consequently reducing the number of cars on the roadways and therefore fewer crashes in these areas.

In addition, the bridge replacements and rehabilitation included in this grant proposal will support an increase in the state of good repair and thus safety for rail assets in this region. With the rehabilitation, performance restrictions (speed limits for freight trains) currently in place can be removed. The three bridges to be replaced are past their useful life and there are two segments of the corridor with speed restrictions that will be removed after the improvements funded by this grant. The new bridges will have a useful life of fifty years.

1.3.5 Enhancing Economic Competitiveness (National and Regional Significance)

As the fourth largest metropolitan area in the US, the Dallas-Fort Worth region is responsible for one-third of the Gross Domestic Product of the State of Texas. The North Central Texas region is centrally located within the lower 48 states making it a logistical sweet spot for a primary distribution center, or inland port, for the southwestern US and the nation. Trucks leaving the region can reach most of the nation within 72 hours. This area is situated at the crossroads of east/west rail lines from the ports of Los Angeles/Long Beach to the eastern US and the north/south rail lines from Mexico and the Port of Houston to the Upper Midwest. Transporting freight is a key component of the regional economy. Over 380,000 tons of freight move to and from the region in a single year. Moving this much freight through the region requires a well-developed rail system. Three Class 1 railroads (BNSF, UPRR and KCS) and two short lines as well as the Trinity Railway Express and Amtrak operate in the region. A key component to this system is freight and passenger movement on the corridors identified in the NT MOVES program. In addition to the importance these corridors have to the success of rail movements in the North Central Texas area, there are state and national impacts as well, on the movement of goods across the country.

The grant proposal includes a new station at Trinity Lakes in Fort Worth. The North Central Texas region is in a period of intense growth, and new transit-oriented development at the Trinity Lakes Station will accommodate new transit riders that live, work and play at the new mixed-use development.

2.0 Project Location

The Dallas-Fort Worth metropolitan area is one of the fastest growing areas in the country. The population of the North Central Texas region has increased from 2.4 million in 1970 to over 7.2 million in 2017, an increase of 200 percent. A significant part of this growth has occurred in the project areas. **Exhibit 7** highlights both the past trends and future forecasts for population

growth within the adjoining cities along project corridors, Dallas County, Tarrant County and the 12-county NCTCOG Metropolitan Planning Area (MPA).

Exhibit 7: Population Trends in the Project Area

Location	1980 Census[1]	1990 Census[1]	2000 Census[1]	2010 Census[1]	2020 Forecast	2040 Forecast	Growth 2010-2040
Dallas	904,078	1,006,877	1,188,580	1,197,816	1,141,059	1,420,781	19%
Fort Worth	385,164	447,619	534,697	741,206	960,824	1,499,216	102%
Irving	109,943	155,037	191,615	216,290	259,186	301,541	39%
Tarrant County	860,880	1,170,103	1,446,219	1,809,034	2,020,278	3,094,649	71%
Dallas County	1,556,390	1,852,810	2,218,899	2,368,139	2,600,408	3,357,469	42%
NCTCOG MPA	**3,030,053**	**4,013,418**	**5,197,317**	**6,417,724**	**7,612,993**	**10,183,523**	**59%**

Notes:
All historical data derived from the 2010 US Census:
https://www.census.gov/programs-surveys/decennial-census/decade.2010.html
All future City data derived from the Texas Water Development Board, 2021 Regional Water Plan - Population Projections for 2020-2070 for Water User Groups by Region, County, and Basin in Texas:
http://www2.twdb.texas.gov/ReportServerExt/Pages/ReportViewer.aspx?%2fProjections%2f2022+Reports%2fpop_Region_search&rs:Command=Render.
All Future County data derived from:
https://data-nctcoggis.opendata.arcgis.com/datasets/2040-nctcog-demographic-forecast-tsz

While forecasted city populations are expected to slow as they approach build out within their jurisdictions, growth elsewhere in the region (particularly in Dallas County) and the strong economic draw of the area will continue to attract significant traffic surges over time. The projected high traffic growth for this corridor attributed to forecasted population increases for both adjacent cities and the North Central Texas region at-large.

NT MOVES projects for this grant are located in the State of Texas in Dallas County, Tarrant County, and the Dallas-Fort Worth-Arlington Urbanized Area. Dallas and Fort Worth serve as two urban anchors to this North Central Texas region. The Trinity Railway Express commuter railroad connects these two anchors and serves as a connection point to the Dallas Fort Worth International Airport.

On the west end of the corridor, the TRE has two stops in downtown Fort Worth. Over 45,000 employees work in downtown Fort Worth where there are more than 13 million square feet of office space, over 2,500 hotel rooms, and more than 7,500 downtown residents (www.dfwi.org). Residents and employees in downtown Fort Worth may connect to DFW International Airport (DFW Airport) using the TRE, and travelers coming to downtown Fort Worth may connect to additional destinations using Trinity Metro's downtown circulator, *Molly the Trolley*, the bus network, bike share, and transportation network companies. Downtown Fort Worth is also a

connection point for TEXRail commuter rail service, serving northern Forth Worth, several suburbs, and a connection to the north entrance of DFW Airport.

The TRE corridor also includes a stop at the planned Trinity Lakes Station (included in this grant funding request) and its transit-oriented development. This development will accommodate new residents and employees and is part of the "BUILD" scenario associated with this grant. The new Trinity Lakes development is expected to accommodate approximately 1.8 million square feet of medical and office space, 400,000 square feet of retail and restaurant space, 1,400 multifamily housing units, and 200 single family homes, townhomes and villas. Additional information about the demographic adjustment included, due to this transit-oriented development, is located in **Attachment 4**.

Existing stops in the TRE corridor include:

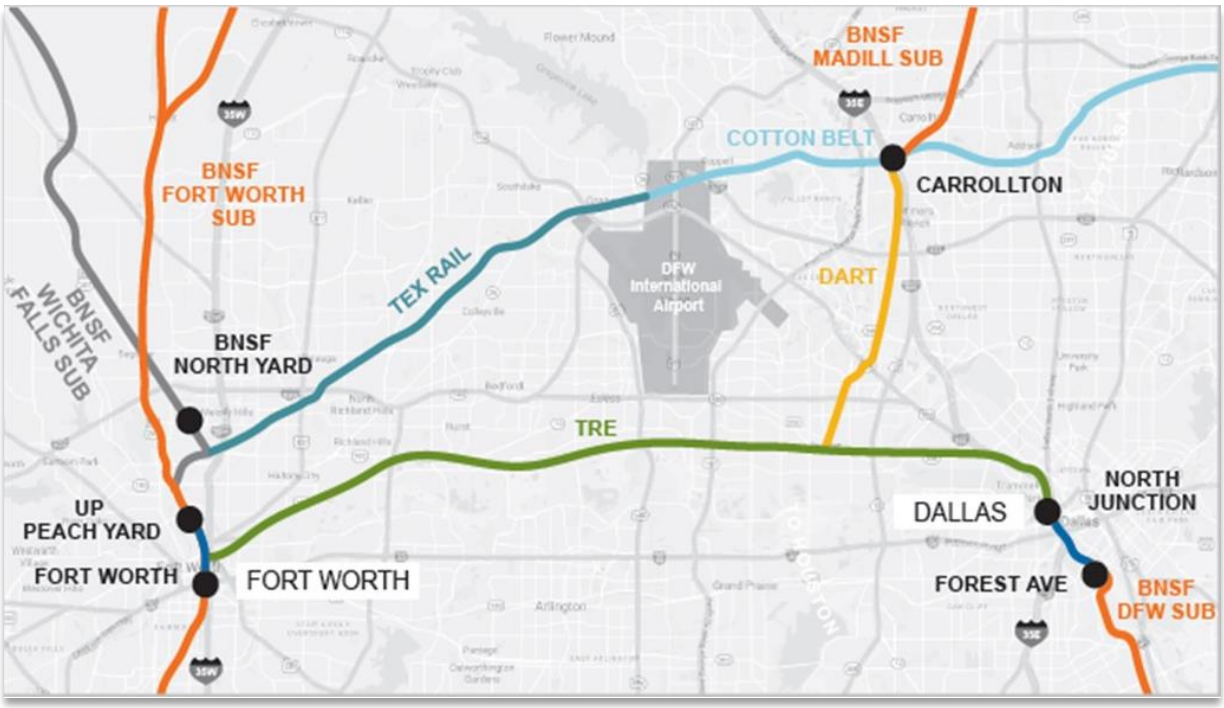
- Richland Hills Station, which will be closed with the opening of Trinity Lakes Station referenced above;
- Bell Station, convenient to Bell Helicopter main plant employees and connecting bus service;
- CentrePort/DFW Airport Station, centrally located for many mid-cities commuters and the businesses in this airport development area including the American Airlines headquarters;
- West Irving Station, where facilities include a drop-off and pick-up area, bicycle racks, and free commuter parking, with connecting bus service;
- Downtown Irving/Heritage Crossing Station, connecting to the redeveloping downtown Irving area and bus service to employment throughout the City of Irving;
- Medical/Market Center Station, connecting to the medical district including Parkland Hospital, UT Southwestern Medical Center, and other major employers via shuttle service; and
- Victory Station, adjacent to American Airlines Center, the host for all Dallas Stars and Dallas Mavericks home games and many concerts/special events throughout the year, and direct connections to DART's extensive light rail network, as well as connecting bus service.

The TRE line terminates at Union Station in downtown Dallas. This is a current Amtrak station and will be a connection point to access future high speed rail service between Dallas and Houston. Union Station also conveniently connects customers to DART light rail, the Dallas streetcar, the downtown circulator (D-Link), numerous bus routes, bike share, and transportation network companies. Downtown Dallas has 135,000 employees and more than 9,000 residents in the city center. In the greater Dallas downtown area, there are over 45,000 residents, more than 420 restaurants and bars, and over 170 shops, according to www.downtowndallas.com. The TRE is clearly an important access point and economic driver for residents, employees, and visitors.

2.1 Map of the Project's Location and Connections to Regional Rail Network

Exhibit 8 illustrates the TRE rail line location in Dallas County and Tarrant County and the connections to other existing freight rail lines.

Exhibit 8: Regional Rail Network Connection



2.2 Geospatial Data Describing Project Locations

The following milepost-based descriptions in **Exhibit 9** provide detailed geospatial information for each project component location. The component numbering corresponds to the project map that is included following these descriptions for reference purposes.

Exhibit 9: NT MOVES Project Locations

1 – Replacement of the bridges over Inwood Road and Double Track Medical Market Center to Stemmons Freeway (milepost 640.33) and Knights Branch (0.05 miles west of the Inwood Bridge), and the Obsession Bridge (approximately 0.3 miles west of milepost 640 and 0.2 miles east of the Interstate 35E Bridge). New double-tracking from a point east of the bridge over Interstate 35E (approximately 0.5 miles west of milepost 640) to the beginning of the existing double-tracked section west of Medical Market Center Station (approximately 0.7 miles east of milepost 640), a distance of about 1.2 miles.

2 – Double-tracking from the end of the existing double-tracked section and construction of new Trinity Lakes Station, approximately 0.3 miles west of milepost 619, near Handley-Ederville Road, to a point east of the future station (see next item), near milepost 620 and 0.35 miles east of Interstate 820 (approximately 1.3 miles). New station and double tracking at the station to be located approximately 0.3 miles east of milepost 619, or about 0.15 miles east of Interstate 820.

3 – Shore Connection System in TRE's Maintenance Yard. TRE currently operates nine Electro Motive Division (EMD) locomotives that would benefit from the wayside power units. While the main engine in the locomotives idles when parked in the yard, the HEP engines do not technically "idle," they remain powered at 1800 rpms. HEP engines can run approximately 35,000 hours before requiring an overhaul and can be overhauled twice before replacement. Utilizing wayside power will extend the period between overhauls by approximately one to two years, thus extending the life span of the engine fleet.

4 – (Not Shown on map) **ClearPath™ - Design and develop a concept of operations for this rail traffic management application** and implement the hardware and software backbone structure of ClearPath™ Technology, enormously successful in the nation's busiest freight rail hub, Chicago. ClearPath™ Technology will empower all agencies and users of the DFW metroplex rail system to exchange timely, accurate, and actionable information on train movements in the terminal complex.

3.0 Grant Funds, Sources and Uses of Project Funds

3.1 Project Budget

The total project budget for the NT MOVES projects is $45.75 Million, which includes a $24.25 Million BUILD grant request, $4.5 Million other federal funding, and $17 Million in non-federal funding. Each component of the grant has its own total cost, BUILD request, other federal funding, and non-federal funding as described in the following table. Additional detail is available in **Attachment 3**. Please see **Exhibit 10**.

Exhibit 10: NT MOVES Funding Table

BUILD Rail Projects Funding Table				
Potential Project	Cost	Non-Federal*	Other Federal	Build Request
DT Medical Market Center to Stemmons Freeway	$23,500,000	$14,000,000		$9,500,000
DT TRE near new Trinity Lakes Station	$18,000,000	$3,000,000	$4,500,000	$10,500,000
Implement ClearPath™ Technology	$2,250,000	$ -	$ -	$2,250,000
Shore Connection System	$2,000,000	$ -	$ -	$2,000,000
Total	**$45,750,000**	**$17,000,000**	**$4,500,000**	**$24,250,000**
*** Includes BNSF Contribution**				

The table above illustrates each projects' funding source distribution for non-federal, other federal, and BUILD funding requests. The source of other federal funds is Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds programmed by the North Central Texas Council of Governments (project applicant).

The source of the non-federal match for DT Medical Market Center to Stemmons Freeway is $12 million from DART local revenues (primarily sales tax) and a $2 million contribution of private capital from BNSF. Documentation of this non-federal source for DT Medical Market Center to Stemmons Freeway is located in the attached excerpt from DART's FY 2018 Business Plan (**Attachment 6**) and includes funds from line items numbered 130, 132, and 135. The source of the non-federal match for the new Trinity Lakes Station is $3 million from Trinity Metro. Documentation of this non-federal source for the station is located in the attached excerpt from Trinity Metro's board packet from March 2018 (**Attachment 7**). The non-federal sources of funds in this grant proposal satisfy the statutory cost-sharing requirements of the BUILD grant dollars and the other federal dollars to be used. In terms of the BUILD grant budget, the BUILD federal request is $24.25 million. ***Seventeen million in non-federal funds have been committed to the project for a federal/local split of 63% federal and 37% non-federal, which exceeds the 20% local match requirement for urban BUILD projects.*** This cost share split is documented in **Attachment 3**.

3.2 Project Cost

In summary, NT MOVES projects construction costs include funds for all five projects that will be needed to achieve the benefits described in this application. Taking all of those costs into account, the project construction costs have the following breakdown: $24.5 million BUILD federal (59% of total), $4.5 million other federal (4% of total), and $17 million non-federal (37% of total). Details on the project costs and how each source of funds will be spent are included in **Attachment 3**. The details are provided as a total and separated per project components. **Exhibit 11** details the total project budget cost, per major construction activity.

Exhibit 11: Project Cost Summary by Major Construction Activity in Dollars

Major Construction Activity	BUILD Request	Other Federal	Non-Federal	Total
Administrative and legal expenses	$180,500	$100,000	$264,500	$545,000
Land, structures, rights-of-way, appraisals, etc.	$0	$0	$0	$0
Relocation expenses and payments	$0	$0	$0	$0
Architectural and engineering fees	$1,826,000	$1,000,000	$2,724,000	$5,550,000
Other architectural and engineering fees	$0	$300,000	$300,000	$600,000
Project inspection fees	$800,000	$600,000	$1,075,000	$2,475,000
Site work	$805,000	$1,200,000	$2,145,000	$4,150,000
Demolition and removal	$141,000	$0	$564,000	$705,000
Construction	$15,300,000	$900,000	$7,460,000	$23,660,000
Equipment	$2,100,000	$0	$0	$2,100,000
Miscellaneous	$1,092,500	$100,000	$822,500	$2,015,000
Contingencies	$2,005,000	$300,000	$1,645,000	$3,950,000
Total in Dollars	**$24,250,000**	**$4,500,000**	**$17,000,000**	**$45,750,000**

Exhibit 12: Project Cost Summary by Major Construction Activity in Percent

Major Construction Activity	BUILD Request	Other Federal	Non-Federal	Total
Administrative and legal expenses	33%	18%	49%	100%
Land, structures, rights-of-way, appraisals, etc.	0%	0%	0%	0%
Relocation expenses and payments	0%	0%	0%	0%
Architectural and engineering fees	33%	18%	49%	100%
Other architectural and engineering fees	0%	50%	50%	100%
Project inspection fees	32%	24%	43%	100%
Site work	19%	29%	52%	100%
Demolition and removal	20%	0%	80%	100%
Construction	65%	4%	32%	100%
Equipment	100%	0%	0%	100%
Miscellaneous	54%	5%	41%	100%
Contingencies	51%	8%	42%	100%
Total	**53%**	**10%**	**37%**	**100%**

The funding for the entire NT MOVES project and for each project component is grouped into three categories: non-federal, BUILD, and other federal. **Attachment 3** illustrates how each funding source will share in each major construction activity per project component, and the data is presented in dollars ("Detailed Cost Table – Dollars" pages 3 and 4) and in percentages ("Detailed Cost Table – Percent" pages 5 and 6). All costs provided in these tables are future costs and do not include costs already incurred on any of the projects. In addition, costs are shown in Year of Expenditure (YOE) dollars. These tables also include the anticipated YOE by major construction activity (to the right-hand side of the table) and in a summary of per-project cost by major construction activity, and by year given in 2017 real dollars.

The costs in 2017 real dollars were used as an input to the benefit-cost analysis. The total capital construction cost for this grant is approximately $33 million (discounted 2017 dollars). Details on the capital construction costs can be found in the "Costs Lifecycle" of **Attachment 3**, and the methodology for calculating that cost is further defined in **Attachment 2A, Benefit Cost Analysis Methodology.**

In addition, the BCA analysis includes an Operating and Maintenance (O&M) cost estimate, which includes the costs as described below. Following the BCA guidance, the O&M costs include only the incremental cost of the "build" scenario, which are the costs required to provide the service levels used in the BCA benefits calculations. Overall O&M costs will increase in real dollars, accounting for the increased headways in the TRE corridor and the increased cost to maintain additional double-track funded by this grant. The total O&M cost for this grant is approximately $7M (discounted 2017 dollars). Details on the O&M cost can be found in the

"Costs lifecycle" section of **Attachment 3** and the methodology for calculating that cost is further defined in **Attachment 2A.**

4.0 Selection Criteria

4.1 Primary Selection Criteria

4.1.1 Safety

The NT MOVES projects contribute to transportation safety by improving freight and transit frequency, reducing travel time, and promoting transit-oriented development in the TRE corridor, thus encouraging a mode shift from travel in personal automobiles to travel by transit. Based on current crash rates and the projected number of trips diverted away from personal automobiles, this project is forecast to prevent $31.7 million (discounted 2017 dollars) in losses from vehicle crashes. This value represents the savings on only one parallel freeway corridor and does not include the potential regional savings. Details on the quantifiable safety benefit can be found in the "Safety" tab of the attached Benefit-Cost Analysis (BCA) Excel file, **Attachment 2B** and the methodology for calculating that benefit is further defined in the **Attachment 2A**.

The bridge replacement and construction elements of this project boost the potential for incidental safety benefits as well. The replacement of bridges over Inwood Road provides an opportunity to work with the relevant jurisdictions to provide expanded shoulders, widened lanes, or other safety features that might reduce the likelihood of crashes on those roads.

4.1.2 State of Good Repair

Maintaining transportation facilities in a state of good repair is vital for delivering on commitments to provide safe, efficient, and reliable transit services. NT MOVES projects will promote and maintain good repair on the rail networks, with one of its four elements devoted to rehabilitating or replacing three aging bridges along the corridor. The current state of disrepair on these bridges is imposing significant maintenance costs and, due to speed restrictions, is creating considerable delays on freight and passenger movements while consuming resources that could be utilized to enhance service. With replacement and rehabilitation, the annual maintenance costs will decrease considerably.

This project is anticipated to produce more than $479,000 (discounted 2017 dollars) in maintenance savings over its lifetime, as the proposed bridges are past their useful life and command above normal maintenance costs at present. The BCA for this project accounts for the additional operational and maintenance expense needed to maintain a state of good repair on these assets. The cost estimate includes a mid-life rehabilitation for the Trinity Lakes Station, to support a continuing state of good repair. The benefits associated with eliminating delays, due to the poor condition of several bridge assets, are described further in the **Economic Competitiveness section**. Details on the quantifiable maintenance savings benefit can be found in the "Maintenance Savings" section of **Attachment 2B** and the methodology for calculating that benefit is further defined in **Attachment 2A.**

4.1.3 Economic Competitiveness

NT MOVES projects will provide a significant boost to economic competitiveness in the TRE corridor. First, by replacing or upgrading bridges and double-tracking portions of the corridor, the project will increase reliability, and decrease travel time, of train movements, not only in the short term but far beyond the life cycle of the project. Based on travel-time estimates prepared by NCTCOG, travel time for freight trains in this corridor is expected to decrease by 10.5 minutes per trip across the entirety of the corridor, while travel time for commuter trains is expected to decrease by 6 minutes per trip, leading to benefits worth $7 million and $15.6 million respectively (discounted 2017 dollars) through 2045.

Second, the new station at Trinity Lakes enables the placement of a transit-oriented development in an underutilized section of the City of Fort Worth, creating employment opportunities and supplementing the housing supply, during a period of rapidly increasing demand. By directing development toward the center of the region rather than outward toward the fringe, and by inducing a mode shift to transit through improved headways and reduced travel time, this project creates a net regional reduction in congestion, eliminating 400,000 daily vehicle miles traveled by 2045, generating a benefit of $83 million from reduced congestion delay, as well as a $12.7 million benefit from reduced driver travel cost (both values in discounted 2017 dollars).

Finally, this project promotes the region's economic competitiveness by emphasizing long-lasting capital improvements. Between the various bridge improvements and the new Trinity Lakes Station, the improvements included in this project are expected to have a residual value of nearly $3.1 million (discounted 2017 dollars) in 2045, the end of the benefits analysis period for this grant application. These improvements will help maintain the economic competitiveness of the region for decades to come. Furthermore, incremental freight movement over the TRE enabled by additional track capacity results in revenue growth for DART and Trinity Metro that can be utilized to reinvest in their network, since freight carriers pay a car-mile fee to utilize the trackage, in accordance with TRE contracts.

Details on the quantifiable economic competitiveness benefits described above can be found in the following tabs of the attached BCA Excel file: "TRE_TravelTime," "RR Freight_TravelTime," "Truck Freight_TravelTime," "CongestionDelay_Savings," "DriverCost_Savings," and "Residual_Value." The methodology for calculating these benefits is further defined in the **Attachment 2B.**

4.1.4 Environmental Sustainability

The Shore Connection System will achieve significant reductions in emissions by enabling diesel-powered HEP engines to be turned off while the railcars are connected to grid power. This project provides direct health benefits to the residents of the City of Irving, as the emission reductions gained through implementation will reduce exposure to particulate matter (PM), toxic diesel exhaust, and noise. Reductions in NOX emissions will also reduce ground-level

ozone formation and improve overall regional air quality reducing the negative respiratory effects of ozone exposure most prominently to children, the elderly, and those already suffering from respiratory complications. As the 10-county nonattainment area currently supports approximately 6.3 million people, air quality improvements are badly needed and quantifiable. The population is expected to grow to nearly 10.4 million by the year 2040. Funding and implementation of these projects will lead to substantial investment in further diesel emission reduction projects, beyond the scope of the grant. The Shore Connection technology was also selected for use on the TRE as it is not dependent on locomotive type. As the fleet is modernized, the technology remains compatible and useful on new locomotive engines.

The NT MOVES projects also improve air quality due to increased ridership on the TRE and modal diversion to transit trips over the 20-year analysis period. The quantifiable emissions benefits from the roadway emissions reduction related to TRE travel combined total approximately $138,000 (discounted 2017 dollars) through 2045. Details on the quantifiable emissions benefit can be found in the "Emissions" section of **Attachment 2B** and the methodology for calculating that benefit is further defined in **Attachment 2A**.

4.1.5 Quality of Life

The NT MOVES projects will boost the quality of life for residents in the region in a number of ways. Commuters on the TRE will benefit from the reduced travel times and increased service frequency allowed by the bridge rehabilitation/replacement and double-tracking portions of the project. TRE passengers will also experience a shorter total trip time from Texas & Pacific Station in Fort Worth to Dallas Union Station, following implementation of improvements. This was calculated based on the transit trip time savings generated by the travel model across all origin and destination pairs, represented by the three project segments that will allow improved travel times due to double tracking and bridge replacements. Existing riders are counted at the full travel time value of $14.80 per hour while forecast new riders attracted by reduced headways are valued at $7.40 per hour as described in USDOT BCA 2018 Guidance. The quantifiable passenger travel-time savings from this grant total is $15.6 million (discounted 2017 dollars). Details on the quantifiable passenger travel-time savings benefit can be found in the "TRE_TravelTime" tab of the attached BCA Excel file, and the methodology for calculating that benefit is further defined in **Attachment 2A.**

Residents of the Trinity Lakes development will find a particular benefit to their quality of life. The new Trinity Lakes station will offer a no-drive, congestion-free alternative to reach the employment and entertainment opportunities of both downtown Fort Worth and Dallas, as well as other areas served by DART and Trinity Metro service areas. Transit-oriented developments discourage vehicle dependence thereby reducing congestion and improving air quality. Other areas of the region will benefit from the placement of new residents in a development where they have the option to choose transit, as well as potential employment and entertainment options in the Trinity Lakes development, with easy access from the new station.

4.2 Secondary Selection Criteria

4.2.1 Innovation

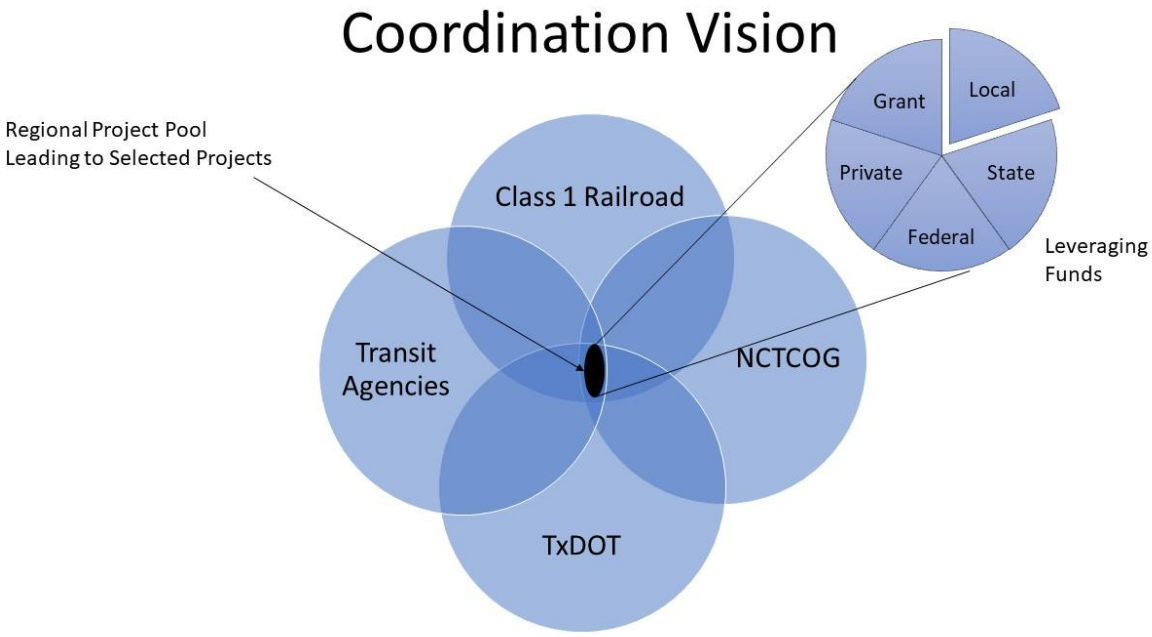
The NT MOVES program is committed to innovation to ensure the rapid implementation of new rail capacity assets and the full utilization of those assets. This grant submittal ***includes the implementation of Clear Path technology, developed by Railinc, to increase velocity and efficiency among freight and passenger users in the DFW complex.*** This platform, a centerpiece of the Chicago terminal improvement program (CREATE), has proven its effectiveness in improving throughput, safety, and on-time performance in congested, urban rail corridors. Freight carriers in DFW will gain visibility and a clear view of all inbound, through and outbound rail traffic on the shared-use public infrastructure to understand the likely availability of train "slots" through the complex for their traffic. At the same time, DART controlled dispatchers of the shared-use assets will be able to see inbound freight demand far enough in advance to provide clearance to traverse the complex with the confidence those through freight movements will not impact passenger on-time performance.

4.2.2 Partnership

The NT MOVES Program is an ambitious and innovative approach to resolving long-standing congestion issues with freight and passenger rail integration in the DFW region. TxDOT Rail Division, NCTCOG and the private rail sector have come together to develop a regional rail study to help identify and resolve rail bottle necks and operational issues within the North Central Texas region. While working with local transit and private freight rail providers, it was determined that this study would be best developed and implemented in two phases. Phase 1 focused on freight and passenger rail integration congestion issues and Phase 2 will focus on rail/highway interaction issues. This method has resulted in a systemwide analysis of the rail network in the DFW region and systemized approach to resolving rail issues.

Through Rail Traffic Controller modeling, with input from both the UPRR, BNSF and local transit agencies, the proper projects are being identified and are being addressed as soon as possible. The full study will be completed later this year, while Phase 1 has resulted in the North Texas MOVES program. This approach allows for regional rail partners to come together quickly and work to identify funds to be used for the projects. DART and BNSF have identified opportunities to work together on design and track construction. TxDOT is also supporting the effort through assistance with engineering, design and environmental study support. This all helps to reduce the soft cost, construction timelines and track outages during implementation. The regional partners are now working together on projects that are the highest priority for all. Please see **Exhibit 13**.

Exhibit 13: NT MOVES Coordination Vision



NCTCOG (Submitting Agency)
NCTCOG is a voluntary association of cities, counties, school districts, and special districts established in January 1966 to assist local governments in planning for common needs, cooperating for mutual benefit and coordinating for sound regional development. Since 1974, NCTCOG has served as the Metropolitan Planning Organization (MPO) for the 12-county Dallas-Fort Worth MPA. The NCTCOG Transportation Department is responsible for the regional planning process for all transportation modes. The department provides technical support and staff assistance to the Regional Transportation Council (RTC) and its technical committees, which comprise the MPO policy-making structure. The department also provides technical aid to local governments and transportation providers in planning, coordinating, and implementing transportation decisions.

Dallas Area Rapid Transit (Grant Recipient and Railway Implementation)
Dallas Area Rapid Transit (DART) operates in the City of Dallas and 12 other surrounding cities with an extensive network of DART Light Rail, Trinity Railway Express commuter rail, bus routes and paratransit services which move more than 220,000 passengers per day across a 700-square-mile service area.

Trinity Metro (Grant Recipient and Railway Implementation)
Trinity Metro (TM) was created in 1983 as a regional transportation authority of the State of Texas and is not an agency or department of any of its member cities. The agency annually provides nearly 10 million passenger trips on buses, vanpools and the Trinity Railway Express,

which it jointly owns and operates with Dallas Area Rapid Transit. The governing body is an eleven-member board of directors with eight appointed by the Fort Worth City Council and three by Tarrant County Commissioners Court.[4]

Trinity Railway Express
Trinity Railway Express (TRE) began operations in December of 1996. It is jointly owned by DART and Trinity Metro to provide a commuter rail service between downtown Dallas and downtown Fort Worth. The TRE has 10 stations along the route, provides daily service and had over two million annual rides in 2018.

5.0 Project Readiness

5.1 Technical Feasibility

The technical feasibility of all project components is high. All components are in preliminary design and engineering stages and cost estimates are parametric estimates based on the anticipated scope of the project components. Design costs are included in the cost estimate at 10% for most components and at 15% for the new Trinity Lakes Station, due to additional design needs associated with coordinating this project component with other nearby improvements. The cost estimate also includes approximately 10% contingency for all project components, with slight deviations for projects that are expected to be more complex based on known conditions such as location or scope of work. The statement of work for each component follows.

- **Bridge replacement and double tracking for Obsession, Inwood, and Knights Branch Bridges** – Replace and double track Obsession, Inwood, and Knights Branch Bridges. Bridges to be replaced are past their useful life. For Obsession Bridge, replace truss and timber approaches. For Inwood Bridge, replace ballast deck and timber approach. Construct 1.2 miles of double tracking from west of West Perkins (MP 640.7) to Stemmons Freeway Bridge (MP 639.5).

- **Double track TRE near new Trinity Lakes Station** – Construct 1.3 miles of a new second track from existing TRE Richland Hills Station (MP 618.7) to just east of proposed Trinity Lakes Station (MP 620.0). There are no bridges or at-grade crossings in this segment. Component includes retained fill and at-grade construction. Construct new station platforms and canopies, install ticket vending machines and associated pedestrian components.

- **ClearPath™ Technology Implementation** – This project will deliver a browser-based suite of applications that provides networked visibility to gateway operations including inbound train lineup, train and locomotive consist, crew status, train location and infrastructure status across all gateway railroads. Railroad-provided data will be collected in standard formats, including some in near real-time, to facilitate gateway status visualization on a consolidated and accurate geospatially enabled map.

Functionality will also include train route forecasting, performance metrics and historical trend analysis.

- **Shore Connection System** – Wayside power systems are designed to feed 480-volt, three-phase power from the electric utility to the train through the HEP system or a dedicated "yard power" connector. Providing standard utility power to the train for maintenance or layover is far less expensive (and quieter) than providing HEP power from the locomotive. The average life of these wayside power connector systems is greater than 20 years. Investment in a stationary wayside power source is more economical and efficient for our system than installing idle-reduction technologies directly onto our aging fleet. The wayside power system can be utilized for the current fleet and for any replacement fleet that TRE may purchase in the future (i.e., it is not unique to any one engine type).

5.2 Project Schedule

Upon notification that the NT MOVES projects have been funded under the BUILD program, project components will be added to the region's Transportation Improvement Program at the next quarterly modification (anticipated February 2020 State and federal approval of that modification). In addition, any necessary project partnership and implementation agreements with implementing agencies (Dallas Area Rapid Transit/Trinity Railway Express and Trinity Metro) will be completed on the same timeline as Transportation Improvement Program modifications following standard partnership approaches used in the region. Project work will therefore be able to start expeditiously.

All project components will receive environmental clearance in a timely manner and funds will be obligated no later than September 30, 2021. All of the project components will be completed in the existing right-of-way or do not have a right-of-way component. Additionally, all project components, including construction and delivery of technology components, will be completed by the first quarter of 2024. Please see **Attachment 5** for environmental, design, procurement, and construction scheduling activities for each project component.

5.3 Required Approvals

5.3.1 Environmental Permits and Reviews

The required Environmental Permits and Reviews for the project's components are summarized in **Exhibit 14**, followed by additional information related to environmental clearance and other required approvals.

Exhibit 14: Project Component Environmental Clearance Status

Component Name	Environmental Clearance Status
Bridge Replacement and Double tracking for Obsession, Inwood, and Knights Branch Bridges Double track from Medical Market Center to Stemmons Freeway Bridge	Anticipated Fall 2019
Double track TRE near new Trinity Lakes Station and New Trinity Lakes Station	Anticipated Fall 2019
ClearPath™ Technology	Not Applicable
Shore Connection System	Anticipated Fall 2019

All components of the project will be pursuing Categorical Exclusions because they will not individually or cumulatively involve significant social, economic or environmental impacts. All project components are within existing right-of-way (bridge replacements, double-tracking, station platform construction) and involve minimal or no effects off-site or require little or no construction.

Bridge Replacement and Double Tracking for Obsession, Inwood, and Knights Branch Bridges
Double track from Medical Market Center to Stemmons Freeway Bridge have been preliminarily designed and will obtain environmental clearance in the fall of 2019. The worksheets for the categorical exclusions are attached. These projects may require review by the United States Army Corps of Engineers and the local flood control district.

Double track TRE near new Trinity Lakes Station
This project will obtain environmental clearance in the fall of 2019. The station platform will be built in the right-of-way. The new station will require additional construction of access roads and parking in support of new development that will have a greater environmental impact and will require a more in-depth environmental process. However, those components requiring more in-depth environmental review are outside the scope of this grant and will be on a separate timeline for environmental clearance. The grant components will pursue a Categorical Exclusion.

5.3.2 State and Local Approvals and Federal Transportation Requirements

After the Request for Qualification documents, issue solicitation, evaluation, and award recommendations are completed, the individual projects will be brought to the DART/Trinity Metro Boards.

A revision to the State Transportation Improvement Program/Transportation Improvement Program (STIP/TIP) will be necessary to add the BUILD Grant funding to the project. The modification will be coordinated between NCTCOG and TxDOT during a quarterly STIP/TIP modification cycle. It is anticipated that the revision would occur in August 2020 (assuming grant award by May 2020).

Several project components are already included in the region's Transportation Improvement Program (TIP). A letter from the Chairman of the Regional Transportation Council (RTC), included in Attachment 8 - Letters of Support, indicates that this project is consistent with the programs and policies in Mobility 2045: The Metropolitan Transportation Plan for North Central Texas (Mobility 2045). All federally-funded surface transportation projects must also be included in the TIP. If the project is successful in receiving funds, the RTC will support its inclusion in the 2019-2022 TIP for North Central Texas.

Mobility 2045 includes rail strategies that are to be implemented, to expand both freight and passenger rail services and programs and projects that support NT MOVES Projects. Specific references include:

- Freight System/Network Planning (FP2-120) – This includes implementing recommendations of the Regional Rail Study, which will be completed later this year and contain the projects in the NT MOVES Program.
- Regional Connections: Next Generation Transit Program (TR2-003) – This includes recommendations for improving services through public and private agencies, and implementing service as needed in communities throughout the region through 2045.

5.4 Assessment of Project Risk and Mitigation Strategies

All the projects are integral parts of longer-term plans to double track the entire TRE corridor and improve commuter rail. These plans have been vetted through community involvement. These projects will connect with other projects that have already been constructed in similar environs, will not require the acquisition of right-of-way, and will not require extensive environmental documentation or permitting.

As the Applicant, NCTCOG will coordinate with DART and Trinity Metro on the implementation of the project components and, as needed, provide technical support to our project partners to ensure timely delivery of the projects. However, it is expected that DART and Trinity Metro would implement the projects and be the recipient of the grant funds. Please see **Exhibit 15** for identified risks and opportunities.

Exhibit 15: Identified Risks and Opportunities

Risk/Opportunity	Chance or Occurrence	Likely Impact to Costs	Likely Impact to Schedule	Potential Mitigation Strategy
Unplanned Work (changed orders)	100%	$2 million	Unknown	As design moves from 30% to final design this will be mitigated with a contingency
Increased Right-of-Way Costs	5%	$2 million	None	DART/TRE owns the right-of-way the work is to be done on
Third Party Impacts (permits, utilities, etc.)	25%	$5 million	6 months	Early coordination with all third parties
Bridge Rehabilitation	50%	$10 million	None	As design moves from 30% to final design this will be mitigated with a contingency

North Texas Multimodal Operations, Velocity, Efficiency, and Safety (MOVES) Program

FY2019

Attachment 2 – Benefit-Cost Analysis Methodology

North Central Texas Council of Governments

Contents

List of Tables

I. METHODOLOGY – BENEFIT COST ANALYSIS

The following description provides the methodology for the detailed calculations of benefits and costs of the proposed ***The North Texas Multimodal Operations, Velocity, Efficiency, and Safety Program (NT MOVES)*** projects. Benefits are assumed to incur after project completion from 2023 for a 22-year time span of benefits to 2045.

TABLE 1: EXECUTIVE SUMMARY MATRIX OF PROJECT

Current Status/Baseline and Problem to be Addressed	**Change to Baseline or Alternatives**	**Types of Impacts**
Commuter rail and freight rail service is limited by sharing sections of single track and outdated bridges on the TRE corridor. Underperforming stations and outdated engine idling in yard.	Double track current single track sections of TRE corridor and rehab plus construct additional parallel bridges at old crossings. Re-locate station to new development, ClearPath™ and install shore power in TRE maintenance yard. Improve TRE headways in 2025 and in 2035.	Improve transit and freight travel time, reduce automobile congestion and travel cost for new riders, improve air quality, reduce automobile crashes, save on maintenance cost, and improve residual value.

Transit ridership, traffic volumes (vehicle miles traveled), and congestion forecast for current conditions (2018) and for build and no-build conditions in 2045 were based on the North Central Texas Council of Governments (NCTCOG) DFX Regional Travel Demand Model. This version of the travel demand model was used for Mobility 2045: The Metropolitan Transportation Plan for North Central Texas and is based on demographic forecasts at the Traffic Survey Zone (TSZ) level. The no-build alternative scenario in this benefit cost analysis (BCA) excludes the improvements to headway and increases in transit-oriented development attributable to this TRE Multimodal Improvement project. The build alternative includes the assumptions outlined in the narrative and this BCA document.

In addition to the TRE rail and bridge improvements, the new Trinity Lakes station will be connected to more dense transit-oriented development than included in the existing model demographics. Based on approved zoning by the City of Fort Worth and development plans submitted by the developer, an increased density of households, population, and employment was used in modeling the build alternative. A description of this process is included in Attachment 3.

The TRE's service schedule of Monday through Saturday with no Sunday service is assumed to improve headways over the analysis period from 30 minutes peak/60 minutes off-peak at present to 20 minutes peak/40 minutes off-peak in 2045. Headway improvements are made in two steps.

In 2025, the headways improve to 20 minutes peak/60 minutes off-peak. In 2035, the headways improve to 20 minutes peak/40 minutes off-peak.

The travel model only captures weekday travel. This analysis uses 52 weeks of service with five days per week resulting in 260 weekdays per year used in benefit calculation. Saturday is calculated at 1 day per week resulting in 52 Saturdays. The DART Reference Book published in March 2018 (https://www.dart.org/about/dartreferencebookmar18.pdf) contains Commuter Rail ridership information that allows the comparison of average Saturday ridership to average weekday ridership. Using the most recent data (fiscal year 2017) provided in the Reference Book, average Saturday ridership is 44% of average weekday ridership. Weekday ridership provided by the model is used to approximate Saturday ridership on the Trinity Railway Express by reducing the model-predicted weekday ridership by 44%.

II. BENEFITS

A. Mobility

Passenger Travel Time Savings

TRE passengers will benefit from a shorter total trip time for the TRE to travel from Texas & Pacific Station in Fort Worth to Dallas Union Station following implementation of improvements. This was calculated based on the transit trip time savings provided by the travel model across all origin and destination pairs represented here by the three project segments. Existing riders are counted at the Personal travel time value of $14.80 per hour while forecast new riders attracted by reduced headways are valued at $7.40 per hour as described in USDOT BCA 2018 Guidance. Weekday and Saturday riders are initially separate based on separate annual counts.

*TRE Passenger Travel Time Savings = (T *(R1+R3)*S) +(T *(R2+R4)*(S/2))*

T = Transit Trip Travel Time Savings (hours)
R1 = Weekday Riders Base (no-build)
R2 = New Weekday Riders (build)
R3 = Saturday Riders Base (no-build)
R4 = New Saturday Riders (build)
S = Value of Travel time savings

Freight Travel Time Savings

Improved speed and capacity in the TRE corridor will translate to a reduction in delay for freight moved throughout the corridor resulting in a travel time savings of 6.5 minutes. The estimate was based on the replacement of two bridges with current speed restrictions for freight trains on the Inwood Bridge and Obsession Bridge-. The travel time savings is converted to hours and multiplied by the number of freight trains in the corridor and their associated number of

engineers. NCTCOG staff estimates 2 to 3 engineers on board each train for average of 2.5 per train with per hour travel time value of $44.90 as provided in 2018 BCA Guidance. Rail traffic on the TRE is bidirectional with an average daily train count of 63 trains, of which approximately 60 are passenger trains, and 3 are freight as counted per DART staff. For this analysis, only an incremental 1 Aggregate Train was used as the basis for the Freight Travel Time Savings. Freight train trips were held constant over time due to insufficient data on freight modal diversion and/or freight traffic growth.

*Freight travel time savings = T * N* X *D* S*

T = Freight Travel Time Savings (hours)
N = Number of freight trips in corridor
X = Number of engineers per train
D = Days per Year
S = Value of Travel time savings

Freight Travel Time Savings- Truck

The estimate was prepared based on the number of trucks that are estimated to be taken off the road with the availability of increased rail capacity. No change in the current speed for trucks was assumed. The travel time savings of 2 hours per truck trip is multiplied by the number of freight trucks taken off the corridor and the associated number of truck drivers. USDOT estimates 1 truck driver in each truck with per hour travel time value of $28.60 as provided in 2018 BCA Guidance.

*Freight travel time savings- Truck = T * N* X * S*

T = Freight Travel Time Savings- Truck (hours)
N = Number of freight truck trips saved in corridor
X = Number of drivers per truck
S = Value of Travel time savings per truck driver

Congestion Delay Savings

Reduced vehicle hours of congestion delay per year for all regional roadway users as a result of the TRE Improvements was calculated by the DFX Travel Demand Model. The reduced hours of congestion delay were multiplied by the per hour value of general travel time ($14.80) and the average vehicle occupancy of 1.39 provided by the 2018 BCA guidance to produce an annual benefit value.

*Congestion Delay Savings = (((V1- V2)*D)*P) * S*

V1 = Vehicle Hours/day of Congestion Delay no-build
V2 = Vehicle Hours/day of Congestion Delay build
D = Days per year

P = Persons per vehicle
S = Value of Travel time savings

Driver Cost Savings

A reduced personal auto use cost is calculated using the reduction in vehicle miles traveled by each transit passenger who uses the TRE instead of driving. New transit commuters are calculated based on modeled ridership increase. Drivers save $0.39 for every mile not driven based on BCA Guidance. NCTCOG regional travel model assumes an average trip length of 13.28 miles and a constant commuter rail fare of $2.10. This calculation is seen below.

Vehicle Operating Cost Savings = NT[(L*S)-F]*

R = Annual New Transit Riders
L = Length of average trip in miles
S = Savings per mile
F = Fare for commuter rail

Operating Cost Savings

Operating Cost Savings are calculate based upon the saving achieved from converting truck miles to rail miles to transport Aggregate Products from Union Station in Dallas to Irving, TX. The Operating Costs of Build Truck miles plus Build Rail miles are subtracted from No-Build Operating Costs

*Operating Cost Savings =(TVMT1*T$) – [(RVMT*R$) + (TVMT2*T$)]*

TVMT1 = No-Build Truck Miles
RVMT = Build Rail Miles
TVMT2 = Build Truck Miles
T$ = Operating cost per mile for Trucks
R$ = Operating cost per mile for Rail

B. Air Quality

Regional Roadway Emissions Reductions

Air quality benefits for this project are derived from increased ridership on the TRE and modal diversion to transit trips as indicated by our travel model over the 20 year analysis period. These result in less delay for roadway users, lowering vehicle emissions. Reduction estimates were developed by taking the difference between the No-Build and the Build scenarios total emissions. The methodology used to calculate the total emissions for each scenario is consistent with our 2018 Transportation Conformity, Chapter 7 (www.nctcog.org/nctcg/media/Transportation/DocsMaps/Quality/Air/Chapter-7_Emission-Factors_MOVES-Model.pdf) of the 2018 Transportation Conformity document discusses the

methodology used to develop regional emissions. Annual estimates were calculated for Nitrogen Oxides (NOX) and Volatile Organic Compounds (VOCs).

*Air Quality Benefit = [(R*D)/2000]*V*

R = Reduction in pounds per day
D = Days per year
V = Value of reduction per short ton

C. Safety

Reduction in Automobile Crashes

The reduction in vehicle miles traveled (VMT) as a result of increased transit ridership will reduce the likelihood of automobile crashes. Number of crashes for a parallel Highway corridor to the TRE (Hwy 121/Hwy 183/ IH-35W) between the two end line stations divided by the 2018 annual VMT in the corridor was used to determine the existing annual crash rate per VMT. The daily VMT was multiplied by 365 to get an annual value because crash data is from all days of the year.

The number of crashes were obtained from TxDOT's Crash Records Information System (CRIS) by KABCO Accident Classification System categories. This data is only composed of TxDOT "Reportable Crashes". A "Reportable Motor Vehicle Traffic Crash" is defined by TxDOT as any crash involving motor vehicle in transport that occurs or originates on a traffic way, results in injury to or death of any person, or damage to the property of any one person to the apparent extent of $1,000. A traffic way is defined as any land way open to the public as a matter of right or custom for moving persons or property from one place to another.

*Annual Crash Reduction = C1 – ((C1/VMT1) * VMT2)*

C1 = Crash Incidents no-build highway corridor
VMT1 = Truck Vehicle Miles Traveled in no-build scenario
VMT2 = Truck Vehicle Miles Traveled in build scenario

D. Maintenance Savings

Bridge Maintenance Cost Savings

The estimated maintenance cost for new bridges on the TRE alignment is lower than the existing annual maintenance cost for older structures. Maintenance cost included in this calculation are not included in the cost section as this provides the net benefit. Other maintenance cost such as rail and train maintenance cost are included in the cost section. While the regional mobility plan

assumes maintenance, cost inflate like all other cost, in this BCA they are held constant to keep values in 2017 dollars.

Annual Bridge Maintenance Cost Savings = (M1 – M2)

M1 = Annual cost of bridge maintenance, no-build (dollars)

M2 = Annual cost of bridge maintenance, build (dollars)

E. Residual Value

Remaining Service Life of New Bridges

New bridges and the rail station in this project will have a remaining service life beyond the 20 year benefit calculation in this BCA. The current value of each new bridge will be divided by the years of its life span and then discounted annually. Value remaining after the end of the 20 year calculation will be added to the benefit calculation. All project elements with life spans beyond the project are included in the attached excel tables. All project components not included are expected to last as long as the project analysis period.

Residual Value = [(U – Y) / U] * C

U = Useful Service Life of Project
Y = Years of Analysis Period
C = Cost of Project Component

III. COSTS

A. Capital Construction

Proposed construction costs were obtained in coordination with the Trinity Railway Express, Dallas Area Rapid Transit, and Trinity Metro. Construction costs were estimated based on the proposed construction schedule and activities for each quarter. Detail for future capital construction cost estimates per project component are located in the "Cost-Lifecycle" tab of the Budget Excel file. The total construction cost estimates used in this BCA are given in 2017 real dollars. The following table summarizes each component's capital construction cost in 2017 dollars, including costs incurred prior to the grant application up through 2045. Additional information on the annual costs from 2017-2045 in 2017 dollars are found on the "Costs Lifecycle" tab of the BCA Tables Excel file. Costs incurred prior to the grant application include design and engineering costs for the improvements. Table 2: Construction Cost per Project Component

Component ID	Component Name	**Construction Cost** (2017 dollars)
1	Double track from Medical Market Center to Stemmons Freeway Bridge and Bridge Replacement and Double tracking for Obsession, Inwood, and Knights Branch Bridges	**$23,500,000**
2	Double track TRE near new Trinity Lakes Station and New Station at Trinity Lakes	**$18,000,000**
3	Shore Connection System	**$2,000,000**
4	ClearPath Technology	**$2,250,000**
Total	**All Projects**	**$45,750,000**

B. Operations and Maintenance

The Operations and Maintenance cost estimate excludes the maintenance savings attributable to bridge replacements. The methodology for the bridge maintenance cost savings is described above in section II.D. Maintenance Savings.

The remaining operating and maintenance (O&M) costs for this project used in the BCA include the costs as described below. Following the BCA guidance, the O&M costs include only the incremental cost of the "build" scenario, which are the costs required to provide the service levels used in the BCA benefits calculations. Overall O&M costs will increase in real dollars, accounting for the increased headways in the corridor and the increased cost to maintain additional double-track funded by this grant. Double track will be completed by 2025 and headways will be improved in two steps. The incremental cost of increased O&M cost is estimated at 2% of baseline capital improvements ($2017) for O&M costs per year from 2020 - 2045. ClearPath's Life-cycle costs are estimated at $50,000 per year plus a major upgrade at year 10,15 and 20. This estimate is based upon a detailed O&M schedule by asset type. Details for the O&M cost estimate are located in in the "Cost_Lifecycle" tab of the BCA Tables Excel file.

IV. SUMMARY OF BENEFITS AND COST

A. Result Ratio

Results of the benefit cost comparison are summarized in Table 3. The benefits are assumed to incur after project completion from 2025 for a 20-year life span of the projects to 2045. Costs are calculated from 2016 to 2045. All monetized estimates were discounted at a 7% rate to 2017. The details tables (Excel) have a tab detailing the calculations of each benefit and the model outputs of ridership, VMT, Vehicle hours of congestion delay, plus the cost summary table.

TABLE 3: NT MOVES PROJECTS PROJECT BENEFIT/COST SUMMARY

Costs and Benefits	Nominal Total Value	Discounted to 2017 (7%)
Costs		
Construction Cost	$45,750,000	$33,441,194
Operation and Maintenance Cost	$21,510,000	$7,368,337
Total Cost	**$67,260,000**	**$40,809,531**
Benefits		
Passenger Travel Time Savings	$48,508,698	$15,601,393
Freight Travel Time Savings - Rail + Truck	$21,735,730	$7,595,139
Congestion Delay Savings	$289,916,643	$80,015,253
Operating Cost Savings	$155,402,916	$51,150,875
Driver Cost Savings	$44,306,529	$11,272,698
Emissions Reductions Benefit	$850,185	$157,594
Crash Reduction Benefit	$119,135,339	$31,788,982
Maint/ Preservation Savings	$1,365,000	$438,608
Less Operation Cost and Maintenance Savings	-$21,510,000	-$7,368,337
Value of Remaining Service Life	$20,790,000	$3,126,862
Total Benefit	**$680,501,040**	**$193,779,067**
Net Present Value (NPV)		**$152,969,536**
Benefit-Cost Ratio (BCR)	**10.12**	**4.75**

The following attachment is not included in the view since it is not a read-only PDF file.

Upon submission, this file will be transmitted to the Grantor without any data loss.

BCA Tables.xlsx

North Texas MOVES Projects
BUILD Grant Budget Summary

Component ID	Component Name	Component Description	Total Cost	BUILD Federal	Other Federal	Federal Comments	Non-Federal	Non-Federal Source
1	Bridge Replacement and Double tracking for Obsession, Inwood, and Knights Branch Bridges. Double track from Medical Market Center to Stemmons Freeway Bridge	Replace and double track Obsession, Inwood, and Knights Branch Bridges. Bridges to be replaced are past their useful life. Construct 1.2 miles of double tracking from west of West Perkins (MP 640.7) to Stemmons Freeway Bridge (MP 639.5)	$23,500,000	$9,500,000	$0		$14,000,000	Private sector source or DART
2	Double track TRE near new Trinity Lakes Station and New Station at Trinity Lakes	Construct 1.3 miles of a new second track from existing TRE Richland Hills Station (MP 618.7) to just east of proposed Trinity Lakes Station (MP 620.0). There are no bridges or at-grade crossings in this segment. Construct new station platforms and canopies, install ticket vending machines and associated pedestrian components. This cost does not include parking and other station access components that will be funded outside of the grant.	$18,000,000	$10,500,000	$4,500,000	CMAQ programmed by NCTCOG	$3,000,000	Trinity Metro
3	Shore Connection System	(also known as wayside power or yard power) that allows TRE's nine (9) locomotives to “plug into” an electrical power source instead of using the diesel engines while in our rail yard. This project entails the installation of 10 wayside cabinets along the tracks at TRE’s equipment maintenance facility that will provide electrical power to the Head End Power (HEP) engines	$2,000,000	$2,000,000	$0		$0	
4	ClearPath Technology Implementation	This project will deliver a browser-based suite of applications that provides networked visibility to gateway operations including inbound train lineup, train and locomotive consist, crew status, train location and infrastructure status across all gateway railroads. Railroad-provided data will be collected in standard formats, including some in near real-time, to facilitate gateway status visualization on a consolidated and accurate geospatially enabled map. Functionality will also include train route forecasting, performance metrics and historical trend	$2,250,000	$2,500,000	$0		$0	

Total Cost	BUILD Federal	Other Federal	Non-Federal
$45,750,000	$24,500,000	$4,500,000	$17,000,000

BUILD Federal Request	**$24,500,000**	**59%**
BUILD Local Match	**$17,000,000**	**41%**

North Texas MOVES Projects
BUILD Grant Cost Summary (Future Costs Only)

Component ID	Component Name	Component Description	Total Cost	BUILD Federal	Other Federal	Federal Comments	Non-Federal	Non-Federal Source
1	Bridge Replacement and Double tracking for Obsession, Inwood, and Knights Branch Bridges. Double track from Medical Market Center to Stemmons Freeway Bridge	Replace and double track Obsession, Inwood, and Knights Branch Bridges. Bridges to be replaced are past their useful life. Construct 1.2 miles of double tracking from west of West Perkins (MP 640.7) to Stemmons Freeway Bridge (MP 639.5)	$23,500,000	$9,500,000	$0		$14,000,000	Private sector source or DART
2	Double track TRE near new Trinity Lakes Station and New Station at Trinity Lakes	Construct 1.3 miles of a new second track from existing TRE Richland Hills Station (MP 618.7) to just east of proposed Trinity Lakes Station (MP 620.0). There are no bridges or at-grade crossings in this segment. Construct new station platforms and canopies, install ticket vending machines and associated pedestrian components. This cost does not include parking and other station access components that will be funded outside of the grant.	$18,000,000	$10,500,000	$4,500,000	CMAQ programmed by NCTCOG	$3,000,000	Trinity Metro
3	Shore Connection System	(also known as wayside power or yard power) that allows TRE's nine (9) locomotives to “plug into” an electrical power source instead of using the diesel engines while in our rail yard. This project entails the installation of 10 wayside cabinets along the tracks at TRE’s equipment maintenance facility that will provide electrical power to the Head End Power (HEP) engines	$2,000,000	$2,000,000	$0		$0	
4	ClearPath Technology Implementation	This project will deliver a browser-based suite of applications that provides networked visibility to gateway operations including inbound train lineup, train and locomotive consist, crew status, train location and infrastructure status across all gateway railroads. Railroad-provided data will be collected in standard formats, including some in near real-time, to facilitate gateway status visualization on a consolidated and accurate geospatially enabled map. Functionality will also include train route forecasting, performance metrics and historical trend	$2,250,000	$2,500,000	$0		$0	

Total Cost	BUILD Federal	Other Federal	Non-Federal
$45,750,000	$24,500,000	$4,500,000	$17,000,000

Total Federal	**$29,000,000**	**63%**
Total Local - Excluding Previously Expended Funds	**$17,000,000**	**37%**

North Texas MOVES Projects
BUILD Grant Detailed Costs in Dollars (Future Costs Only)

All	Total for All Projects in Year of Expenditure Dollars	BUILD Request	Other Federal	Non-Federal	Total
	Administrative and legal expenses	$180,500	$100,000	$264,500	$545,000
	Land, structures, rights-of-way, appraisals, etc.	$0	$0	$0	$0
	Relocation expenses and payments	$0	$0	$0	$0
	Architectural and engineering fees	$1,826,000	$1,000,000	$2,724,000	$5,550,000
	Other architectural and engineering fees	$0	$300,000	$300,000	$600,000
	Project inspection fees	$800,000	$600,000	$1,075,000	$2,475,000
	Site work	$805,000	$1,200,000	$2,145,000	$4,150,000
	Demolition and removal	$141,000	$0	$564,000	$705,000
	Construction	$15,300,000	$900,000	$7,460,000	$23,660,000
	Equipment	$2,100,000	$0	$0	$2,100,000
	Miscellaneous	$1,092,500	$100,000	$822,500	$2,015,000
	Contingencies	$2,005,000	$300,000	$1,645,000	$3,950,000
	Total in Dollars	**$24,250,000**	**$4,500,000**	**$17,000,000**	**$45,750,000**

Costs in 2017 Real Dollars (reduced based on 3% inflation assumption)
$502,538
$0
$0
$5,110,175
$557,321
$2,140,210
$3,585,080
$608,139
$20,435,590
$1,889,890
$1,717,245
$3,358,769
$39,904,958

Year	Years from 2017	Inflation Adjustment
2019	2	1.0609
2020	3	1.092727
2021	4	1.12550881
2022	5	1.15927407
2023	6	1.1940523
2024	7	1.22987387

Double track from Medical Market Center to Stemmons Freeway bridge in Year of Expenditure Dollars	BUILD Request	Other Federal	Local	Total	Anticipated Year of Expenditure per Line Item	Costs in 2017 Real Dollars
Administrative and legal expenses	$70,500	$0	$164,500	$235,000	2019	$221,510.04
Land, structures, rights-of-way, appraisals, etc.	$0		$0	$0		
Relocation expenses and payments	$0		$0	$0		
Architectural and engineering fees	$826,000		$1,524,000	$2,350,000	2019/2021	$2,151,522
Other architectural and engineering fees	$0		$0	$0		
Project inspection fees	$700,000		$475,000	$1,175,000	2022	$1,013,565.32
Site work	$705,000		$1,645,000	$2,350,000	2022	$2,027,130.64
Demolition and removal	$141,000		$564,000	$705,000		$608,139.19
Construction	$6,000,000		$7,160,000	$13,160,000	2022	$11,351,931.60
Equipment	$0		$0	$0		
Miscellaneous	$352,500		$822,500	$1,175,000	2023	$984,044.00
Contingencies	$705,000		$1,645,000	$2,350,000	2023	$1,968,088.00
Total in Dollars	**$9,500,000**	**$0**	**$14,000,000**	**$23,500,000**		**$20,325,931**

Year	Cost
2019	$1,107,550
2020	
2021	$1,043,972.28
2022	$1,235,075
2023	$16,939,333
2024	
	$20,325,931

New Station at Trinity Lakes and Double Track in Year of Expenditure Dollars	BUILD Request	Other Federal	Local	Total	Anticipated Year of Expenditure per Line Item	Costs in 2017 Real Dollars
Administrative and legal expenses	$0	$100,000	$100,000	$200,000	2020/2021	$180,363
Land, structures, rights-of-way, appraisals, etc.	$0	$0	$0	$0		
Relocation expenses and payments	$0	$0	$0	$0		
Architectural and engineering fees	$0	$1,000,000	$1,200,000	$2,200,000	2019/2021	$2,043,511
Other architectural and engineering fees	$0	$300,000	$300,000	$600,000	2019/2021	$557,321
Project inspection fees	$0	$600,000	$600,000	$1,200,000	2022	$1,035,131
Site work	$0	$1,200,000	$500,000	$1,700,000	2022	$1,466,435
Demolition and removal	$0	$0	$0	$0		
Construction	$8,800,000	$900,000	$300,000	$10,000,000	2022	$8,626,088
Equipment	$100,000	$0	$0	$100,000	2022	$86,261
Miscellaneous	$500,000	$100,000	$0	$600,000	2022	$517,565
Contingencies	$1,100,000	$300,000	$0	$1,400,000	2022	$1,207,652
Total in Dollars	**$10,500,000**	**$4,500,000**	**$3,000,000**	**$18,000,000**		**$15,720,327**

Year	Cost
2019	$1,319,634
2020	$1,372,712
2021	$88,849
2022	$12,939,132
2023	
2024	
	$15,720,327

ClearPath Technology	BUILD Request	Other Federal	Local	Total	Anticipated Year of Expenditure per Line Item	Costs in 2017 Real Dollars
Administrative and legal expenses	$100,000	$0		$100,000	2020	$91,514.17
Land, structures, rights-of-way, appraisals, etc.	$0	$0		$0		$0
Relocation expenses and payments	$0	$0		$0		$0
Architectural and engineering fees	$1,000,000	$0		$1,000,000	2020	$915,141.66

Year	Cost
2019	$2,028,416
2020	
2021	
2022	

Other architectural and engineering fees	$0	$0		$0		$0	2023	
Project inspection fees	$0	$0		$0		$0	2024	
Site work	$0	$0		$0		$0		**$2,028,416**
Demolition and removal	$0	$0		$0		$0		
Construction	$0	$0		$0		$0		
Equipment	$1,000,000	$0		$1,000,000	2021	$888,487.05		
Miscellaneous	$150,000	$0		$150,000	2021	$133,273.06		
Contingencies	$0	$0		$0	0	$0		
Total in Dollars	**$2,250,000**	**$0**	**$0**	**$2,250,000**		**$2,028,416**		

Shore Connection System	BUILD Request	Other Federal	Local	Total	Anticipated Year of Expenditure per Line Item	Costs in 2017 Real Dollars	Year	Cost
Administrative and legal expenses	$10,000			$10,000	2020	$9,151.42	2019	
Land, structures, rights-of-way, appraisals, etc.				$0			2020	
Relocation expenses and payments				$0			2021	
Architectural and engineering fees				$0			2022	$9,151
Other architectural and engineering fees				$0			2023	$1,821,132
Project inspection fees	$100,000			$100,000	2020	$91,514.17	2024	
Site work	$100,000			$100,000	2020	$91,514.17		**$1,830,283**
Demolition and removal				$0				
Construction	$500,000			$500,000	2020	$457,570.83		
Equipment	$1,000,000			$1,000,000	2020	$915,141.66		
Miscellaneous	$90,000			$90,000	2020	$82,362.75		
Contingencies	$200,000			$200,000	2020	$183,028.33		
Total in Dollars	**$2,000,000**	**$0**	**$0**	**$2,000,000**		**$1,830,283**		

North Texas MOVES Projects

BUILD Grant Detailed Costs (Future Costs Only) By Percent Share in Major Construction Activity

All	Total for All Projects in Year of Expenditure Dollars	BUILD Request	Other Federal	Non-Federal	Total
	Administrative and legal expenses	33%	18%	49%	100%
	Land, structures, rights-of-way, appraisals, etc.	0%	0%	0%	0%
	Relocation expenses and payments	0%	0%	0%	0%
	Architectural and engineering fees	33%	18%	49%	100%
	Other architectural and engineering fees	0%	50%	50%	100%
	Project inspection fees	32%	24%	43%	100%
	Site work	19%	29%	52%	100%
	Demolition and removal	20%	0%	80%	100%
	Construction	65%	4%	32%	100%
	Equipment	100%	0%	0%	100%
	Miscellaneous	54%	5%	41%	100%
	Contingencies	51%	8%	42%	100%
	Total	**53%**	**10%**	**37%**	**100%**

	Double track from Medical Market Center to Stemmons Freeway bridge in Year of Expenditure Dollars	BUILD Request	Other Federal	Local	Total
	Administrative and legal expenses	30%	0%	70%	100%
	Land, structures, rights-of-way, appraisals, etc.	0%	0%	0%	0%
	Relocation expenses and payments	0%	0%	0%	0%
	Architectural and engineering fees	35%	0%	65%	100%
	Other architectural and engineering fees	0%	0%	0%	0%
	Project inspection fees	60%	0%	40%	100%
	Site work	30%	0%	70%	100%
	Demolition and removal	0%	0%	0%	0%
	Construction	46%	0%	54%	100%
	Equipment	0%	0%	0%	0%
	Miscellaneous	30%	0%	70%	100%
	Contingencies	30%	0%	70%	100%
	Total	**40%**	**0%**	**60%**	**100%**

C2	Double track and New Station at Trinity Lakes in Year of Expenditure Dollars	BUILD Request	Other Federal	Local	Total
	Administrative and legal expenses	0%	50%	50%	100%
	Land, structures, rights-of-way, appraisals, etc.	0%	0%	0%	0%
	Relocation expenses and payments	0%	0%	0%	0%
	Architectural and engineering fees	0%	45%	55%	100%
	Other architectural and engineering fees	0%	50%	50%	100%
	Project inspection fees	0%	50%	50%	100%
	Site work	0%	71%	29%	100%
	Demolition and removal	0%	0%	0%	0%
	Construction	88%	9%	3%	100%
	Equipment	100%	0%	0%	100%

Miscellaneous	83%	17%	0%	100%
Contingencies	79%	21%	0%	100%
Total	**58%**	**25%**	**17%**	**100%**

ClearPath Technology	BUILD Request	Other Federal	Local	Total
Administrative and legal expenses	100%	0%	0%	100%
Land, structures, rights-of-way, appraisals, etc.	0%	0%	0%	0%
Relocation expenses and payments	0%	0%	0%	0%
Architectural and engineering fees	100%	0%	0%	100%
Other architectural and engineering fees	0%	0%	0%	0%
Project inspection fees	0%	0%	0%	0%
Site work	0%	0%	0%	0%
Demolition and removal	0%	0%	0%	0%
Construction	0%	0%	0%	0%
Equipment	100%	0%	0%	100%
Miscellaneous	100%	0%	0%	100%
Contingencies	0%	0%	0%	0%
Total	**100%**	**0%**	**0%**	**100%**

Shore Connection System	BUILD Request	Other Federal	Local	Total
Administrative and legal expenses	100%	0%	0%	100%
Land, structures, rights-of-way, appraisals, etc.	0%	0%	0%	0%
Relocation expenses and payments	0%	0%	0%	0%
Architectural and engineering fees	0%	0%	0%	0%
Other architectural and engineering fees	0%	0%	0%	0%
Project inspection fees	100%	0%	0%	100%
Site work	0%	0%	0%	0%
Demolition and removal	0%	0%	0%	0%
Construction	0%	0%	0%	0%
Equipment	100%	0%	0%	100%
Miscellaneous	0%	0%	0%	0%
Contingencies	100%	0%	0%	100%
Total	**100%**	**0%**	**0%**	**100%**

North Texas Multimodal Operations, Velocity, Efficiency, and Safety (MOVES) Program

FY2019

Attachment 4 – Transit-Oriented Development Demographics Methodology

North Central Texas Council of Governments

4

Transit-Oriented Development Demographics Methodology for Traffic Survey Zones (TSZ) adjacent to new Trinity Lakes Station

The project includes a new station at "Trinity Lakes." The area around the new station is proposed to include more and different types of development (transit-oriented) than was previously reflected in the demographics of the travel model forecast for Mobility 2045. To test the impacts of this development on the transit system, households, population, and employment were increased for two TSZs (40148 and 9580) in two years (2028 and 2045). Table 1 below summarizes the changes in the two model year demographic assumptions.

Table 1: Summary of Demographic Increase to Trinity Lakes TSZs

	Existing Forecast				**With Added Development**			
TSZ 40148								
YEAR	**RETAIL**	**SERVICE**	**HH**	**POP**	**RETAIL**	**SERVICE**	**HH**	**POP**
2028	141	836	541	1,392	356	1,104	686	1,465
2045	206	1,343	803	2,071	1,640	3,129	1,769	2,559
TSZ 9580								
2028	102	400	2,184	7,381	317	668	2,204	7,395
2045	126	485	2,525	9,078	1,560	2,271	2,661	9,173

Information consistent with anticipated development at Trinity Lakes was provided to calculate the additional forecast for households, population, and employment. Table 2 provides a summary of information provided on the development in terms of square feet or units per development type (see the first three columns of Table 2).

The office/medical, retail/restaurant, multi-family, and single-family housing data was converted into estimates of population and jobs using methods employed in NCTCOG 2040 Demographic forecast and through occupancy factors from the International Building Code and U.S. Census. Calculated population and employment was added to each TSZ based on the difference between growth already projected and growth anticipated with this new transit-oriented development. The percent of each new development by type was distributed into each TSZ based on staff's interpretation of a draft site plan. Results of this process are displayed in Tables 2 and 3.

Development is expected to start drawing new household, population, and employment in 2025 and we used linear growth to interpolate the added populations over a 20-year period, which matches the time period of project benefits and cost analysis with 2045 as the end year.

Table 2: Conversion Factors for Development to Forecast Demographics

Development Type	Total (SQFT)	Units	Housing Units to HH	Housing Units to People	SQFT to Employees
Medical and Office	1,800,000				0.003
Retail and Restaurant	400,000				0.008
Multi-family	1,400,000	1,418	1	1.8	
Single, Townhome, Villa		200	1	2.5	

Table 3: Output Demographics based on Development Conversion Factors

Development Type	HH	POP	Retail	Service	% in 40148	% in 9580
Medical and Office				5,400	50%	50%
Retail and Restaurant			3,200		50%	50%
Multi-family	1,418	2,552			100%	
Single, Townhome, Villa	200	500				100%
Totals	**1,618**	**3,052**	**3,200**	**5,400**		

North Texas Multimodal Operations, Velocity, Efficiency, and Safety (MOVES) Program

FY2019

Attachment 5 – Schedule

North Central Texas Council of Governments

		2019				2020				2021				2022				2023			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project 1	**DT Medical Market Center to Stemmons Freeway**			E	E																
							D	D	D	D											
													C	C	C	C	C	C			
Project 2				E	E																
	DT near New Trinity Lakes Station and New Station									D	D										
													C	C	C	C					
Project 3	**Shore Connection System**				E																
						D	D														
								C	C												
Project 4	**Implement ClearPath Technology**																				
						D	D														
									C	C											

Legend

E	Environmental	D	Design	C	Construction

The following attachment is not included in the view since it is not a read-only PDF file.

Upon submission, this file will be transmitted to the Grantor without any data loss.

Attachment 6 DART FY 2019 Business Plan.pdf

The following attachment is not included in the view since it is not a read-only PDF file.

Upon submission, this file will be transmitted to the Grantor without any data loss.

Attachment 7 TMBoard.pdf

The following attachment is not included in the view since it is not a read-only PDF file.

Upon submission, this file will be transmitted to the Grantor without any data loss.

Attachment 8 - Letters of Support.pdf