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US 2/US 81 SKEWED INTERSECTION STUDY

Final Report

October 2019

Overcoming Barriers Strengthening Connections

M.P.O. M.P.O. M.P.O.

Grand Forks - East Grand Forks
Metropolitan Planning Organization

Ensuring Opportunities Planning One Community

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Report Contents:

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Chapter 1 – Existing and Future Conditions

Overcoming Barriers Strengthening Connections

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INTRODUCTION

The purpose of this study is to evaluate potential improvements for the skewed intersections in the area around US 2/Gateway Drive and US 81/Washington Street in Grand Forks, North Dakota. This chapter will identify issues and opportunities that will be used to develop potential transportation improvements in the study area.

STUDY AREA

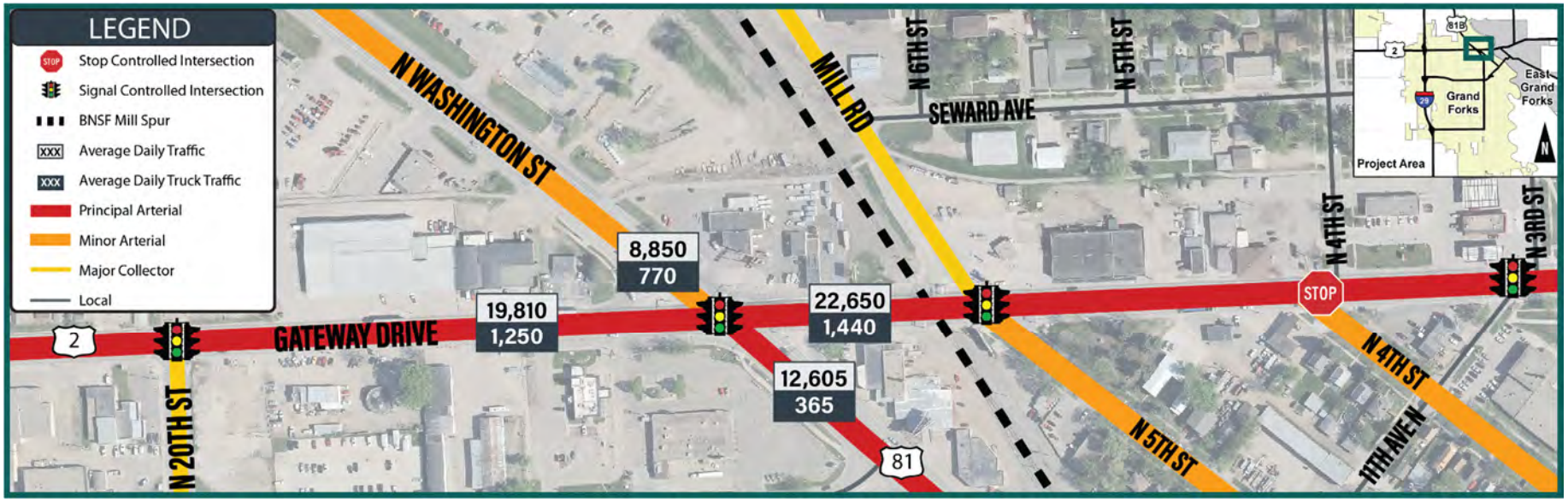
The study area consists of one-half mile of US 2/Gateway Drive. This study area includes five intersections with US 2/Gateway Drive:

- 20th Street
- US 81/Washington Street
- Mill Road/5th Street
- 4th Street
- 3rd Street/11th Avenue

US 2/Gateway Drive and US 81/Washington Street serve as Level One Freight Systems for the State of North Dakota, as defined in the *North Dakota State Freight Plan*. This means they serve as critical freight corridors, with International and Interstate connections. Between the US 2/Gateway Drive intersections of US 81/Washington Street and Mill Rd/ 5th Street is the Burlington Northern Santa Fe (BNSF) Mill Spur that serves the North Dakota State Mill and Elevator (NDSM) to the north.

Figure 1 shows the study intersections, current traffic control, average daily traffic (ADT), truck ADT, and functional classification of study area roadways. Further information obtained from a field review and desktop review of the current infrastructure are summarized in subsequent sections.

Figure 1: Study Area Infrastructure



Functional Classification

Functional classification is a uniform way of classifying roadways based on the mobility and access characteristics of the roadway. Core classifications are arterials, collectors, and local roads which encompass all roadways and provide a range of higher mobility/lower access to lower mobility/higher access, respectively. Characteristics also vary depending on whether they are in an urban or rural environment. Functional classifications for study area roads are shown in **Figure 1**.

- US 2/Gateway Drive and US 81/Washington Street south of the intersection with US 2/Gateway Drive are classified as Principal Arterials. Principal Arterials in the urban environment, are defined as roadways that serve major areas with high traffic volumes. These roadways should have the lowest access density according to the Federal Highway Administration (FHWA). US 2/Gateway Drive is also listed on the National Highway System, which includes roads important to the nation's economy, defense, and mobility.
- US 81/Washington Street north of the intersection with US 2/Gateway Drive, 5th Street and 4th Street south of US 2/Gateway Drive are classified as Minor Arterials. Urban Minor Arterials provide connections to Principal Arterial roads from other lower classifications. Minor Arterials also provide more property access than a Principal Arterial, but lower property access than Collectors and Local roads. US 81/Washington Street south of US 2/Gateway Drive is also listed on the National Highway System.
- Mill Road and 20th Street are classified as Collectors. The main purpose of collectors is to provide access to arterials from local roads.
- All other roads in the study are classified as local streets. Local roads are intended for short trips and primarily serve as direct land access.

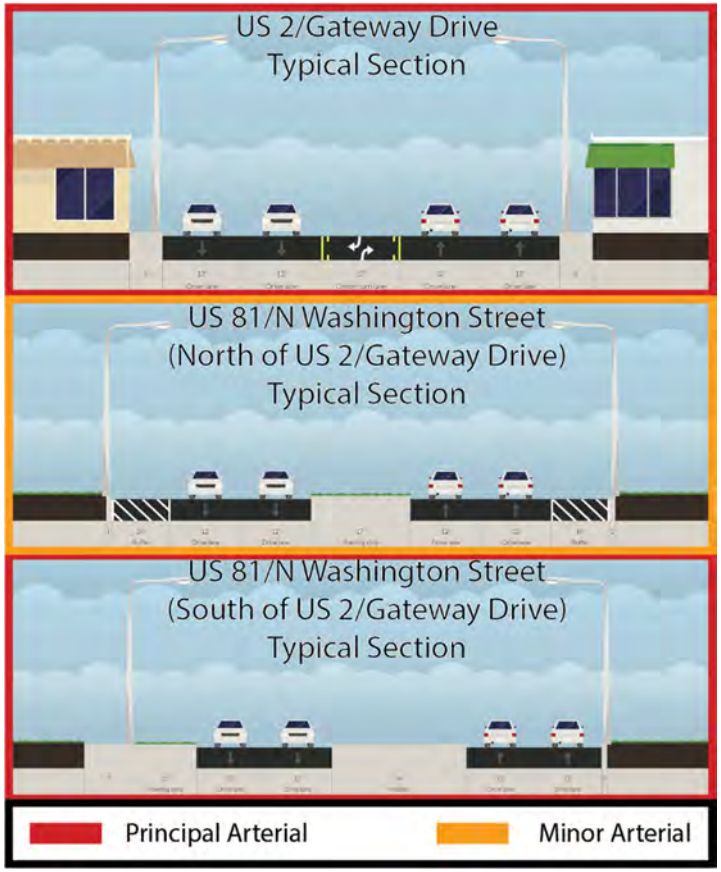
Typical Sections

Typical sections show the general configuration of a roadway, with typical sections for the study area shown in **Figure 2**. Within the study area US 2/Gateway Drive is a five-lane section with additional right-turn lanes at intersections as necessary. Sidewalks are available for pedestrians.

US 81/Washington Street north of US 2/Gateway Drive is a four-lane section with a grass median approximately 17' feet wide, and 10' shoulders on either side of the road. Left-turn lanes are provided approximately every 200 feet, and additional turn lanes are provided at the intersection with US 2/Gateway Drive. Pedestrian facilities are limited to directly adjacent to the intersection of US 2/Gateway Drive and US 81/Washington Street on US 81/Washington Street.

US 81/Washington Street south of US 2/Gateway Drive is a four-lane section with a center median and a shared use path for pedestrians on the west side of the roadway.

Figure 2: Typical Sections



Right-Of-Way

Right-of-way refers to the land available adjacent to a corridor for the expansion or modification of roads, pedestrian facilities, or utilities.

Existing right-of-way information was obtained from City of Grand Forks GIS Services. US 2/Gateway Drive is limited to the roadway and current sidewalks, with limited utility easements available for streetlights. The approximate width is 70 feet.

Businesses and parking lots occupy the space adjacent to the right-of-way making the acquisition of additional right-of-way difficult. Examples of this in the study area can be seen in **Figure 3:**

- The University Storage Building is immediately adjacent to the sidewalk
- Facilities/parking at U-Haul of Grand Forks are also adjacent to the sidewalk.

US 81/Washington street has approximately 20' of available on the east side of the road and 60' on the west side of the roadway, allowing for more flexibility.

Pavement Conditions

Studies have found that timely pavement rehabilitation has the potential to be six to 14 times more cost-effective than rebuilding a deteriorated road. Another study found that rough roads add an average of $515 to the annual cost of car ownership due to damaged tires, suspensions, reduced fuel efficiency, and accelerated vehicle depreciation.

The Grand Forks-East Grand Forks MPO derived a pavement conditions map for the 2045 Long Range Transportation Plan update that combined NDDOT and City of Grand Forks pavement data into one pavement map. This information is shown in **Figure 4**. Based on this information, US 2/Gateway Drive pavement is in good condition, US 81/Washington Street pavement is in satisfactory condition, and Mill Road/5th street is in fair condition.

Figure 3: Right of Way Limitations

Utilities

Existing utilities and locations were also obtained from City of Grand Forks GIS Services. These utilities include buried water lines, sanitary sewer, storm sewer, electrical, and fiber optic. Utilities can be seen in **Figure 4**.

US 2/Gateway Drive and US 81/Washington Street both have overhead street lights on either side of the roadway.

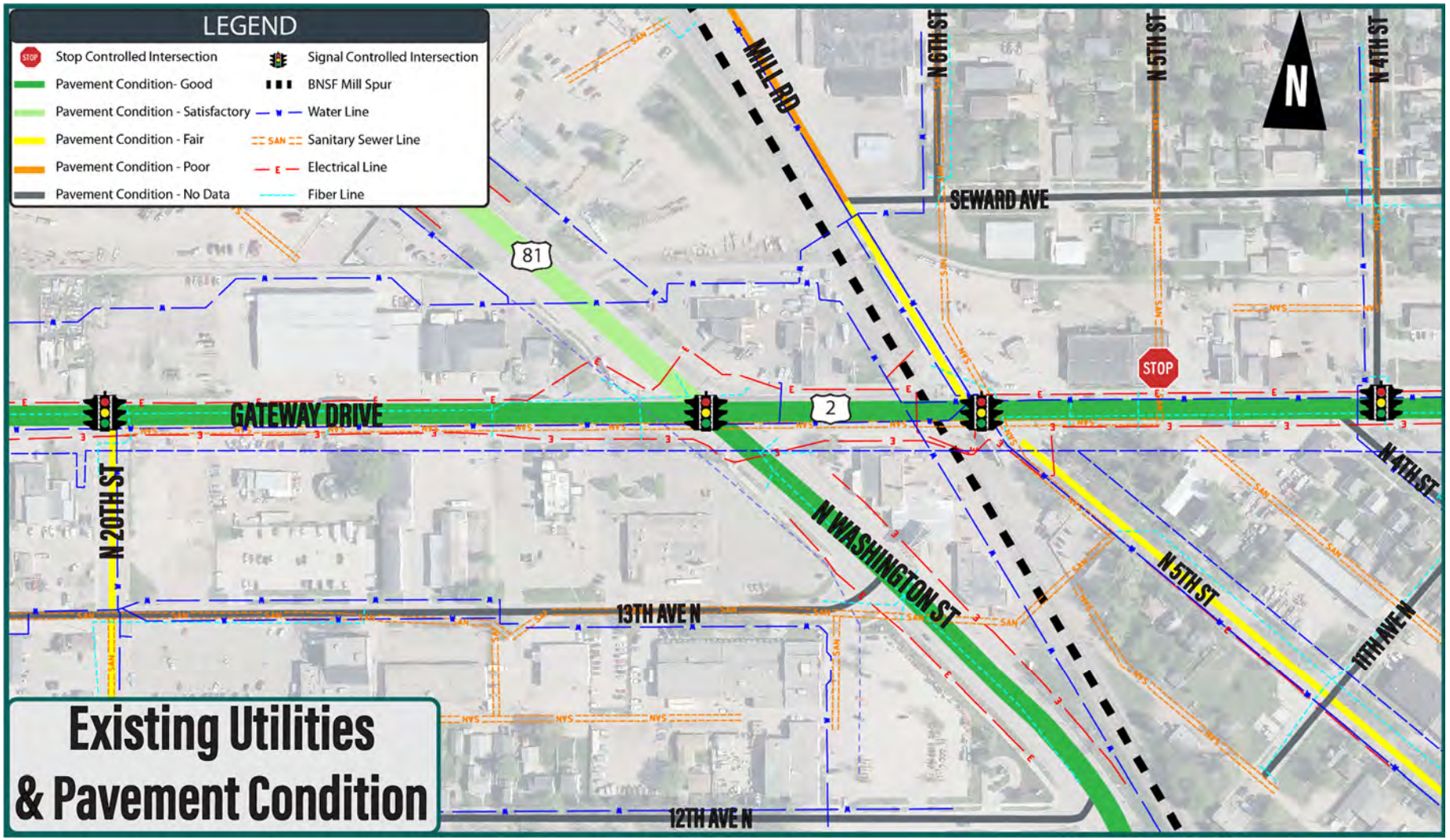


Figure 4: Utilities and Pavement Condition

Access Management

Access management is the process of balancing the competing needs of traffic movement and land access. Accesses introduce conflict and friction into the traffic stream. Allowing dense, uncontrolled access spacing results in safety, operational and aesthetic deficiencies for all users.

- According to NCHRP Report 420: Impact of Access Management Techniques, every unsignalized driveway increases the corridor crash rate by approximately two percent and decreases corridor travel speeds by 0.25 miles per hour.
- The safety and operational issues caused by dense access spacing potentially makes an area less attractive to developers and the general traveling public. Multiple national studies have shown most people have no problem making a slightly longer trip, including U-turns, to access destination businesses so long as the ride is pleasant and congestion free.

Desirable access risk considers the spacing guidelines set forth in the City of Grand Forks ordinances, NDDOT Design Manual, FHWA Functional Classification Guidelines, and effective access management configurations locally and statewide.

The study corridor is a principal arterial classified by the Grand Forks Land Development Code as a Level 4 Access Controlled Street. The desired access spacing is 660 feet, or eight accesses per mile per side including crossing arterial routes. There were 33 accesses including roadways, private residential driveways, and commercial business driveways inventoried on the half-mile study corridor. This equates to 66 access points per mile, which is more than eight times the recommended spacings for a principal arterial. **Figure 5** shows the existing accesses in the study area.

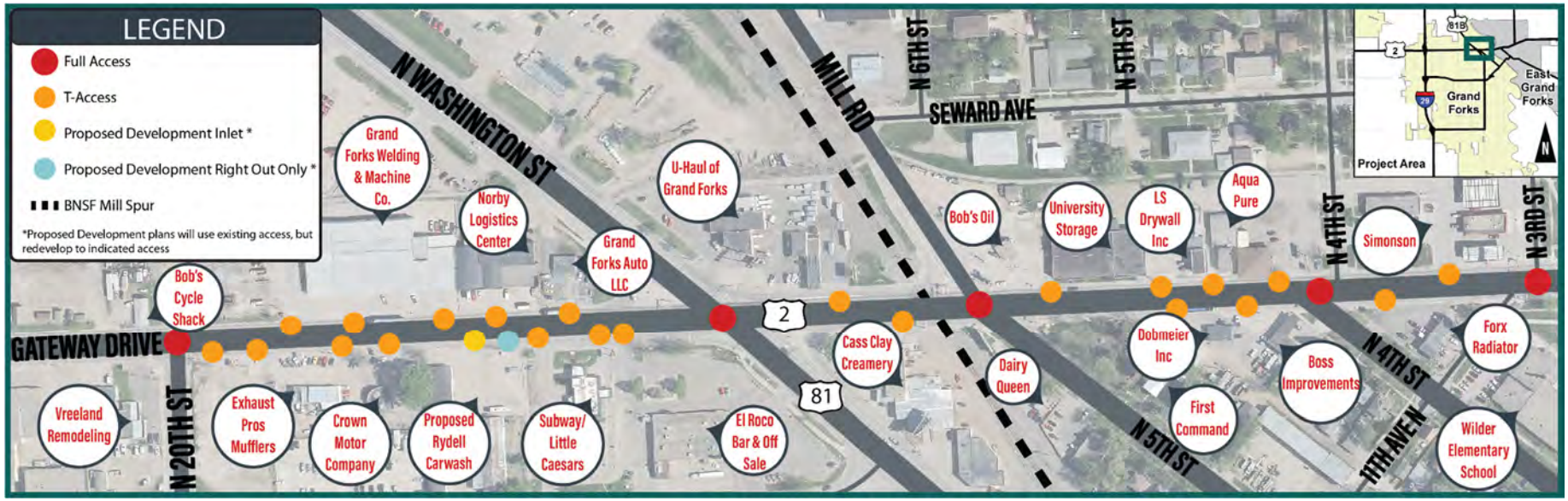


Figure 5: Existing Accesses

TRAIN ACTIVITY

The Burlington Northern Santa Fe (BNSF) railroad line runs parallel to Mill Road/5th Street on the west side. Preemption data obtained from the City of Grand Forks shows that the average number of train blockages daily is between 4 and 5 trains. Data from the Federal Railroad Administration (FRA) is consistent with this, showing 4 trains or switching maneuvers per day. The maximum train speed is 20 miles per hour, with common train speeds between five and 10 miles per hour.

Given the low train volumes and low train operating speeds, the existing overhead flashers meet FRA guidelines for active crossing safety devices. While no crashes involving a train have been reported since 1994, 12 crashes had occurred previously between 1975 and 1994.

In 2010, the Grand Forks – East Grand Forks MPO completed the *Mill Spur Feasibility Study* to identify railroad crossing improvements that would improve safety and aesthetics of the corridor, improve traffic operations, and plan for improvements that would accommodate a future train whistle quiet zone. This study recommended installing an active warning system (railroad gate arms and constant warning time), 8-inch high concrete median, pedestrian gates, and other geometric improvements that will increase crossing safety for vehicles and pedestrians.

Conflicts are not only limited to vehicles, with sidewalks crossing the tracks on each side of US 2/Gateway Drive, and a multi-use path crossing the tracks 250 feet north of the corridor.

The North Dakota State Mill is also working to accommodate unit train access. Unit trains are trains that carry one single commodity to reduce costs of switching out train cars at multiple locations. They typically exceed 110 cars and are approximately 7,000 feet in length. These trains can be longer and have more cars that will need to be loaded at the NDSM which can have a more significant impact to traffic flow during train events. According to analysis completed as part of the Mill Spur Feasibility Study, one Unit Train will block each individual crossing between 8.67 and 16.57 minutes depending on the speed. A unit train would block all of the crossings along the Mill Spur from 2nd Avenue to Gateway Drive between 2.97 and 5.17 minutes depending on speed.

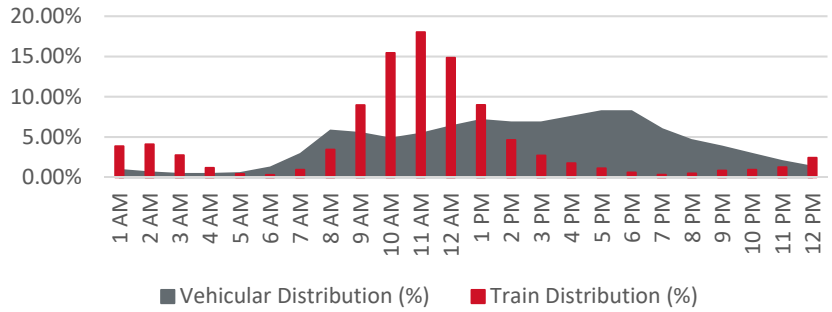
According to the ND Mill, the Mill would typically receive two unit trains per month with a maximum of three and a minimum of zero unit trains. This would be in replacement of other trains and not in addition to. The Mill also expects most of these trains to come on the weekends and at night. While the evenings and weekends limit the impact to traffic delays, this does increase the noise impacts to surrounding neighborhoods.

Current Train Events

The City of Grand Forks provided railroad preemption data from the traffic signals for the periods between 2016 and 2018. This data shows date, time, and duration of train events on the Mill Spur rail line. Only 4.5 months of data were analyzed due to most data files not showing the type of preemption (train vs. emergency vehicle), this data was not used in the analysis, to prevent skew from shorter duration emergency vehicle preemption events. Further information on types of preemption, as well as, providing data for the full year of 2018 would provide the most accurate analysis of current traffic conditions.

The following analysis was based on the 4.5 months of useable data. The months analyzed included March, April, October, November, and half of December. These numbers likely do not reflect the highest or lowest number of trains throughout the year. Figure 6 shows the daily distribution of trains per intersection, based on this data, as well as, the typical daily distribution of traffic. This distribution shows how trains and vehicles are spread out throughout the day. The peak hour for trains occurs between 11am and noon, while the peak hour for vehicles is 4pm to 6pm.

Figure 6: Train and Traffic Distribution



As illustrated by the duration of these blockages, this crossing accommodates train movements and switching maneuvers. Figure 7 shows the average number of blockages per day of the week based on the data provided and the duration of train blockages. Average, maximum, and minimum duration of train blockings at the US 2/Gateway Drive crossing were found to be 2:31, 14:14, and 0:21 minutes respectively. When considering the total delay to all vehicles, the combined delay for all vehicles is 89 hours per day, 2,670 hours per month, and 32,396 hours a year. This does not consider seasonal variances due to the limited amount of data.

Figure 7: Average Daily Trains and Average Train Event Duration

Crossing Exposure and Crash Prediction

Data from the *National Highway Traffic Safety Administration* (NHTSA) indicates that a motorist is 20 times more likely to die in a crash involving a train than in a collision involving another motor vehicle. Therefore, it is imperative that the risk for vehicle-train collisions is minimized while working to achieve other goals such as reducing traffic delays and minimizing the impacts that train activity has on surrounding homes and businesses.

The Federal Railroad Administration (FRA) has a crash prediction model, according to this model, this intersection will have 0.02808 crashes per year with a train. This is the 5th highest rate in Grand Forks, and the 7th highest rate in Grand Forks County.

FHWA has guidelines for determining if grade separation should be considered at locations.

Grade Separation Guidelines:

- Highway designated in National Highway System
- Highway access is designed for partial controlled access
- Highway speed exceeds 55 mph
- Train speed exceeds 100 mph
- AADT exceeds 50,000 in urban areas
- Average number of trains per day exceeds 75 (or 50 passenger trains)
- Crossing exposure (product of vehicular crossing ADT and number of trains) exceeds 500,000 (or 400,000 for passenger train crossing exposure)
- Accident frequency exceeds 0.2
- Vehicle delay per day exceeds 30 vehicle hours per day
- An engineering study indicates lack of grade separation would cause the highway to perform below design level of service more than 10 percent of the time.

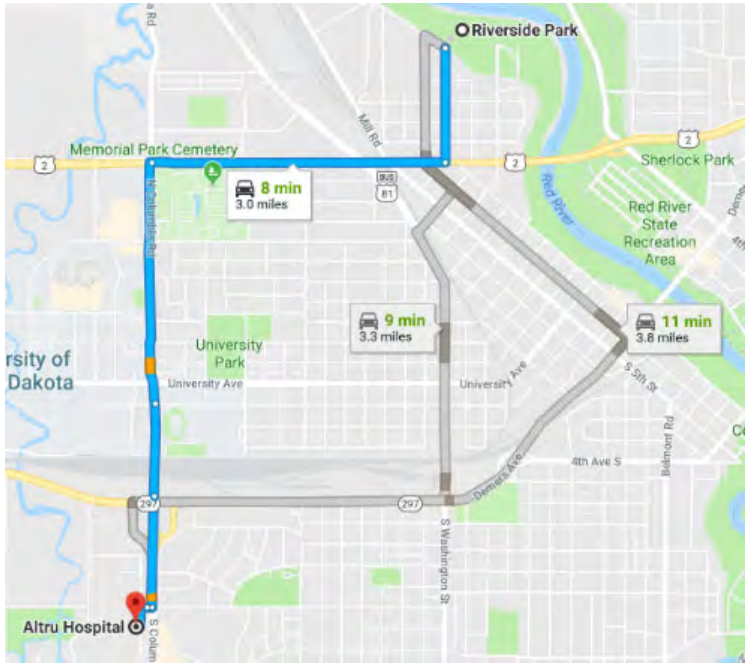
Under current conditions, the only guideline that this intersection meets for grade separation is for vehicle delay. The threshold for vehicle delay is 30 vehicle hours per day, and currently vehicle delay is almost three times that at 89 hours per day.

Emergency Operations

Grand Forks Fire, Police, and Ambulance service regularly cross the Mill Spur rail line for emergency service, especially to provide service to East Grand Forks and rural Minnesota. During a train event the crossing is blocked on average 2 minutes and 31 seconds. This delay impacts the response time of these emergency services.

- For emergencies involving loss of oxygen to the brain, brain damage is possible within four to six minutes, expected from six to 10 minutes, and death is most likely to occur after 10 minutes, making ambulance and medical first responders time critical.
- Effective fire-fighting is also impacted with each minute of delay: typical residential fires double in size every 60 seconds so response time to fires is critically important.

Figure 8: Google Maps Travel Time Estimate from Riverside Park to Altru Hospital



Altru Hospital is the primary healthcare provider for the city and region including East Grand Forks and surrounding areas. The impacts of a train event on the Mill Spur line, for a medical first responder is shown in **Figure 8**. To travel from Riverside Park to Altru Hospital during a train event adds three additional minutes, assuming no additional congestion through downtown.

The Grand Forks Fire department has five fire stations, which are placed to allow them to respond to any address in city limits within four minutes. Station 2 serves approximately the northern third of the city and is located on the corner of North Columbia Road and 10th Avenue North. Any train delays would impact the department's capability to respond to the northeast corner of the city. **Figure 9** shows the response area for Station 2 from the Grand Forks Fire Department and the location of the rail crossings.

Figure 9: Grand Forks Fire Station 2 Response Area

PEDESTRIAN, BICYCLE, AND TRANSIT FACILITIES ANALYSIS

Pedestrian Facilities and Amenities

The industrial nature of the corridor and high truck traffic can conflict with the ability to provide pedestrian and bicyclist comfortability. There are four-foot sidewalks adjacent to the curb line throughout most of the study area, excluding the north side of US 2/Gateway Drive from 20th Street to US 81/Washington Street.

The only marked crosswalk across US 2/Gateway Drive is located at the 3rd Street/11th Avenue signalized intersection, where there are also pedestrian push buttons, countdown pedestrian signals, and ADA ramps with truncated domes. There are no other marked crosswalks across US 2/Gateway Drive in the study area, however there is a multi-use path grade-separation under US 2/Gateway Drive just east of 3rd Street.

For east-west crossings, there are marked crosswalks and ADA ramps with truncated domes across the minor approaches at 20th Street, US 81/Washington Street, and Mill Road/5th Street, but there are no pedestrian signal heads at the intersections with US 81/Washington Street and 5th Street/Mill Road. High vehicle volumes combined with long pedestrian crossing distances can make east-west crossings difficult in the absence of pedestrian signal phases. Additionally, the presence of channelized right turns on US 81/Washington Street and 5th Street/Mill Road can reduce pedestrian comfort and safety as it permits right-turning vehicles to make fast, uncontrolled right-turns.

In addition to the sidewalks along US 2/Gateway Drive, there is a multi-use path that runs along the back of the commercial properties north of US 2/Gateway Drive. This transitions to the south at the 3rd Street underpass, ultimately connecting to the Red River Greenway and Riverside Pool. There is also a multi-use path that runs along the west side of US 81/Washington Street south of US 2/Gateway Drive that continues to 8th Avenue N, where it transitions to sidewalks and continues south through the City of Grand Forks.

Pedestrian facilities in the study area are shown in **Figure 10.**

Safe Routes to School

The Wilder Elementary School is located on the south-east quadrant of US 2/N 3rd Street/11th Avenue intersection. The existing surface crossing and tunnel on the east side of the N 3rd Street and 11th Avenue crossing US 2/Gateway Drive is a designated safe route to the school for pedestrians and bicyclists.

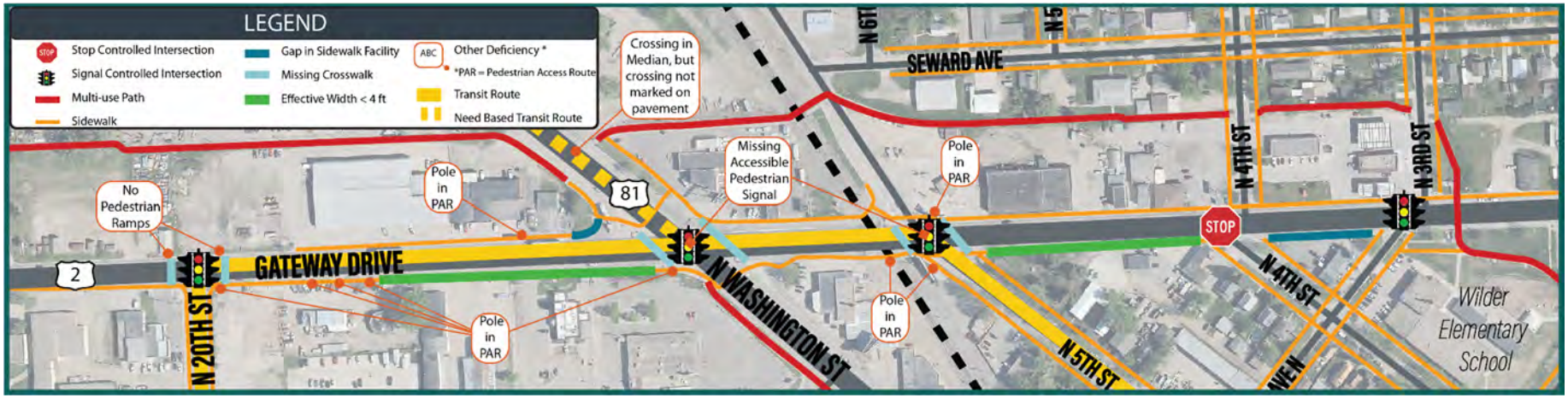


Figure 10: Pedestrian, Bicycle, and Transit Facilities

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) provides design standards for pedestrian paths and curb ramps in the *2010 ADA Standards for Accessible Design*. The basic requirements address width, condition, surfaces, curb ramps and flares, location, placement of pedestrian push buttons, slopes for pedestrian paths, and curb ramps. Beyond the federal law that requires ADA compliance, meeting standards improves accessibility and comfort for all users. A full evaluation of ADA compliance is outside the scope of the study. However, during the field review, multiple locations were noted with narrow, broken, or overgrown sidewalks. Signs, light poles, and debris often block pedestrian paths which could be dangerous to pedestrians with visual impairments and make traversing the sidewalk difficult for pedestrians in wheelchairs. Detectable warning panels are present at all marked crosswalks.

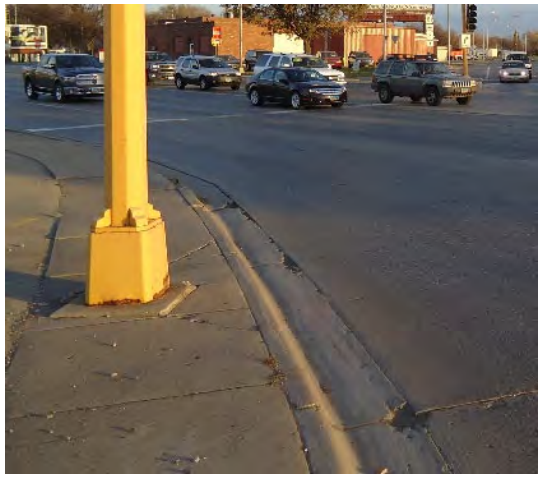
The existing non-compliant ADA pedestrian facilities in the study area are shown in **Figure 10**.

Effective Walkway Width

Effective walkway widths ensure a minimum accessible route of passage within a sidewalk or other walkway that may not comprise the full width of the route. Research presented in the *Highway Capacity Manual* (HCM) found that pedestrians generally keep 18 inches between themselves and adjacent walls, curbs, and other obstructions, resulting in sidewalks that have less usable space than their design space. This is especially true when pedestrian routes are directly adjacent to a vehicular travel lane. Along US 2/Gateway Drive, the effective walkway width does not follow the recommended four-feet of clear width. There are several obstructions including presence of utility structures and advertisement poles within the pedestrian access route (PAR) along the corridor, examples of which can be seen in **Figure 11**.

The non-compliant effective width and obstructions within the PAR in the study area are shown in **Figure 10**.

Figure 11: Obstructions in Walkways



Bicycle Facilities and Amenities

The City of Grand Forks is a Bronze level Bicycle Friendly Community as designated by the League of American Bicyclists. The city has an extensive network of bicycle facilities and amenities due to City Ordinances prohibiting bicycles on sidewalks, except in residential districts. Along US 2/Gateway Drive, the multi-use path that runs along the back of commercial properties north of US 2/Gateway Drive connects cyclists to 3rd Street and the Red River Greenway to the east and to the Columbia Road and 55th Street multi-use paths and the 42nd Street multi-use path to the west. However, when this path crosses US 81/Washington Street there are no protections available for bikes and pedestrians.

Bicycle facilities in the study area are shown in **Figure 10**.

Transit Service and Operations

Cities Area Transit (CAT) provides fixed-route transit service in the Grand Forks – East Grand Forks CAT Route 2 runs along US 2/Gateway Drive, with hourly service. It has designated stops at 5th Street and 10th Avenue and Hugo's on 20th Street, two blocks south of US 2/Gateway Drive. CAT will also stop at Home of Economy on US 81/Washington Street, north of US 2/Gateway Drive when scheduled in advance.

Transit service in the study area is shown in **Figure 10**. Reliability information was not readily available for the route, however, according to CAT no delay issues have been reported due to the Mill Spur at this location.

EXISTING TRAFFIC CONDITIONS

To analyze existing, and forecast future conditions, the 85th Percentile of five days of data from the Upper Great Plans Transportation Institute Advanced Traffic Analysis Center (ATAC) was taken for each intersection in the study area. The days selected were from May, June, July, August and October of 2018. The Grand Forks – East Grand Forks MPO also provided data on 12-hour turning movement counts that were collected in October 2018. After reviewing the data, provided by the MPO, the counts were much lower than those in ATAC and were determined did not accurately depict existing conditions in the study area. The morning peak was identified between 7:15 AM and 8:15 AM, while the evening peak was identified between 4:15 PM and 5:15 PM, based upon this turning movement data. Turning movements were adjusted to balance the observed volume differences between intersections.

The existing average annual daily traffic (AADT) was obtained from the North Dakota Depart of Transportation (NDDOT)*Transportation Information Map* for the corridor segments. The 2015 count data was used due to construction on the Kennedy bridge causing skewed data in 2018. 2018 data showed a reduction in overall traffic but an average increase in truck traffic of 32 percent. Operations at the Mill, which expanded in the summer of 2016, may be contributing to the increase in truck traffic. They are now producing up to 25 percent more trucks each day than before the expansion. All analysis was based on peak hour turning movement counts.

Figure 13 shows the existing morning and evening peak hour turning movement counts, AADT, and lane configurations of the intersections along the corridor.

Traffic Volumes

US 2/Gateway Drive is a major east-west principal arterial and a business corridor. The corridor is a thoroughfare to and from Grand Forks International airport, Grand Forks Air Force Base and East Grand Forks, Minnesota. The corridor carries between 20,000 and 23,000 vehicles per day.

The US 2/Gateway Drive and US 81/Washington Street intersection is a major intersection along the corridor. US 81/Washington Street is an important north-south arterial route, serving as the business route for US 81, carrying between

9,000 and 12,500 vehicles per day. 5th Street serves as the US 2 business route and is a major entry point into downtown Grand Forks, carrying around 3,200 vehicles per day.

There is some minor directionality of traffic corresponding with the peak hours. Specifically, about 5-7% more traffic is headed westbound in the morning peak hour and 3-5% more traffic is headed eastbound in the afternoon peak hour. This may be from residents living in East Grand Forks heading to/from work in Grand Forks.

Truck Volumes

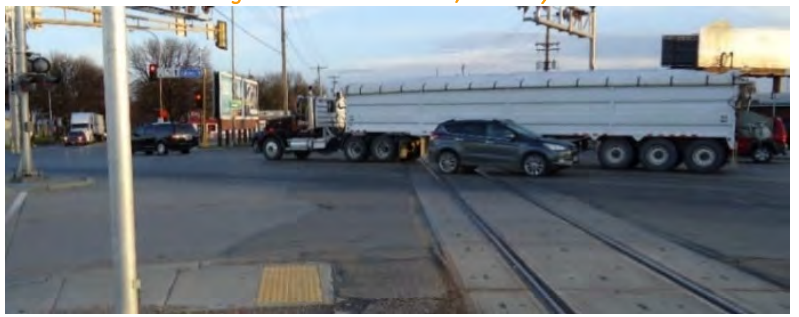
The US 2/Gateway Drive corridor is designated as a major truck route by the *NDDOT Freight Plan 2015*. The corridor carries between 1,250 and 1,500 trucks per day.

During the annual sugar beet harvest between September and October of each year, the truck volumes can far exceed 1,500 trucks per day. Grand Forks County produces over 80,000 tons of sugar beets, which must make their way to the processing plant in East Grand Forks, located off the US 2 business loop.

The North Dakota State Mill (NDSM), northwest of US 2/Gateway Drive and Mill Road intersection is a major truck generator in the region. Trucks bring commodities to NDSM and after processing, the outputs are shipped on the BNSF Mill Spur. NDSM currently processes and ships almost 5 million pounds of product daily according to their website. There are plans for improvement at NDSM with the anticipated increase in grain processing in the future. This is expected to have an impact on the roadway network due to increased truck traffic and additional activity at the railroad crossing.

The geometrics of the corridor intersections need to support the critical truck movements in the corridor. The skew characteristics make sight lines much more difficult than a typical intersection, as drivers must turn their head at a much greater angle to view the cross traffic. It can also make negotiating the turns much more difficult. US 81/Washington Street intersects US 2/Gateway Drive at a 42-degree angle and Mill Road intersects US 2/Gateway drive at a 55-degree angle. Based on traffic data collected between 6 am and 6 pm, 72 trucks made skewed turning movements at the US 81/Washington Street intersection and 113 trucks made skewed turning movements at the Mill Road/5th Street intersection. Over 90 percent of these movements were between the north and west approaches at each intersection.

Figure 12: Trucks on US 2/Gateway Drive



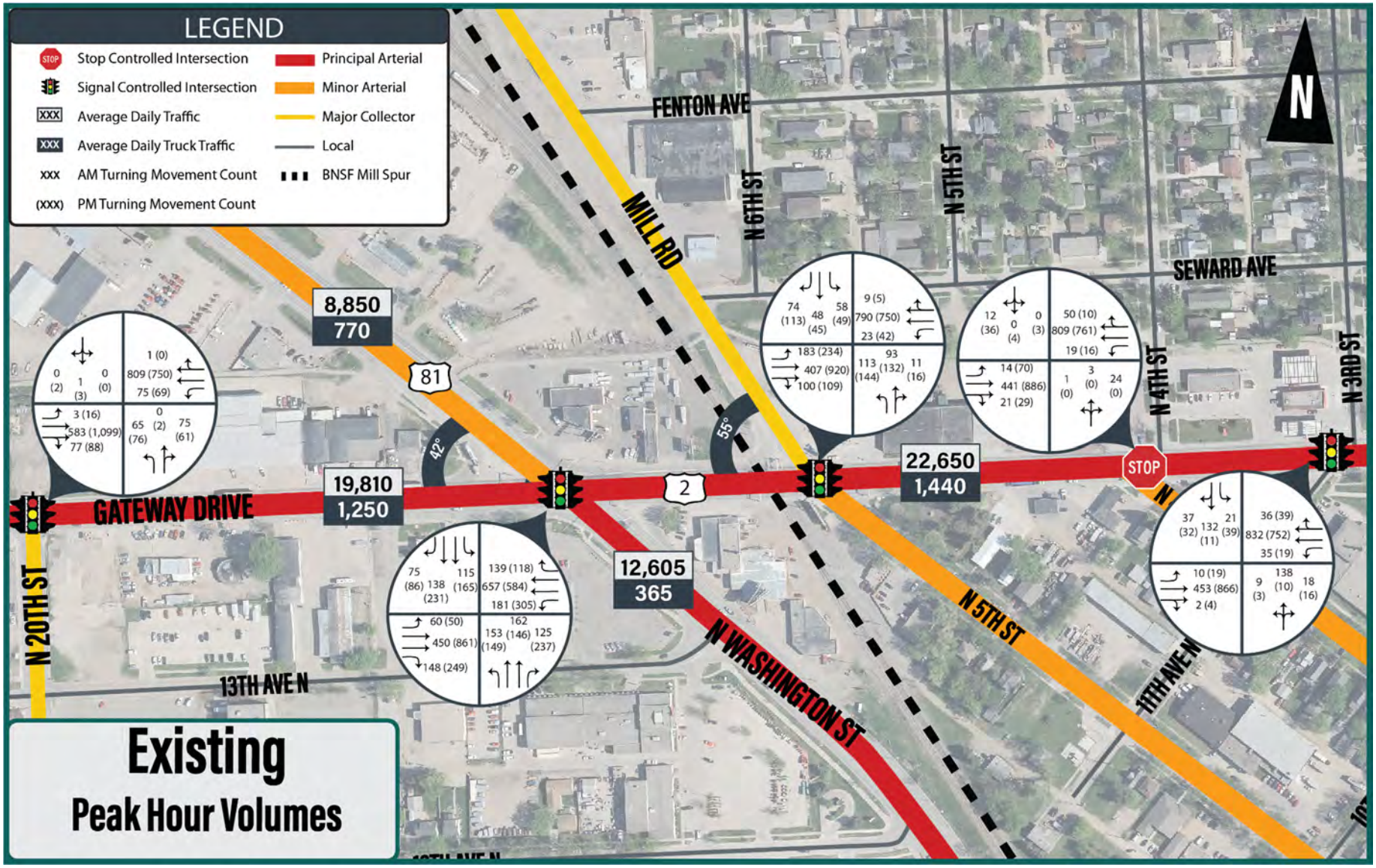


Figure 13: Existing Peak Hour Turning Movements

Traffic Control Warrant Analysis

Selecting the appropriate traffic control device requires consideration of traffic patterns and volumes, roadway geometry, lane configurations and multimodal aspects. The *Manual of Uniform Traffic Control Device* (MUTCD) provides guidance and standards on the installation of traffic control methods which considers vehicular volume, pedestrian volumes, and crash frequency thresholds for multiple roadway contexts. Warrant analysis does not require signals to be built. However, the analysis highlights the locations that may benefit from traffic control upgraded or removed. Research conducted by FHWA found that that removing unwarranted signals may result in a 24 percent decrease in all crashes, a 53 percent decrease in injury crashes, a 24 percent decrease in right-angle crashes, and a 29 percent decrease in rear-end crashes. Specific traffic control alternatives will be analyzed in the *Alternatives Development and Assessment Report*, to be developed later.

Warrant analysis was conducted at the five study intersections. In accordance with NDDOT guidance for warrant analysis, minor street right-turn volumes were excluded for dedicated right-turn lanes and included at 50 percent for shared right-turn lanes. **Figure 14** shows existing traffic control at each of the study intersections. Only the 4th Street intersection is two-way stop controlled; the remaining study intersections are currently signalized. Below is a summary of the findings from the traffic control analysis.

Table 1 shows required hours of specified volumes to meet each warrant and how many hours are being fulfilled with the current volume of traffic:

- The US 81/Washington Street and Mill Road/5th Street intersections meet traffic volume warrants 1, 2, and 3 currently.
- The 20th Street and 3rd Street/11th Avenue intersections do not meet signal warrants under current conditions. These intersections are currently signalized.
- The 4th Street intersection does not meet any signal warrants under current conditions.

Table 1: Existing Traffic Control Warrants Analysis

Intersection	Existing Traffic Control	Warrants Met (Hours Met/Required)			
		1A	1B	2	3
20th Street	Signal	0/8	0/8	0/4	0/1
US 81/ Washington Street	Signal	**8/8**	**8/8**	**4/4**	**1/1**
Mill Road/5th Street	Signal	0/8	**8/8**	**4/4**	**1/1**
4th Street	Thru/Stop	0/8	0/8	0/4	0/1
3rd Street/11th Ave	Signal	0/8	1/8	1/4	0/1

Warrant 1a: Minimum Vehicular Volume
Warrant 1b: Interruption of Continuous Traffic
Warrant 2: Four-Hour Vehicular Volume
Warrant 3: Peak Hour Vehicular Volume
Warrant 9: Intersection Near a Grade Crossing

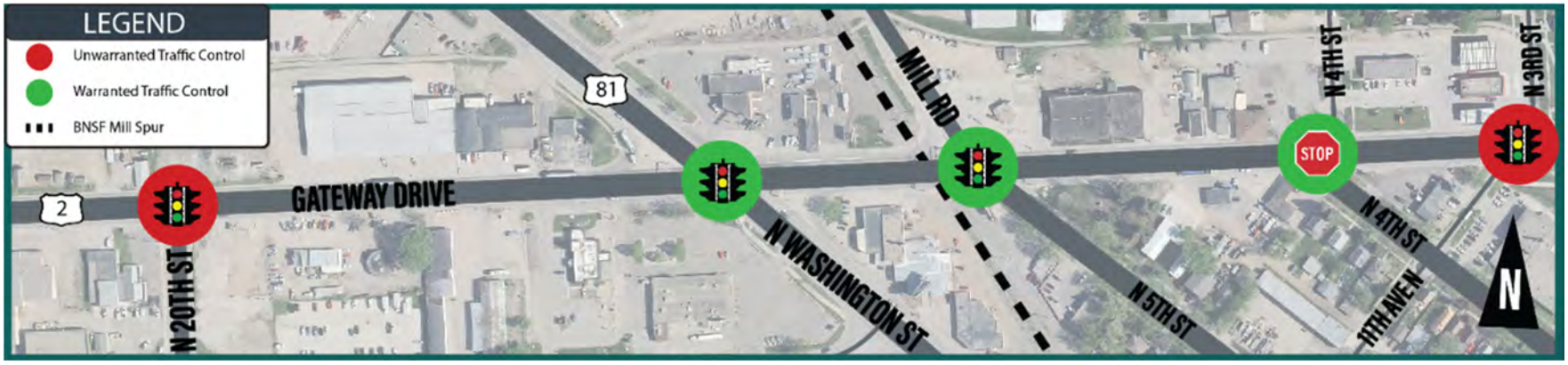


Figure 14: Existing Traffic Control Warrant Analysis

TRAFFIC OPERATIONS

Methodology

Existing traffic operations were analyzed using PTV VISSIM Version 9 that utilizes the Level of Service (LOS) methodologies documented in the *Highway Capacity Manual* (HCM). VISSIM simulates the movement of every vehicle through an intersection and then collects information for associated performance measures like delay, queue lengths, travel times, and density. The models included in-place geometry such as number of thru lanes and turn lanes, storage length for turn lanes, distances between traffic control (link distance), speed limits. The model also includes signal timing parameters such as phasing, cycle length, maximum greens, yellow, all red intervals. The primary results that are used in the study are delay/LOS and queuing analysis. Operational analysis results are described in terms of LOS ranging from A to F with A operating with the least delay and F operating with the most delay. Intersection delay and corresponding LOS for signalized and unsignalized intersections, as defined by HCM are presented in **Table 2**.

Based on NDDOT guidance and standard practice in traffic engineering, the threshold for acceptable intersection operations is commonly the border between LOS D and LOS E. LOS D is considered acceptable and LOS E is considered unacceptable.

Table 2: Intersection Delay and Level of Service Thresholds

Control Delay (sec/veh)		Level of Service (LOS) Thresholds
Signalized	Unsignalized	
≤ 10	≤ 10	A
10 - 20	10 - 15	B
20 - 35	15 - 25	C
35 - 55	25 - 35	D
55 - 80	35 - 50	E
> 80	> 50	F

Queuing of vehicles at intersections can have serious traffic safety implications, as well as contributing to excessive delay due to blocked lanes impeding the flow of traffic. Queue analysis was completed in addition to level of service analysis. Queuing values were analyzed for the average and 95th percentile modeled queue lengths based on the average of five 60-minute simulation runs during peak hours. The 95th percentile queue is the queue length that will be exceeded only five percent of the time.

A queuing issue was identified if any of the five conditions were met:

- Condition 1: 95th percentile queue length exceeds storage length and the movement operates worse than LOS D.
- Condition 2: Average queue length exceeds storage length.
- Condition 3: 95th percentile queue length blocks upstream full access intersection.
- Condition 4: 95th percentile through lane queue blocks access to the turn lane bay.
- Condition 5: 95th percentile queue length exceeds 500 feet on a stop-controlled approach.

Traffic Operations Results

Traffic operations analysis was completed for three scenarios: morning peak, evening peak, and a train event. The traffic signal timing parameters were provided by the City. The traffic models maintained the cycle lengths at each intersection and traffic operations were evaluated after optimizing the signal timing splits. For the train event, the peak was chosen between 11 AM and noon based on the 4.5 months of preemption data provided by the city. This time period has the highest frequency of a train event occurring according to the data. The average train blockage of 2 minutes and 31 seconds was used for the analysis.

Figure 15 and **Figure 16** summarize the morning, evening, and train event operations. The reported approach and intersection delays were derived from PTV VISSIM 9 and is based on the average of five 60-minute simulation runs. The operations and queuing analysis are discussed below.

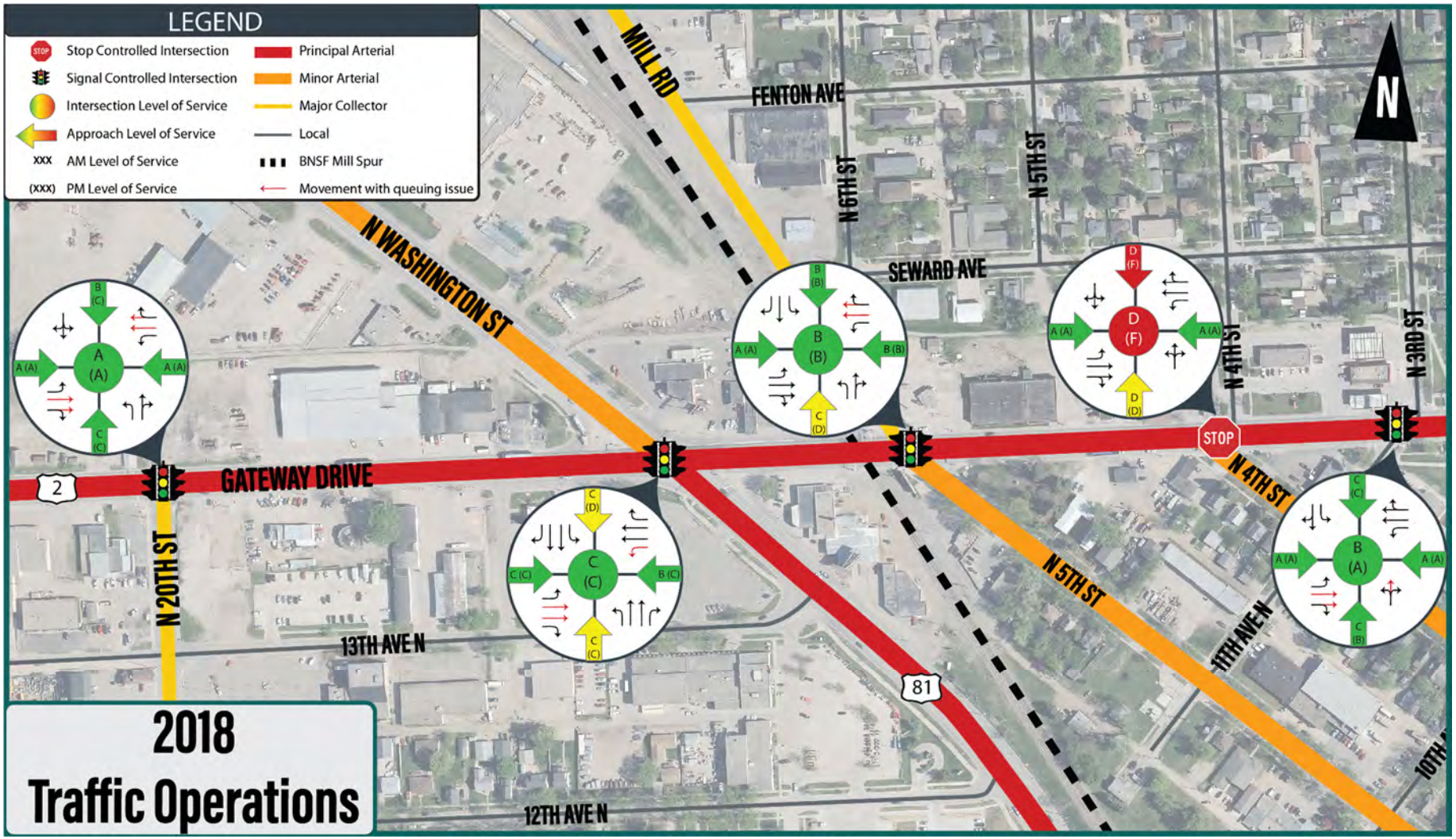


Figure 15: Existing Peak Hour Operations

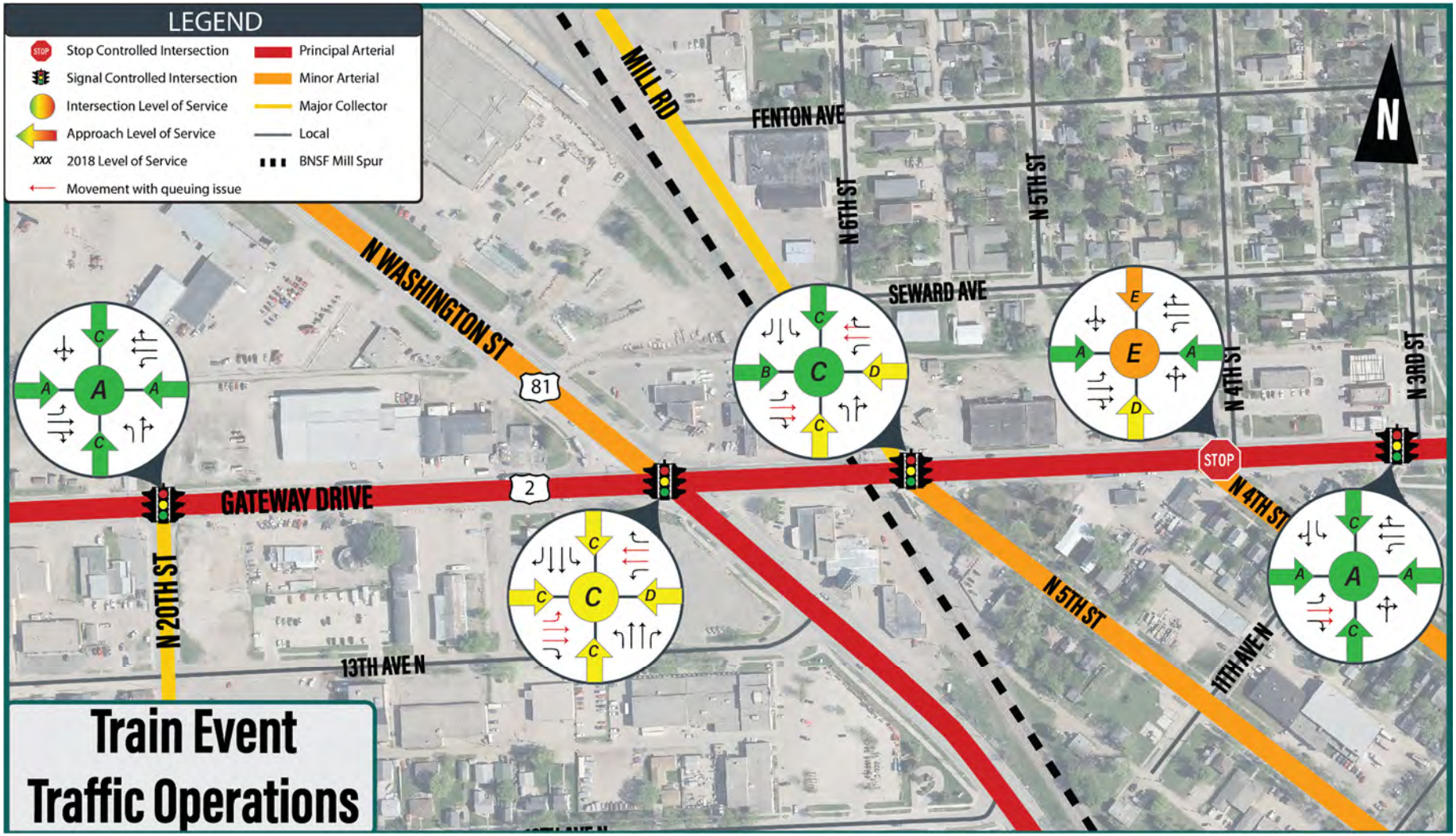


Figure 16: Train Event Operations (Average of Full Hour)

Morning Peak Hour

During the morning peak, intersections and their corresponding approaches operate at an acceptable delay and LOS, with their overall intersection and individual approaches operating no worse than LOS D.

Multiple queuing deficiencies were identified.

- Mill Road/5th Street
  - Block access to turn lanes: westbound thru and right turn queues
- 3rd Street intersection
  - Exceed Storage Length: thru/right turn lane queues on the westbound approaches
  - Block Access to Turn Lanes: westbound thru/right lane queue.

All these deficiencies contribute to the approach and intersection delay, however, currently these intersections are still operating at an acceptable level of delay.

The free flow travel time for the corridor from 20th Street to 3rd Street is 65 seconds, which is the scenario where no delays are encountered. **Figure 17** shows the comparison of travel time for each model analyzed. During the morning peak hour drivers experience, on average, an additional travel time of 30 seconds for eastbound travel and 29 seconds for westbound travel.

Evening Peak Hour

During the evening peak, most intersections and their approaches operate at acceptable delay and LOS. However, delays at the minor approaches of the two-way stop-controlled intersection of US 2/Gateway Drive and 4th street result in an intersection LOS F.

The following queuing issues are present in the evening peak hour.

- 20th Street
  - Block Access to Turn Lanes: eastbound and westbound thru queue.
- US 81/Washington Street,
  - Block access to turn lanes: eastbound thru queues
- Mill Road/5th Street
  - Block access to turn lanes: westbound thru queue
- 3rd Street intersection
  - Block Access to Turn Lanes: eastbound thru queue

Queueing delay can be a contributing factor to the poor LOS at the 4th street intersection, and poor approach delay on the westbound approach of the Mill Road/5th Street intersection.

During the evening peak hour drivers experience an average additional travel time of 51 seconds for eastbound travel and 31 seconds for westbound travel, when compared to free flow conditions.

Train Event

During a train event, each intersection and their approaches operate at acceptable delay and LOS of C or better, except for the 4th Street intersection which operates at a LOS E, as shown in **Figure 16**. The unacceptable delays at 4th Street intersection are caused by high volume of mainline traffic on US 2/Gateway Drive that limits the gaps for these minor street traffic to enter the intersection. However, the minor approaches have relatively low volumes at this intersection and no significant queuing issues were identified at the minor approaches.

The following queuing issues are present in the hour surrounding a train event.

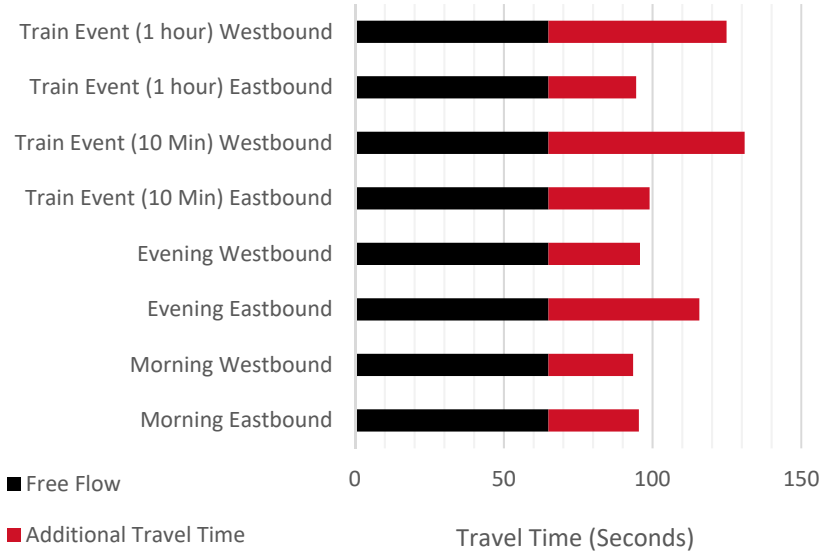
- US 81/Washington Street,
  - Exceed Storage Length: westbound left turn and thru queues
  - Block access to turn lanes: westbound thru queue
- Mill Road/5th Street
  - Exceed Storage Length: eastbound and westbound thru queues
  - Block access to turn lanes: eastbound and westbound thru queue

Queues at US 81/Washington Street and Mill Road/5th Street extend into upstream intersections causing additional delay at those intersections.

Travel time during the peak 10 minutes around a train results in an additional 41 second delay for eastbound travel, and 29 second delay for westbound travel. These results are shown graphically in **Figure 17**.

The average travel time, for the hour surrounding a train event, eastbound travel is 30 seconds longer than free flow (95 seconds total) and westbound travel is 28.5 seconds longer than free flow (93.5 seconds total). Vehicles are not delayed by the entire 2 and ½ minute train event is due to when vehicles arrive. Not all vehicles will arrive right as the train event starts, thus all experience different length delays, which are averaged in the model over the time period analyzed.

Figure 17: Travel Time Comparison

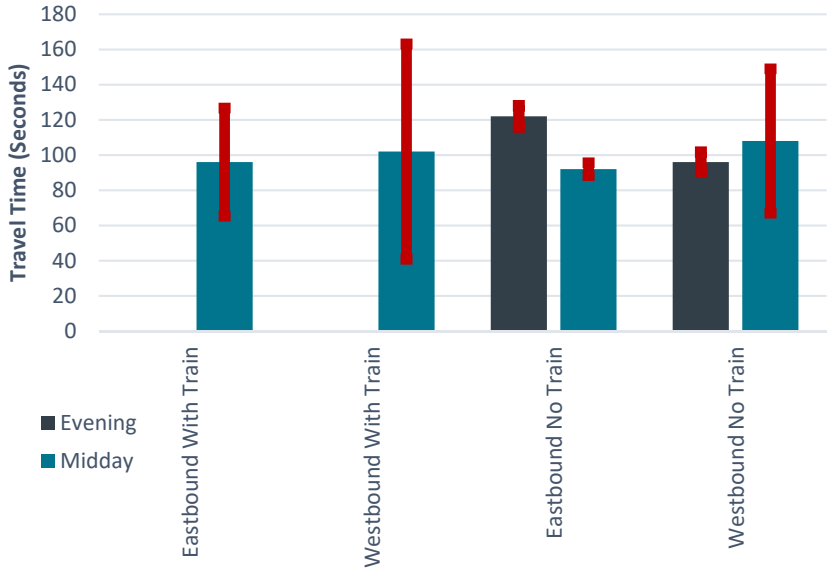


Travel Time Reliability

Travel time reliability is a measure of consistency to indicate day-to-day travel times on a given roadway. Most travelers are less tolerant of unexpected delays because they cannot be incorporated into planned travel time, resulting in late arrivals; alternatively budgeting twice as long as needed for a trip also can result in wasted time. Train events impact reliability on US 2/Gateway Drive and US 81/Washington Street, both which are listed on the NHS, and require high levels of reliability.

Train events and congestion contribute to poor reliability. Travel times and reliability for Existing models are shown in **Figure 18.** This figure shows travel times for the midday and evening peaks. Travel time reliability is shown by the red bars. This represents how much travel time fluctuates for each scenario. There are extreme reliability issues during train events, and westbound traffic has the worst reliability, both when a train event has occurred and also without a train event.

Figure 18: Existing Travel Time Reliability



Safety Analysis

Reviewing historic crash information can help identify existing deficiencies. Five years of crash records (December 1, 2013 to November 30, 2018) were obtained from NDDOT that showed an average of 28 crashes per year in the study area. This includes five crashes per year resulting in an injury, including the possible injury classification. There were no fatalities reported in the study area.

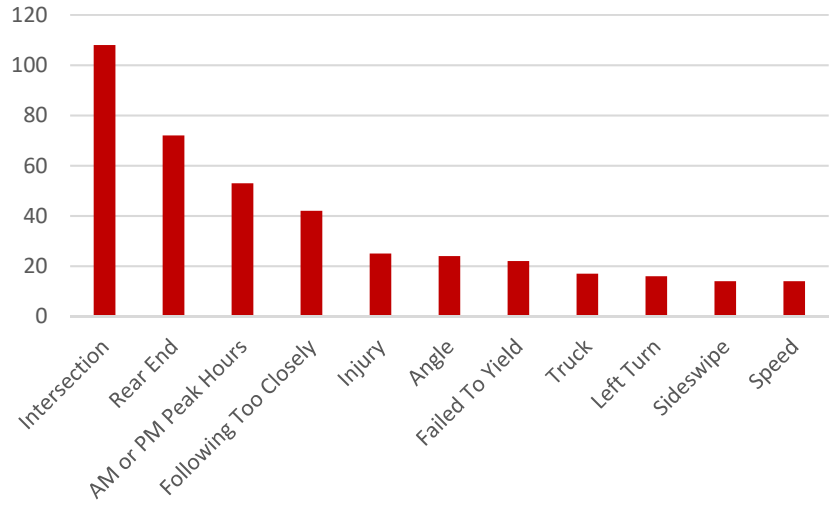
An evaluation of crash trends, shown in **Figure 20**, identifies intersection related crashes were 78 percent of all crashes in the study area; 52 percent of all crashes were rear end crashes and 38 percent occurred during the morning or evening peak hours. **Figure 19** shows the location and distribution of crashes in the study area.

Crash data was also processed as part of the 2014 Local Road Safety Plan (LRSP). This study suggested that segment of US 2/Gateway Drive from Columbia Road to the Red River should be considered for Access Management.

Vehicle-Rail Crashes

BNSF has not reported a vehicle-rail crash at the Mill Spur at-grade crossing since 1994. However, the segment between US 81/Washington Street and Mill Road/5th Street reported two rear-ends that occurred when the overhead warning flashers were active.

Figure 20: Crash Trends



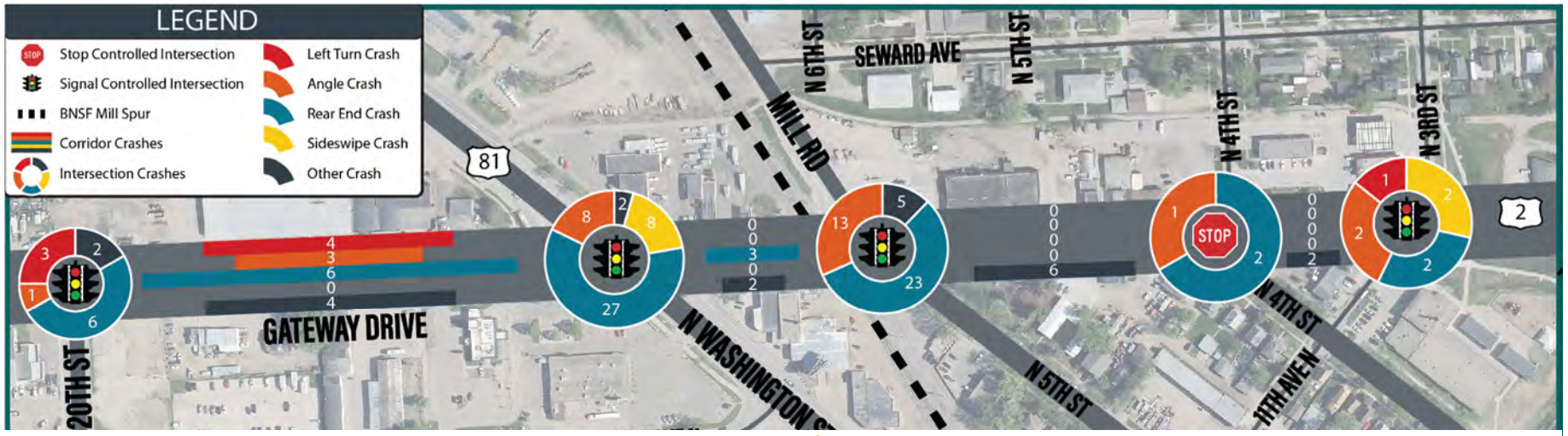


Figure 19: Crash Types

Crash Hot Spots

To identify overrepresented crash locations within the study area, a two-phase approach was used. First, crash frequency was studied to identify locations with the highest number of crashes. This is the most straightforward approach to determining locations susceptible to crashes. This approach, however, ignores the rate at which crashes occur. Typically, intersections with a high number of crashes also carry high traffic volumes. Many times, a low volume location may have fewer overall crashes, but on a per car basis, have a much higher susceptibility to crashes. Therefore, it is beneficial to identify which locations in the study area experience a statistically high crash rate.

Critical Crash Rates

To identify statistically significant crash rates, the critical crash rate method was used, which incorporates traffic volumes and crash rates for a particular location and compares this rate against crash rates for similar facilities.

According to the critical crash analysis methodology, intersections and links with crash rates above the critical rate are considered overrepresented and in need for further review; there is a high probability that conditions at the site are contributing to the higher crash rate. Based on this analysis, the following locations were found to be overrepresented.

- The Mill Road/5th Street intersection with US 2/Gateway Drive
- The segment of US 2/Gateway Drive between 20th Street and US 81/Washington Street

The Mill Road/5th Street intersection was also identified in the 2045 Long Range Transportation Plan (LRTP) as an intersection with a crash rate above the expected crash rate. This is based on the average crash rate for all major intersections in Grand Forks and East Grand Forks.

Trend Analysis

US 2/Gateway Drive and 20th Street Intersection

Over the past five years, there were 12 crashes at this intersection, half of which were rear end crashes. Four rear end crashes were on the eastbound approach. No time of day trends were identified for rear end crashes. In addition to the rear end crashes, there were three left-turn crashes which occurred with the westbound to southbound movement; two occurred during the morning peak. The unwarranted signal control at the intersection may be a contributing factor for the crashes as they increase vehicular delay from stopping at a light with minimal minor approach traffic. A study conducted by *FHWA* indicate that unwarranted signal controls increase right angle and rear-end crashes by 24 percent and 29 percent.

US 2/Gateway Drive and US 81/Washington Street Intersection

Over the past five years, there were 45 crashes at this intersection, 60 percent of which were rear end crashes. There were no discernable directional trends for rear end crashes. Thirty percent of rear end crashes occurred during the morning or evening peak hours, thirty percent occurred between 11 AM and 1 PM. These time periods correspond with peak traffic and low train periods. Rear end crashes were nearly identically split between eastbound and westbound traffic. Long queues, which are common at this intersection, and dense access spacing on US 2/Gateway Drive may have been the predominant circumstance during which rear end crashes occurred. The high crash rate around the noon hour when trains are frequent may be due to motorists abruptly changing their routing to go around a train.

US 2/Gateway Drive and Mill Road/5th Street Intersection

Over the past five years, there were 41 crashes at this intersection. More than half (23 of 41) were rear end crashes; 65 percent of all rear end crashes occurred during the morning or evening peak hours and 52 percent of all rear end crashes occurred on the east approach. Long queues, which are common at this intersection, and dense access spacing on the east approach may have been the predominant circumstance during which rear-end crashes occurred.

US 2/Gateway Drive between 20th Street and US 81/Washington Street

There were 17 crashes along this segment in the last five years, including six rear end crashes. Four of the six rear end crashes occurred during the morning or evening peak hour, with three occurring in the eastbound direction. This may be a result of high volume of mainline traffic and dense access spacings causing vehicles to decelerate or stop.

Figure 21: Intersection Functional Area

Further, there were four left-turning crashes. Three occurred during the evening peak hour. Two factors may be contributing to this crash trend. First, vehicles waiting to make a left-turn into a business along this corridor may become impatient during heavy traffic, accepting smaller gaps to make their movement. They may misjudge the gap, resulting in a left-turning crash.

Second, there are more than ten uncontrolled accesses along this segment, including four within the functional area of the intersection, which means drivers need to pay attention to oncoming traffic and vehicles making movements to and from the different access points. **Figure 21** shows the functional area of 20th Street and US 81/Washington Street intersections, as well as the access points along the corridor. During times of heavy traffic, eastbound queues may block the sight lines for westbound to southbound traffic using these driveways.

FUTURE TRAFFIC CONDITIONS

Traffic demand and growth is likely to be impacted by more than just growth in the study area, but new growth in both metro cities. East Grand Forks anticipates mid and long-term growth in commercial and residential developments along US 2 and Grand Forks anticipates short and mid-term growth in all land use types (commercial, industrial, and residential) along US 2/Gateway Drive. As this development occurs, traffic demand will continue to increase on US 2/Gateway Drive.

FUTURE TRAFFIC PROJECTIONS

Future traffic projections were based on the current Grand Forks MPO travel demand model, approved in 2018. The existing balanced volumes were scaled up based on the future projection factors along the corridor using the iterative directional volume estimation methodology developed and documented in the *NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design.* **Figure 22** and **Figure 23** show the projected 2030 and 2045 turning movement counts, AADT, and current lane-configuration of the intersections along the study corridor.

FUTURE TRAIN CONDITIONS

No growth in the number or the duration of train blockages was incorporated into the train event models. At this time there is not sufficient data to be able to estimate how any growth at the Mill would impact train blockages

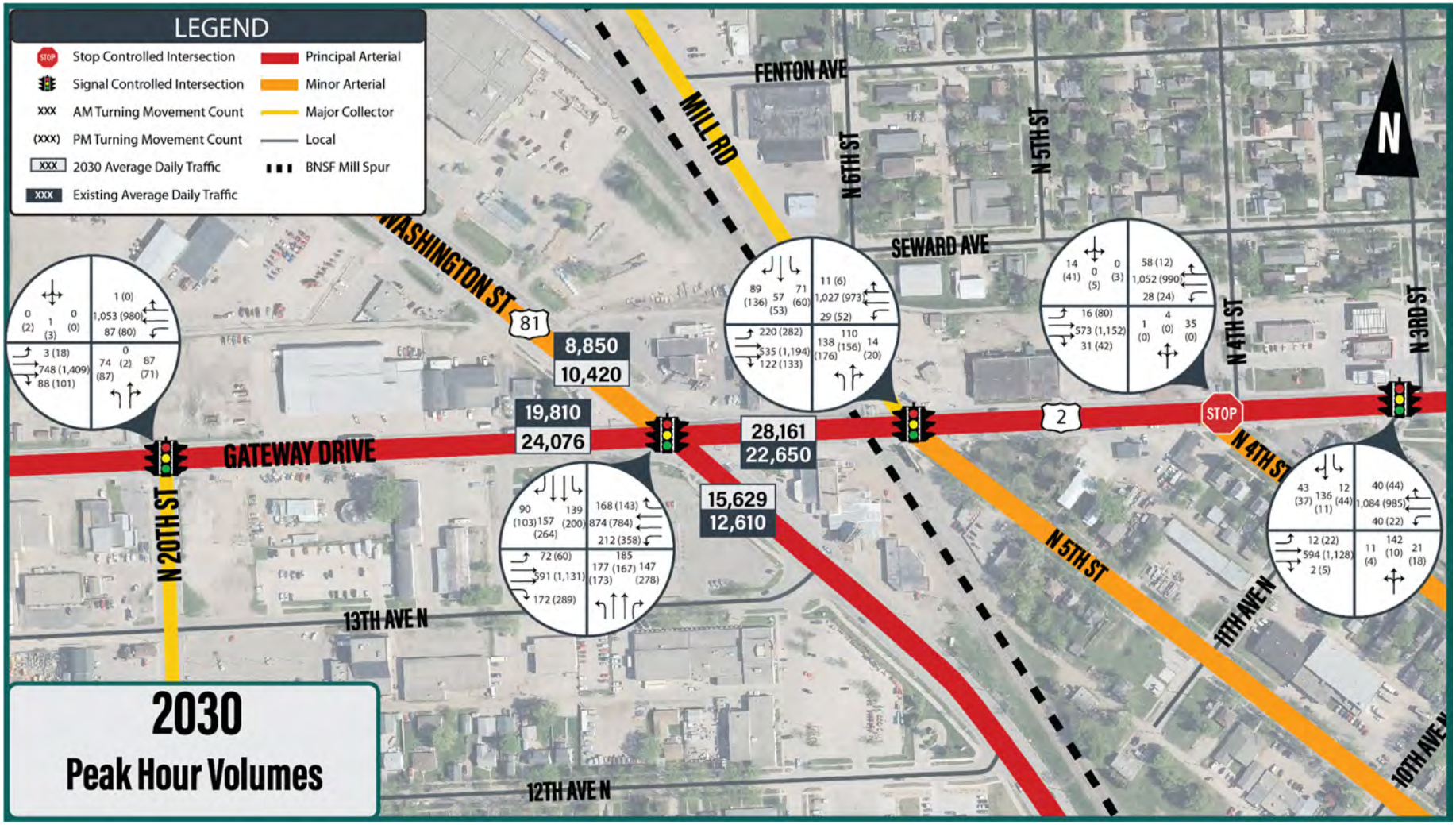


Figure 22: 2030 Peak Hour Turning Movements

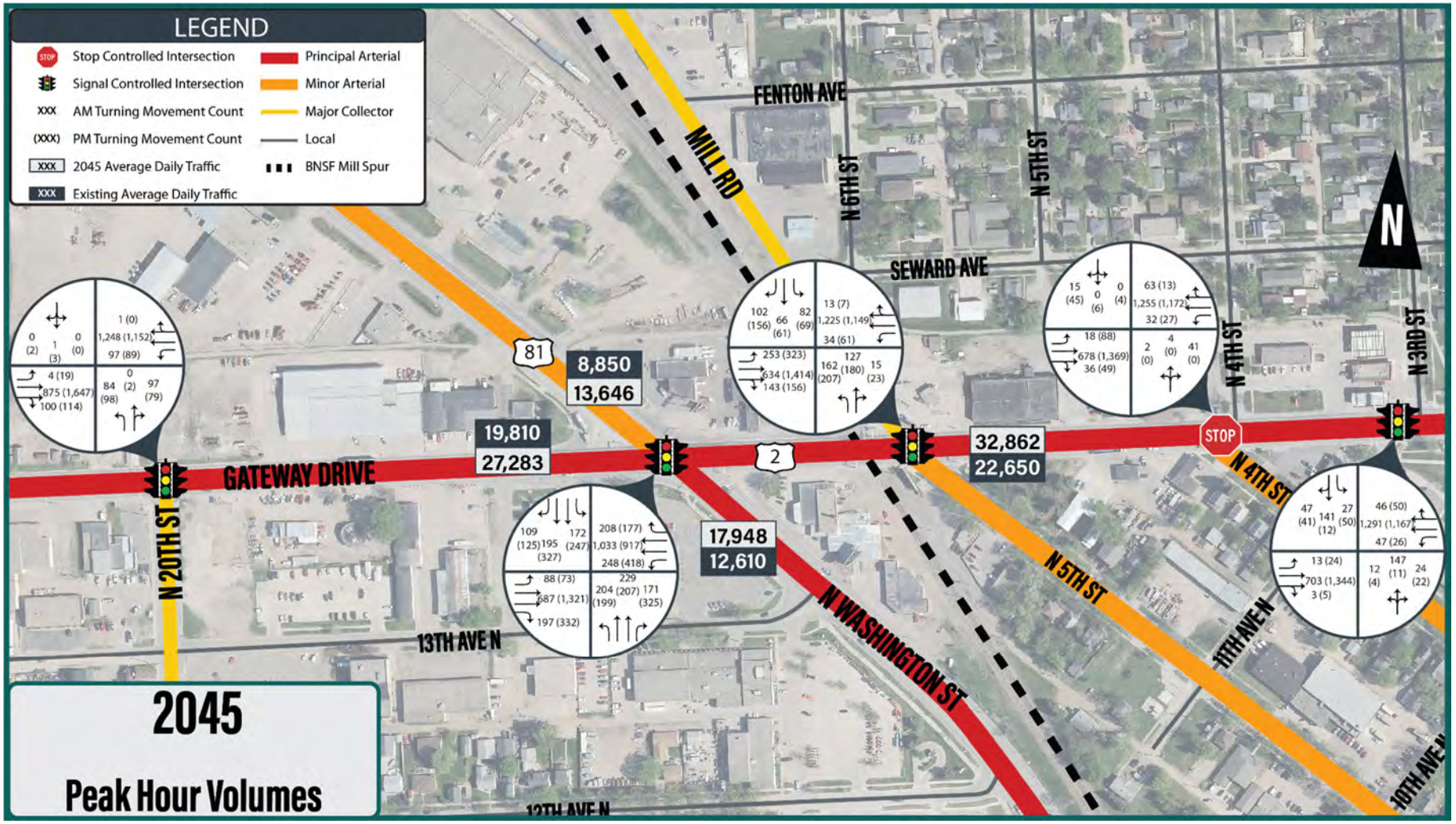


Figure 23: 2045 Peak Hour Turning Movements

2030 Traffic Control Warrant Analysis

Warrant analysis was conducted at the five study intersections with projected 2030 volumes. In accordance with NDDOT guidance for warrant analysis, minor street right-turn volumes were excluded for dedicated right-turn lanes and included at 50 percent for shared right-turn lanes. **Figure 24** shows existing traffic control at each of the study intersections. Only the 4th Street intersection is two-way stop controlled; the remaining study intersections are currently signalized.

Table 3: 2030 Traffic Control Warrants Analysis

Intersection	Existing Traffic Control	Warrants Met (Hours Met/Required)			
		1A	1B	2	3
20th Street	Signal	0/8	1/8	0/4	0/1
US 81/ Washington Street	Signal	**8/8**	**8/8**	**4/4**	**1/1**
Mill Road/5th Street	Signal	**8/8**	**8/8**	**4/4**	**1/1**
4th Street	Thru/Stop	0/8	0/8	0/4	0/1
3rd Street/11th Ave	Signal	0/8	1/8	1/4	**1/1**

Warrant 1a: Minimum Vehicular Volume
Warrant 1b: Interruption of Continuous Traffic
Warrant 2: Four-Hour Vehicular Volume
Warrant 3: Peak Hour Vehicular Volume
Warrant 9: Intersection Near a Grade Crossing

Below is a summary of the findings from the traffic control analysis. **Table 3** shows required hours of specified volumes to meet each warrant and how many hours are being fulfilled with the 2030 traffic volumes.

- The US 81/Washington Street intersection meets traffic volume warrants 1A, 1B, 2, and 3.
- The Mill Road/5th Street intersection meets traffic volume warrant 1A, 1B, 2, and 3.
- The 3rd Street/11th Avenue intersection meets Warrant 3 (peak hour volume), however it is uncommon to use this warrant as justification for installation of a signal.
- The 20th Street intersection does not meet signal warrants in 2030. This intersection is currently signalized.
- The 4th Street intersection does not meet any signal warrants under 2030 conditions.

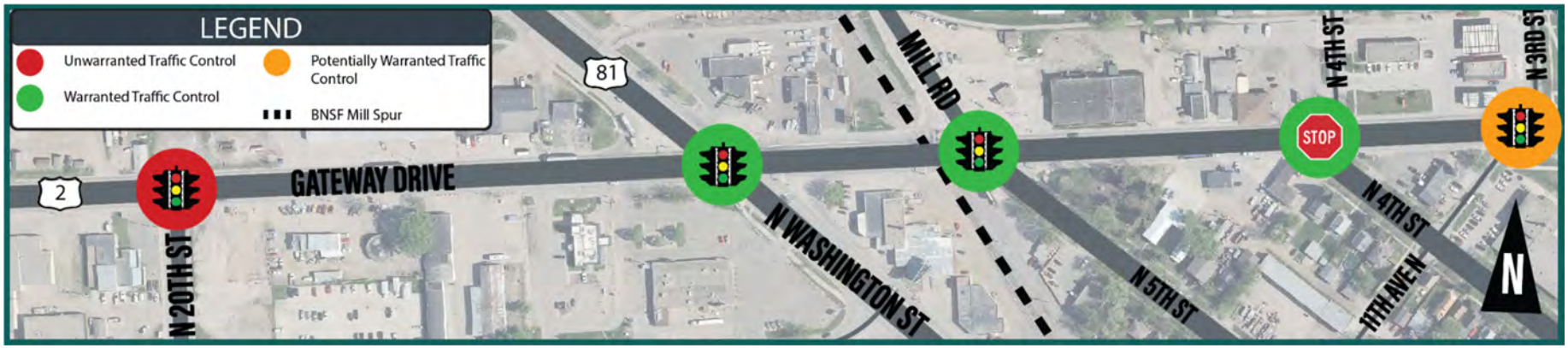


Figure 24: 2030 Traffic Control Warrant Analysis

2045 Traffic Control Warrant Analysis

Warrant analysis was conducted at the five study intersections with projected 2045 volumes. In accordance with NDDOT guidance for warrant analysis, minor street right-turn volumes were excluded for dedicated right-turn lanes and included at 50 percent for shared right-turn lanes. **Figure 25** shows existing traffic control at each of the study intersections. Only the 4th Street intersection is two-way stop controlled; the remaining study intersections are currently signalized.

Table 4: 2045 Traffic Control Warrants Analysis

Intersection	Existing Traffic Control	Warrants Met (Hours Met/Required)			
		1A	1B	2	3
20th Street	Signal	0/8	6/8	0/4	0/1
US 81/ Washington Street	Signal	**8/8**	**8/8**	**4/4**	**1/1**
Mill Road/5th Street	Signal	**8/8**	**8/8**	**4/4**	**1/1**
4th Street	Thru/Stop	0/8	0/8	0/4	0/1
3rd Street/11th Ave	Signal	0/8	1/8	1/4	**1/1**

Warrant 1a: Minimum Vehicular Volume
Warrant 1b: Interruption of Continuous Traffic
Warrant 2: Four-Hour Vehicular Volume
Warrant 3: Peak Hour Vehicular Volume
Warrant 9: Intersection Near a Grade Crossing

Below is a summary of the findings from the traffic control analysis. **Table 4** shows required hours of specified volumes to meet each warrant and how many hours are being fulfilled with the 2045 traffic volumes.

- The US 81/Washington Street intersection meets traffic volume warrants 1A, 1B, 2, and 3.
- The Mill Road/5th Street intersection meets traffic volume warrant 1A, 1B, 2, and 3.
- The 20th Street intersection does not meet signal warrants in 2045. This intersection is currently signalized.
- The 4th Street intersection does not meet any signal warrants under 2045 conditions.
- 3rd Street/11th Avenue intersection meets warrant 3, however it is uncommon to use this warrant as justification for installation of a signal.

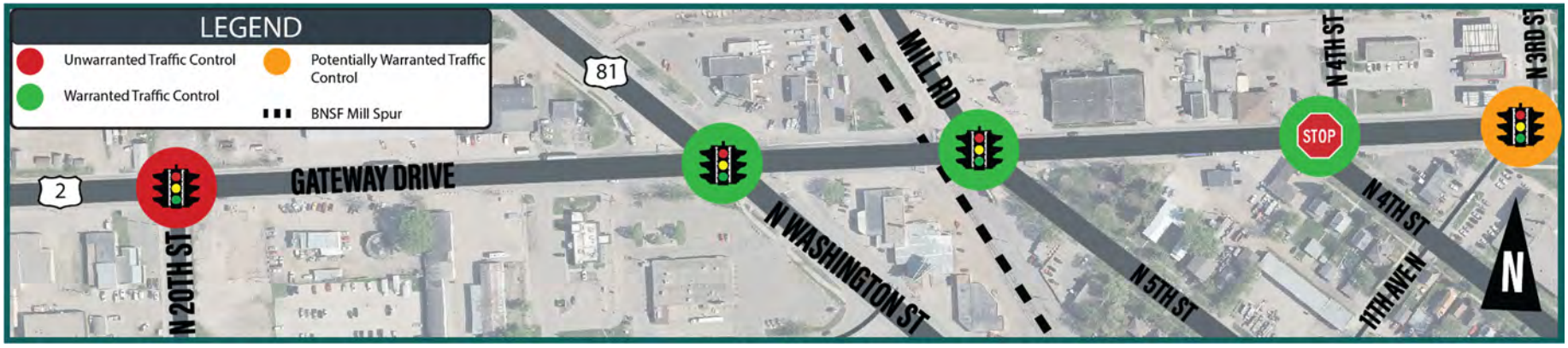


Figure 25: 2045 Traffic Control Warrant Analysis

2030 Traffic Operations

The 2030 traffic operations analysis reflects the existing infrastructure with increased travel demand. The operations analysis was completed using PTV VISSIM 9 microsimulation and is based on the average of five 60-minute simulation runs. The existing signal cycle lengths were maintained but the splits were optimized to 2030 travel demand.

Figure 26 shows the 2030 traffic operations for the morning and evening peak hour, as well as movements with queuing issues.

Figure 27 shows the operations during the hour surrounding a train event in 2030 and 2045. This figure also shows movements with queuing issues.

Travel time results for 2030 scenarios are shown in Figure 28.

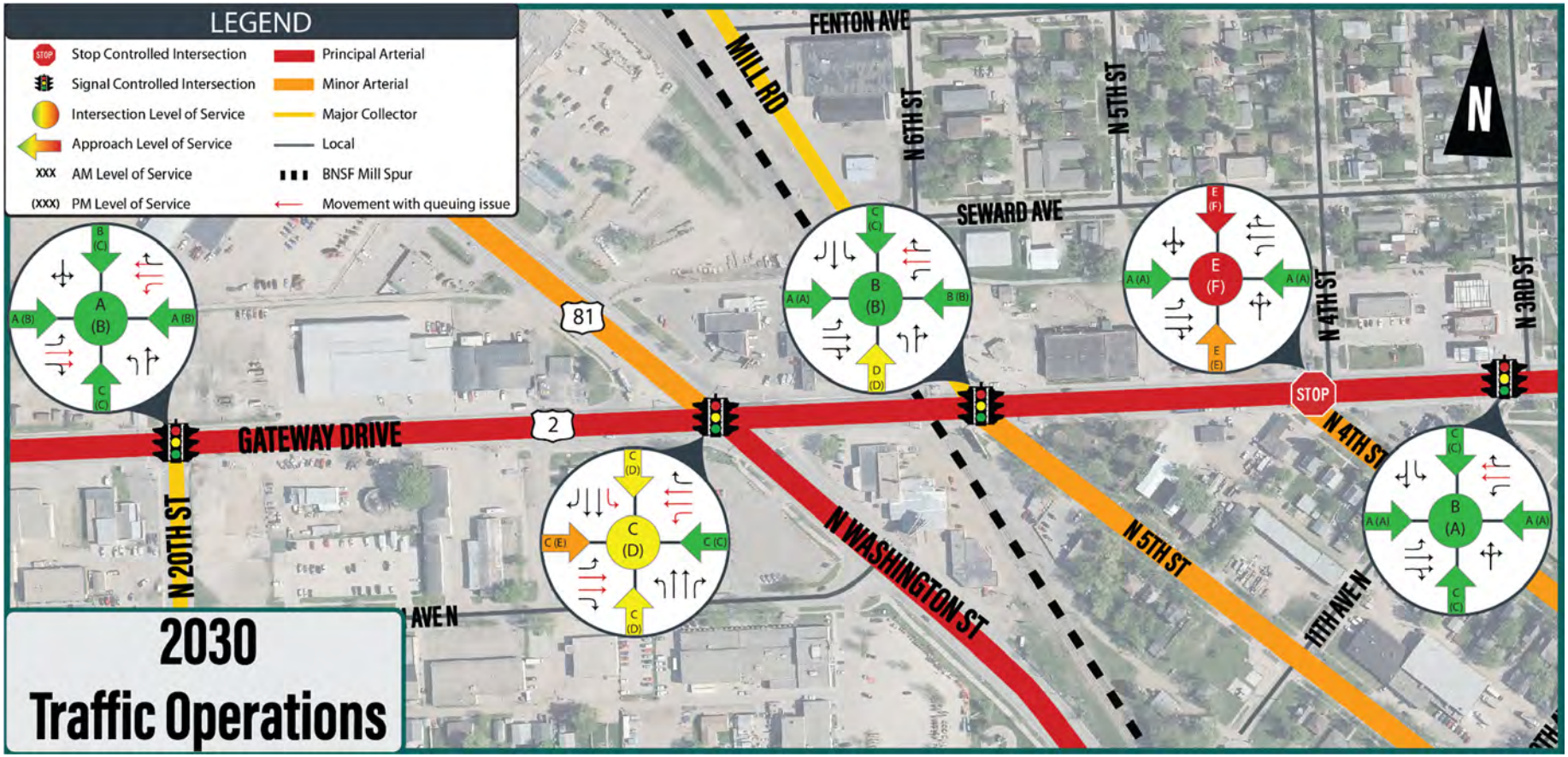


Figure 26: 2030 Traffic Operations

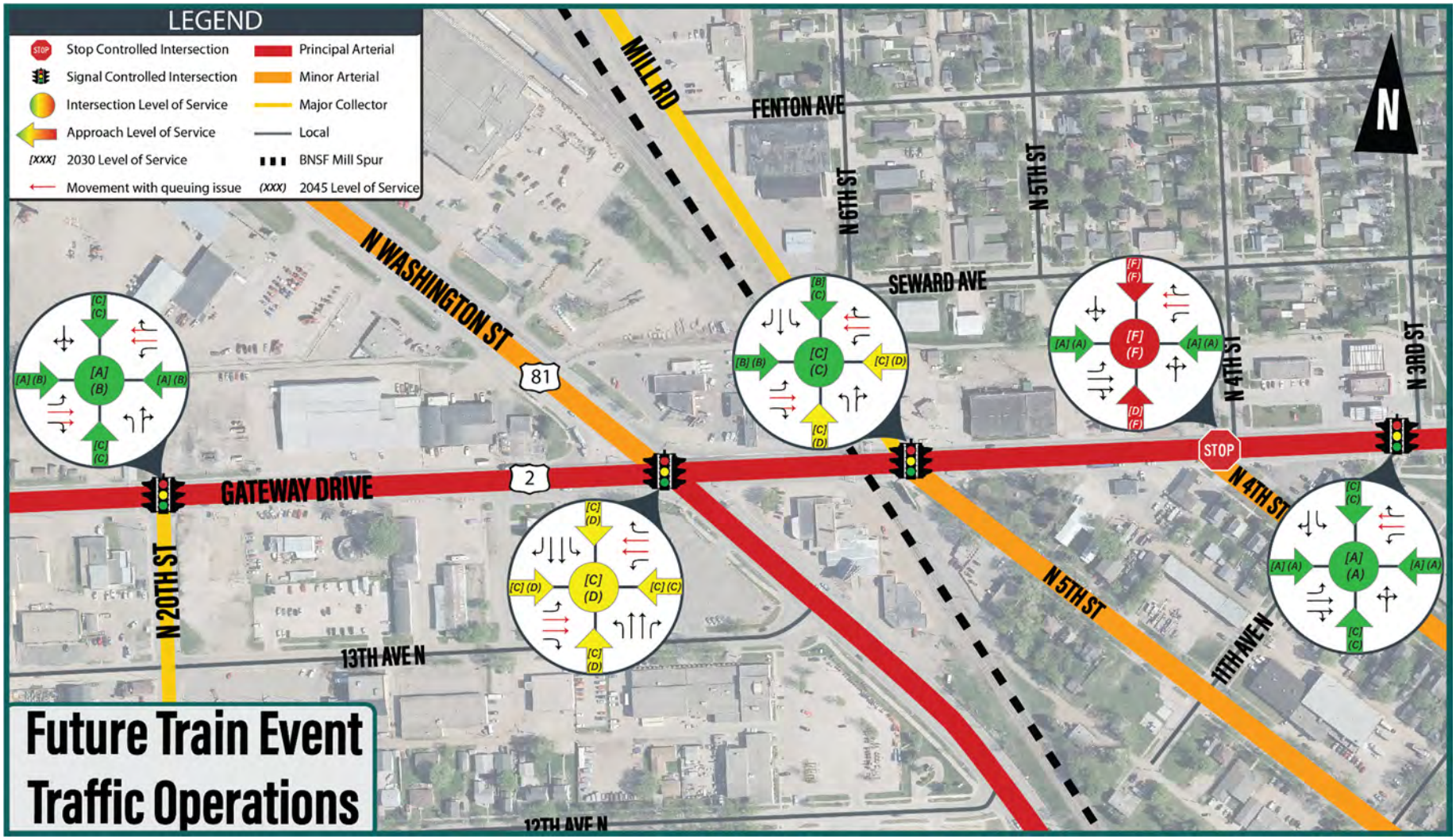


Figure 27: Future Train Event Operations

Morning Peak Hour

During the morning peak hour, each intersection and their corresponding approaches operate at acceptable delay and LOS, with the exception of the 4th Street intersection which operates at a LOS E.

Queues at US 81/Washington extend into the Mill Road/5th Street contributing to queues at that intersection and extra delay. This queue can be especially dangerous due to the potential of vehicles stopping on the railroad between US 81/Washington Street and Mill Road/5th Street. The following additional queuing issues were identified in the 2030 morning peak hour:

- 20th Street
  - Block access to turn lane: westbound thru queue
- US 81/Washington Street
  - Exceed storage length: westbound left turn and thru queues
  - Block access to turn lanes: westbound and eastbound thru queues
- Mill Road/5th Street
  - Block access to turn lanes: westbound thru queue
- 3rd Street
  - Exceed storage length: westbound thru queue
  - Block access to turn lanes: westbound thru queue

During the morning peak hour drivers experience an additional travel time of 40 seconds for eastbound travel and 44 seconds for westbound travel when compared to free flow speeds, (105 and 109 seconds respectively), as shown in Figure 28.

Evening Peak Hour

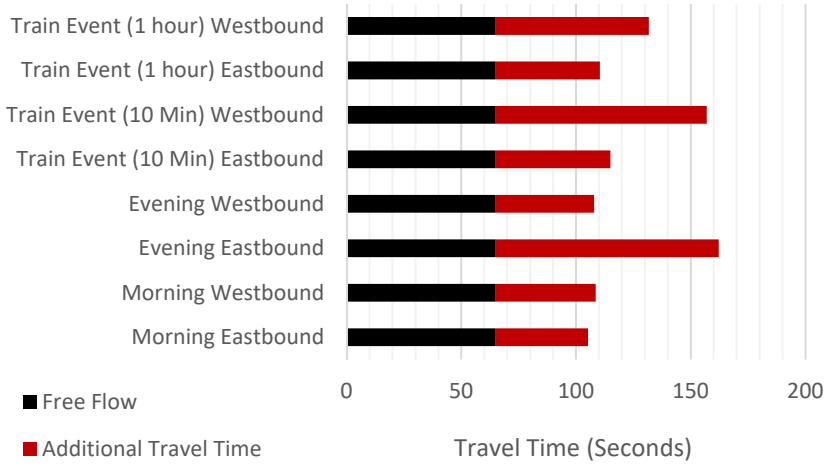
During the evening peak hour, the intersection at 4th Street operates at LOS F with its minor approaches experiencing unacceptable delays. The vehicles along the minor approaches find insufficient gaps to enter the mainline due to high frequency of uninterrupted traffic flow along the mainline. This type of operation is typical for a low volume two-way stop-controlled intersection intersecting a principal arterial. All the other intersections operate at acceptable delay and LOS D or better. The US 81/Washington Street Eastbound approach operates at a LOS E in this scenario.

Queuing issues at US 81/Washington Street cause extra delay and queuing issues to develop at the downstream intersections of Mill Road/5th Street and 20th Street. The queue extending into the Mill Road/5th Street intersection can cause additional complications if vehicles stop on the railroad between the intersections. The following queuing issues were also identified in the 2030 evening peak hour:

- 20th Street
  - Exceed storage length: Westbound left turn queue
  - Block access to turn lanes: eastbound and westbound thru queue
- US 81/Washington Street
  - Exceed storage length: Eastbound and westbound thru queues
  - Block access to turn lane: Eastbound and westbound thru queues
- Mill Road/5th Street
  - Block access to turn lanes: westbound thru queue

During the evening peak hour drivers experience an additional travel time of 97 seconds for eastbound travel and 43seconds for westbound travel (162 and 108 seconds total respectively), as shown in Figure 28.

Figure 28: 2030 Travel Times



Train Event

During a train event in 2030, all intersections and approaches except 4th Street operate at an acceptable LOS, 4th Street continues to operate at a LOS F. These can operations can be seen in **Figure 27.**

Westbound thru queues at US 81/Washington Street extend into the Mill Road/5th Street intersection, which cause Mill Road/5th Street westbound thru queues to extend into the 4th Street intersection. Eastbound queues at Mill Road/5th Street also extend into the US 81/Washington Street intersection. The following additional queuing issues were identified in the hour surrounding a train event in 2030:

- 20th Street
  - Block access to turn lanes: westbound thru queue
- US 81/Washington Street
  - Exceed Storage Length: westbound thru queue
  - Block access to turn lane: westbound thru queue
- Mill Road/5th Street
  - Exceed storage length: westbound and eastbound thru queues
  - Block access to turn lanes: westbound and east bound thru queues
- 3rd Street/11th Avenue
  - Block access to turn lane: westbound thru queue

The travel time during the peak 10 minutes following a train event results in an additional travel time of 50 seconds for eastbound travel, and 92 seconds for westbound travel when compared to free flow conditions (115 and 157 seconds respectively). The average travel time for the hour surrounding a train event for eastbound travel is increased by 45 seconds and for westbound travel is increased by 67 seconds (110 and 132 seconds respectively), as shown in **Figure 28.**

Figure 29: Vehicles on Railroad

2045 Traffic Operations

The 2045 traffic operations analysis reflects the existing infrastructure with increased travel demand. The operations analysis was completed using PTV VISSIM 9 microsimulation and is based on the average of five 60-minute simulation runs. The existing signal cycle lengths were maintained but the splits were optimized to 2045 travel demand.

Figure 30 shows the 2045 traffic operations for the morning and evening peak hour, as well as, the movements with queuing deficiencies.

Figure 31 depicts the travel time comparison for 2045 scenarios.

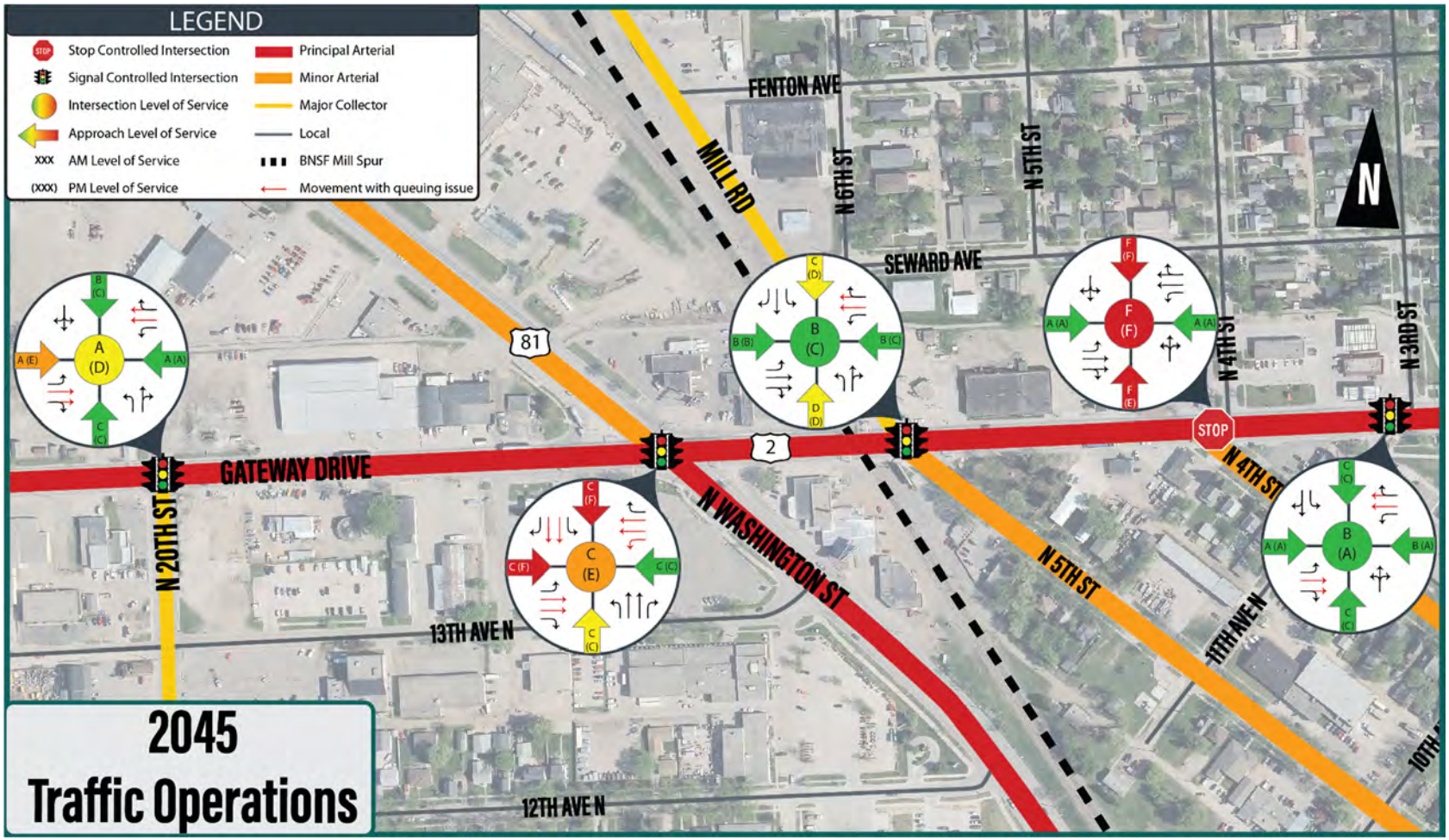


Figure 30: 2045 Traffic Operations

Morning Peak Hour

The intersection at 4th Street operates at LOS F with its minor approach experiencing unacceptable delays. This type of operation is typical for a low volume two-way stop-controlled intersection intersecting a principal arterial. All the other intersections and their corresponding approaches operate at acceptable delay and LOS.

Queues at US 81/Washington extend into the Mill Road/5th Street contributing to queues at that intersection and extra delay. This queue can be especially dangerous due to the potential of vehicles stopping on the railroad between US 81/Washington Street and Mill Road/5th Street. The eastbound thru queue at 3rd Street/11th Avenue extend to the upstream intersection of 4th Street. The following additional queuing issues were identified in the 2045 morning peak hour:

- 20th Street
  - Block Access to Turn Lane: westbound thru queue
- US 81/Washington Street
  - Exceed Storage Length: westbound left turn and thru queues
  - Block access to turn lanes: westbound and eastbound thru queues
- Mill Road/5th Street
  - Block access to turn lanes: westbound thru queue
- 3rd Street/11th Avenue
  - Exceed Storage Length: eastbound and westbound thru queue
  - Block Access to Turn Lanes: westbound thru queue

Travel times during the morning peak hours are 115 seconds for eastbound travel and 128 seconds for westbound travel.

Evening Peak Hour

The intersection at US 81/Washington Street operates at an unacceptable LOS E in 2045 evening peak hour with the southbound and eastbound approaches operating at a LOS F. The 4th Street intersection operates at LOS F with its minor approaches experiencing unacceptable delays. The 20th Street intersection operates at an acceptable LOS however the eastbound approach operates at a LOS E. All other intersections and their corresponding approaches operate at acceptable delay and LOS.

Queuing issues at US 81/Washington Street cause extra delay and queuing issues to develop at the downstream intersections of Mill Road/5th Street and 20th Street. The queue extending into the Mill Road/5th Street intersection can cause additional complications if vehicles stop on the railroad between the intersections. The eastbound thru queue at 3rd Street/11th Avenue extend to the upstream intersection of 4th Street. The following queuing issues were also identified in the 2045 evening peak hour:

- 20th Street
  - Block access to turn lane: westbound and eastbound thru queue
- US 81/Washington Street
  - Exceed storage length: westbound and eastbound thru queues
  - Block access to turn lanes: southbound, westbound and eastbound thru queues
- Mill Road/5th Street
  - Block access to turn lanes: westbound thru queue
- 3rd Street/11th Avenue
  - Exceed storage length: eastbound thru queue
  - Block access to turn lanes: westbound and eastbound thru queues

Evening peak hour drivers experience an eastbound travel time of 239 seconds and a westbound travel time of 126 seconds.

Train Event

During an average train event in 2045 all intersections except 4th Street operate at an acceptable LOS and can be seen in Figure 27.

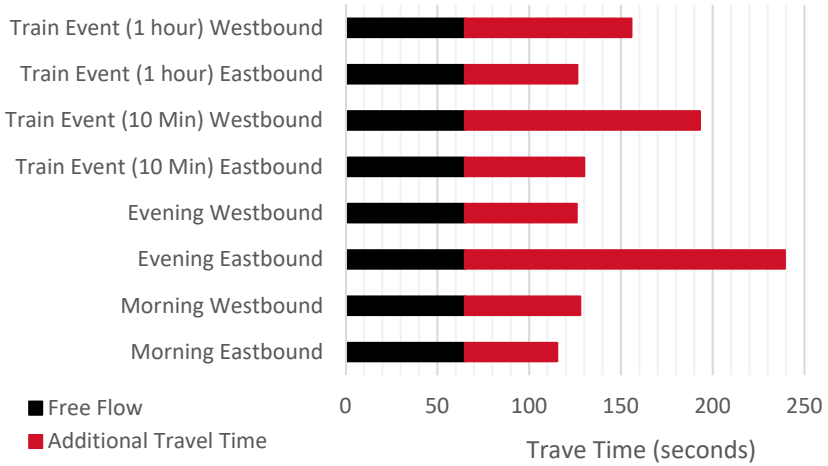
During a train event in 2045 all intersections experience queuing issues. Westbound thru queues at US 81/Washington Street extend into the Mill Road/5th Street intersection, which cause Mill Road/5th Street westbound thru queues to extend into the 4th Street intersection, which in turns extends to 3rd Street/11th Avenue. Eastbound queues at Mill Road/5th Street also extend into

the US 81/Washington Street intersection. The following additional queuing issues were identified in the hour surrounding a train event in 2045:

- 20th Street
  - Block access to turn lanes: westbound and eastbound thru queues
- US 81/Washington Street
  - Exceed storage length: westbound thru queue
  - Block access to turn lane: westbound and eastbound thru queues
- Mill Road/5th Street
  - Exceed storage length: westbound and eastbound thru queues
  - Block access to turn lane: westbound and east bound thru queues
- 4th Street
  - Block access to turn lane: westbound thru queue
- 3rd Street/11th Avenue
  - Block access to turn lane: westbound thru queue

The travel time during the peak 10 minutes following a train event results in a travel time of 130 seconds for eastbound travel, and 193 seconds for westbound travel. The average travel time for the hour surrounding a train event for eastbound travel is 126 seconds and for westbound travel is 156 seconds, as shown in **Figure 31**.

Figure 31: 2045 Travel Times

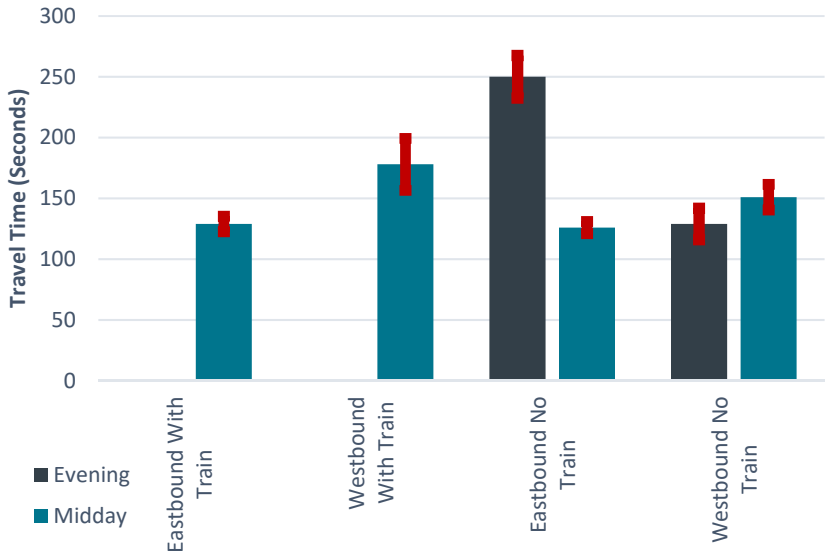


Travel Time Reliability

Travel time reliability is a measure of consistency to indicate day-to-day travel times on a given roadway. Most travelers are less tolerant of unexpected delays because they cannot be incorporated into planned travel time, resulting in late arrivals; alternatively budgeting twice as long as needed for a trip also can result in wasted time. Train events impact reliability on US 2/Gateway Drive and US 81/Washington Street, both which are listed on the NHS, and require high levels of reliability.

Train events and congestion contribute to poor reliability. Travel times and reliability for 2045 models are shown in **Figure 32.** This figure shows extreme travel times, due to the corridor being over capacity. Travel time reliability is shown by the red bars. This represents how much travel time fluctuates for each scenario. From the figure it appears reliability has improved, however due to the over capacity of the system, the models cannot accurately depict the unreliable nature of congestion.

Figure 32: 2045 Travel Time Reliability



ENVIRONMENTAL CONDITIONS

Introduction

The existing environmental conditions, or affected environment, are the baseline conditions in a given area. Environmental conditions have the potential to constrain the development of build alternatives and/or be impacted by build alternatives. Development of build alternatives for a given project is based on the purpose and need for the project and environmental constraints associated with the alternatives. This section contains an overview of the purpose and need as well as pertinent environmental conditions that could affect alternatives development associated with the US 2 and US 81 skewed intersection assessment.

The assessment corridor defines the extent within which project alternatives would be developed at the planning level and potentially transitioned into an environmental document pursuant to the National Environmental Policy Act (NEPA) (42 U.S.C. §4321 et seq.). For the purposes of the environmental conditions report for the US 2 and US 81 Skewed Intersection Study, the assessment corridor includes US 2/Gateway Drive from 20th Street to 3rd Street/11th Avenue as well as adjacent properties within 500 feet of US 2/Gateway Drive and the study intersections.

Purpose and Need

A purpose and need statement outline the problem(s) that project alternatives are intended to solve. The assessment corridors area heavily used roadways that pass through commercial and industrial areas important to the economic wellbeing of the community and the region. The corridors are important for local traffic and commuters. In general, the needs associated with the US 2 and US 81 skewed intersection include:

- Capacity: Existing and projected (2030 and 2045) delays at the minor approaches of the two-way stop-controlled intersection of US 2/Gateway Drive and 4th Street result in LOS F during the evening peak hour. This intersection is projected to operate at LOS E by 2030 and LOS F by 2045 during the morning peak hour as well. In addition, during the evening peak hours the US 81/Washington Street eastbound approach is projected to operate at a LOS E by 2030 and the eastbound approach to the 20th Street is projected to operate at LOS E by 2045. During a train event, the 4th Street intersection currently operates at LOS E and is projected to operate at LOS F by 2030/2045. In addition, existing and projected peak traffic and train delays block access to turn lanes and exceed storage length. Warrants for signal traffic control are currently met at US 81/Washington Street and Mill Road/5th Street intersections. By 2045, the intersection of 3rd Street/11th Avenue is projected to meet a warrant for signal control.
- Social demands and economic development: The NDSM is currently a major truck generator in the region and there are plans to increase operations in the future. This is expected to have an impact on the roadway network due to increased truck traffic and additional activity at the railroad crossing. The geometrics of the corridor intersections need to support the critical truck movements in the corridor. The skew characteristic can reduce visibility for drivers and make negotiating the turns much more difficult. These deficiencies impact regional, national and international economic activity associated with the NDSM.
- Roadway deficiencies: High traffic rail lies between two signalized intersections that are less than 500 feet apart. US 2/Gateway Drive pavement is in good condition, US 81/Washington Street pavement is in satisfactory condition, and Mill Road/5th street is in fair condition. There are currently more than eight times the recommended number of access points along the corridor for a principal arterial.
- Modal interrelationships: Lack of adequate pedestrian features, as well as, pedestrian and bicycle safety features at rail crossing.
- Safety: Crash rates are above the critical rate at intersection of Mill Road/5th Street with US 2/Gateway Drive and the segment of US 2/Gateway Drive between 20th Street and US 81/Washington Street. At-grade railroad crossings introduce the risk for vehicle-trail collisions. Current vehicle delay caused by train blockages along the corridor meets FHWA's grade separation threshold. Delays negatively impact response times for emergency responders that regularly cross the Mill Spur rail line.

The purpose of any projects associated with this assessment would be to address the aforementioned needs., with the overall goal of providing for the safe and efficient movement of people and goods.

The purpose and need for the project have been developed under guidance pursuant to 23 CFR 450 Appendix A (Linking the Transportation Planning and NEPA Processes). Identifying project needs and developing a project purpose at the corridor planning level aids in the development, evaluation, prioritization, and elimination of alternatives.

Affected Environment

The affected environment consists of the baseline resources that could constrain alternatives development or be impacted by a project. A desktop assessment of the corridor was completed using a variety of federal, state, and local resources to identify potential environmental constraints and impacts that projects along the corridor could encounter. As project alternatives are developed and refined, this assessment of impacts will also become more refined. Some of the resources discussed in the subsections below are shown in **Figure 33.**

Land Use

Land use can have many implications on the characteristics of a neighborhood and the efficiency of its transportation network. For example, a primarily industrial neighborhood will have peak traffic flows often associated with shift work and must accommodate heavy truck movements whereas a residential neighborhood will have strong peaking and directional characteristics as people leave to and return from work.

The assessment corridor is primarily characterized by heavy commercial and light industrial uses with areas behind this development as primarily residential. The 2045 Future Land Use Plan projects limited new commercial growth in this area.

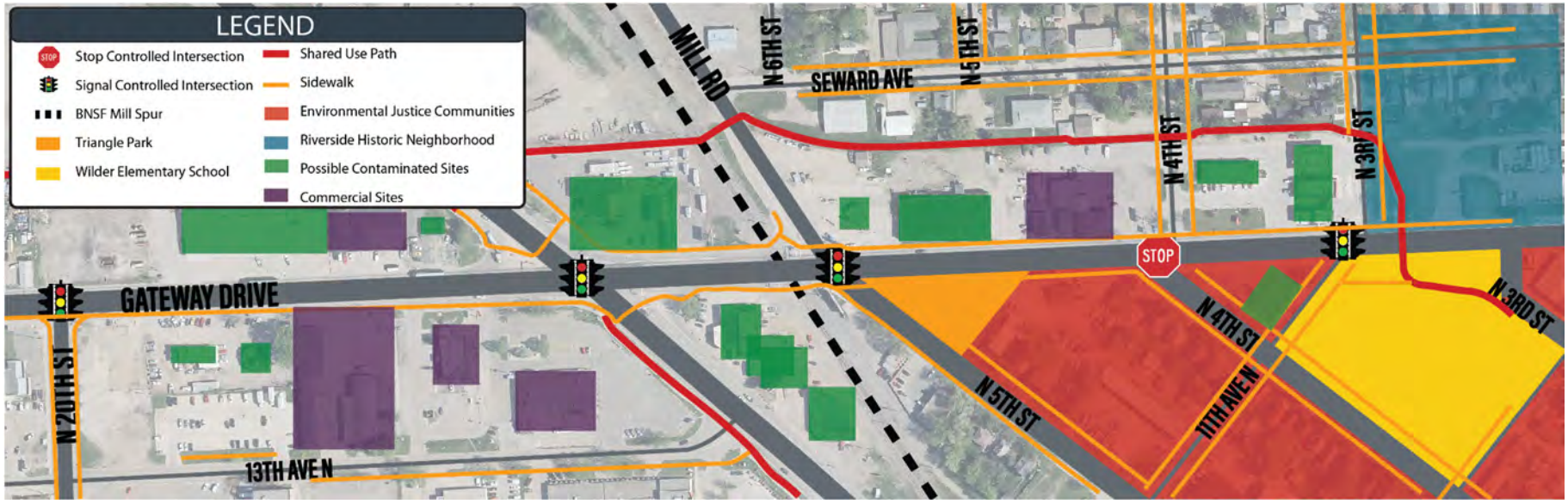


Figure 33: Environmental Constraints

Hazardous Waste Sites

The Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act regulate hazardous waste sites. Hazardous materials/waste could be present along the assessment corridor (e.g., industrial areas, gas and service stations).

Improvements to the corridor would have the potential to encounter regulated materials/waste and/or contaminated properties. Surveys should be conducted to identify regulated materials/waste in structures that would be impacted so that any identified regulated materials/waste can be handled and disposed of according to state and federal law. Prior to right-of-way acquisition, large scale earthwork, groundwater dewatering, or work in commercial or industrial areas, surveys (e.g., Phase I and/or Phase II Environmental Site Assessment) should be conducted to identify contaminated properties so that liability and cost risk can be assessed.

Social and Economic Impacts

All transportation projects have some level of associated social and economic impacts. In general, projects aimed at improving transportation corridors have beneficial overall social and economic impacts. Temporary social and economic impacts could occur during construction activities as a result of reduced mobility through construction zones. Existing roadway right-of-way varies along the corridor and is generally constrained by existing development. Improvements along the corridor may require acquisition of right-of-way and/or temporary easements. Coordination with landowners and/or residents would be required for any acquisitions, access changes, or relocations in accordance with state and federal law, including the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Environmental Justice

Consistent with Executive Order (EO) 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, measures must be taken to avoid disproportionately high, adverse impacts on minority or low-income communities. Minority populations, as defined by the Grand Forks – East Grand Forks MPO's Title VI Non-Discrimination Plan, include any block group with minority populations (American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic) equaling or exceeding 21.2 percent or greater of the total block group population. Low-income populations include those who have an income 1.84 times the US poverty guidelines equaling or exceeding 50 percent or greater of the total block group population.

Figure 34: Commercial and Non-Residential Land Uses in the Corridor

A low-income population has been identified within the assessment corridor to the southeast of the study area. Should impacts during construction activities along the corridor happen to be limited to the area where the identified environmental justice population is located, this population has the potential to experience disproportional impacts on a temporary basis. Permanent impacts of projects along the corridor are intended to improve the transportation corridor for all users; however, the following potential impacts would need to be assessed: splitting existing neighborhoods, promoting social isolation of a particular population, reduction of neighborhood community access or mobility, or promotion the separation of residences or sections of a neighborhood from community facilities or services.

Pedestrians and Bicyclists

The assessment corridor includes several pedestrian and bicyclist generators, such as a park, school, commercial areas, and residential areas. Existing sidewalks extend along the entire assessment area on one or both sides of US 2/Gateway Drive. In addition, multi-use paths extend along the back of the commercial properties north of US 2/Gateway Drive and along the west side of US 81/Washington Street south of US 2/Gateway Drive.

Improvements to the corridor would have the potential improve the pedestrian and bicyclist network within the assessment corridor.

Floodplains

Floodplains constitute land situated along rivers and their tributaries that are subject to periodic flooding with a one percent chance of being flooded in any given year, on the average interval of 100 years or less. EO 11988 - Floodplain Management requires federal agencies to take actions to reduce the risk of flood losses and flood impacts on human safety, health, and welfare, whenever possible. Pursuant to EO 11988, potential effects on floodplains must be evaluated and alternatives that avoid adverse effects and incompatible development in floodplains must be evaluated. If it is found that the only practicable alternatives require siting in a floodplain, it is necessary to design or modify the project to minimize potential harm to or within the floodplain. The North Dakota Floodplain Management Act of 1981 stipulates that the 100-year base flood elevations cannot be increased because of the proposed project. These flood protection measures are to be applied to new construction or rehabilitation. Projects within Floodways or Special Flood Hazard Areas identified on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) are required to obtain permits from local floodplain administrators.

The assessment corridor is located within an area with reduced flood risk due to levee (Zone X) on the FEMA FIRM. As such, projects within the assessment corridor are not anticipated impact floodplains nor require floodplain permitting.

Surface Water

Surface water resources generally include lakes, rivers, streams, floodplains, and wetlands. Water resources were desktop-evaluated using US Department of Agriculture (USDA) National Aerial Imagery Program (NAIP) aerial imagery, US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps, FEMA FIRMs, US Geological Survey (USGS) National Hydrography Dataset (NHD), and various mapping tools.

No surface water resources were identified within the assessment corridor. Therefore, projects within the corridor are not anticipated to directly impact surface water. Potential indirect impacts on surface water during any project construction activities should be minimized by implementing erosion and stormwater best management practices.

Noise

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels discernible by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Perception of noise is affected by intensity, frequency, pitch and duration. Noise levels corresponding to human hearing are quantified by A-weighted decibels (dBA).

Any transportation project within the assessment corridor having Federal Highway Administration (FHWA) involvement would require a noise analysis in accordance with Procedures for Abatement of Highway Traffic Noise and

Construction Noise (23 CFR 772) for "Type 1" projects. These projects include new construction, substantial alteration of horizontal and/or vertical alignment, addition of through-traffic lanes (including restriping). The first step in a noise analysis is assigning each land use an activity category and identifying sensitive noise receptors (i.e., areas of frequent human use). A computer model is then used to determine whether traffic noise impacts are anticipated and if noise abatement (e.g., implementation of noise barriers) is necessary.

Activity categories within the assessment corridor include:

- Residential (Category B)
- Non-residential land uses such as Wilder Elementary and Triangle Park (Category C or D, depending on whether frequent human use occurs outside or inside, respectively)
- Restaurants, offices, etc. (Category E)
- Retail, utilities, etc. (Category F)
- Presumably undeveloped lands that are not permitted for development (Category G).

If improvements to the corridor would be considered Type I projects, a noise analysis would be required for areas with activity categories B through E.

Historic and Archeological Preservation

Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108) requires that federal agencies consider the effects of their undertakings on historic properties. A historic property is any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the National Register of Historic Places (NRHP). The Section 106 review process is defined in regulations promulgated by the Advisory Council on Historic Preservation (ACHP), "Protection of Historic Properties" (36 CFR Part 800).

There is one publicly listed historic property on the NRHP within the assessment corridor, the Grand Forks Riverside Neighborhood Historic District, located northeast of the study intersections. Confidential historic properties or historic properties that have yet to be identified may also be present along the corridor. Projects along the corridor should include a records search at the State Historic Preservation Office (SHPO) records, field cultural resources inventory, and coordination with the SHPO to ensure all historic properties are identified and properly handled.

Figure 35: Grand Forks Historic District

Section 4(f) Resources

Section 4(f) of the Department of Transportation Act (23 U.S.C. 138) prohibits federal transportation agencies from approving the use of significant public parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless no feasible and practicable avoidance alternative exists. If such an avoidance alternative is not available, only the alternative with the least harm, including all possible planning to minimize harm, can be approved.

Section 4(f) is likely applicable to Gateway Triangle Park, the grounds of Wilder Elementary, multi-use paths, and Grand Forks Riverside Neighborhood Historic District. In addition, sites determined to be on or e*ligible* for listing on the NRHP that may be identified during project-specific surveys and coordination would be protected by Section 4(f).

Should projects along the corridor include FHWA involvement, the FHWA would need to determine which properties Section 4(f) applies to and can only approve the project alternative(s) that avoid Section 4(f) resources if any such alternatives exist. If no feasible and prudent avoidance alternative exists, coordination with the official(s) with jurisdiction over the affected Section 4(f) resource(s) would be required to minimize and mitigate for impacts and identify the alternative(s) with least harm. Any Section 4(f) approval by the FHWA would require the appropriate coordination and documentation (e.g., Section 4(f) evaluation) efforts.

Section 6(f) Resources

Section 6(f) of the Land and Water Conservation Act requires that the conversion of lands or facilities acquired with Land and Water Conservation Funds (LWCF) be coordinated with the Department of Interior through the North Dakota Parks and Recreation Department (NDPRD). When such a conversion occurs, replacement in-kind is typically required.

According to the NDPRD's North Dakota LWCF Project and Grant Listing (1965-2015), several projects within Grand Forks have received a total of over $1 million in LWCF funding. It is not anticipated that any of these facilities are within the assessment corridor as such, projects associated with this assessment are not anticipated to require Section 6(f) coordination.

SUMMARY OF EXISTING AND FUTURE CONDITIONS

The Existing and Future Conditions report identified the following safety and operations deficiencies. These will be used to asses potential alternatives for the study area. Findings for each intersection are listed below.

US 2/Gateway Drive and 20th Street

- Signal is unwarranted with current and projected traffic volumes. This can result in more crashes, and unnecessary mainline delays.
- Queuing issues for the west approach develop by 2030 and continue to worsen by 2045.
- There were 12 crashes in the past five years, half of which were rear end. The unwarranted signal control at the intersection may be among the contributing factors for the crashes.

US 2/Gateway Drive and US 81/Washington Street

- Queuing issues exist under current conditions, these will continue to worsen through 2045. These queuing issues extend into upstream intersections causing operational issues at those intersections.
- Queuing issues occur during train events.
- The long queues and dense access spacing may be among the contributing factors for the more than 45 crashes in the last 5 years.

US 2/Gateway Drive and Mill Road/5th Street

- Queuing issues are present under existing conditions for the east approach.
- During train events queuing issues exist for west and east approaches.
- Queueing issues worsen as traffic increases
- More than half of the 41 crashes that occurred over the last five years were rear end crashes.
- The long queues and dense access spacing may be among the contributing factors for the intersection exceeding the critical crash rate.

US 2/Gateway Drive and 4th Street

- Currently operates deficiently, due to poor operations at the north approach and minimal gaps in traffic during peak hours.

US 2/Gateway Drive and 3rd Street

- Currently experiences queuing issues on the east approach that continues to degrade into 2045.
- Does not meet daily volume signal warrants currently or in the future and may impact safety in the corridor. Nearby schools may benefit from a traffic signal, but data collected as part of this study does not indicate a warrant is met based on school-related pedestrian traffic.

Train Events

- Currently the overall delay for drivers is almost 90 hours a day. This accumulates to over 32,000 hours a year in delay for drivers of the corridor. This delay will continue to worsen due to increased traffic.

Trucks

- The corridor carries between 1,250 and 1,500 trucks per day. These volumes can increase dramatically during times of harvest and can worsen queueing issues and operations.
- The skewed intersections at US 81/Washington and Mill Road/5th Street make turning especially difficult for larger trucks.

Pedestrians and Bicycles

- The study area lacks pedestrian accommodations at most intersections
- Multiple instances of objects in the middle of sidewalks
- Only one controlled crossing of US 2/Gateway Drive, even at signalized intersections
- The multi-use path that crosses US 81/Washington Street provides no protections for bikes and pedestrians crossing the road.

Transit

- The CAT Route 2 runs along US 2/Gateway Drive, with hourly service.
- The designated stops include 5th Street and 10th Avenue and Hugo's on 20th Street, two blocks south of US 2/Gateway Drive.
- CAT also stops at Home of Economy on US 81/Washington Street when scheduled in advance.
- No train related delays because of Mill Spur have been reported by CAT.

ROW Constraints

- The corridor is highly developed along US 2/Gateway Drive, making additional ROW acquisition difficult.

Environmental Constraints

- Noise Analysis is likely necessary
- Section (4(f) is likely applicable to Gateway Triangle Park, Wilder Elementary, multi-use paths, and Grand Forks Riverside Neighborhood Historic District

ENGINEERING, REIMAGINED

US 2/US 81 SKEWED INTERSECTION STUDY

Chapter 2 – Public Issues Identification

Overcoming Barriers Strengthening Connections

Grand Forks - East Grand Forks Metropolitan Planning Organization

Ensuring Opportunities Planning One Community

PUBLIC ISSUES IDENTIFICATION

A public input meeting was held on Thursday April 11th, 2019 at Grand Forks City Hall. Although the meeting was held during inclement weather conditions, 12 people attended the meeting. The purpose of this first public input meeting was to present the existing and future conditions and obtain public input on the issues. The community was also asked to help brainstorm possible alternatives and develop a list of priorities.

The primary comments received at the meeting were:

- Concern over noise impacts from train whistles, especially considering a unit train. There were multiple questions about quiet zone status.
- Concern over rail delays, especially considering a unit train.
- Concern over the challenging turning movements related to the skews and how trucks are forced to navigate through the skewed intersections.
- Concern over the lack of good pedestrian and bicycle facilities at the two key intersections.
- Many questions about unit trains, specifically when they will start coming in and at what time of day.
- A general unknown about what could be done to solve such a challenging and diverse issue in such a small area and given limited funds.
- Several residents inquired about how a south river crossing could benefit traffic flow through the area.

Two brainstorming worksheets were filled out. Concepts focused on better pedestrian and bicycle facilities, new connections to improve skewed turning movements, and the potential rerouting of the Mill Spur.

Three additional e-mails were received during the weeks following the meeting. These comments were more focused on smaller scale improvements such as signal phasing, signal timing, and pedestrian and bicycle crossings.

Figure 1 - Public Input Meeting on April 11th, 2019

KLJ

ENGINEERING, REIMAGINED

US 2/US 81 SKEWED INTERSECTION STUDY

Chapter 3 – Alternatives Development and Evaluation

Overcoming Barriers Strengthening Connections

M.P.O. M.P.O. M.P.O.

Grand Forks - East Grand Forks
Metropolitan Planning Organization

Ensuring Opportunities Planning One Community

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INTRODUCTION

The Existing and Future Conditions Analysis in Chapter 1 identified a series of safety and operational deficiencies through the Gateway Drive/US 2 corridor from 20th Street to 3rd Street. These issues, along with feedback from the project's Steering Committee, were the primary drivers of the alternatives development, evaluation, and ranking process discussed in this chapter.

DEVELOPMENT OF ALTERNATIVES

Key Issues

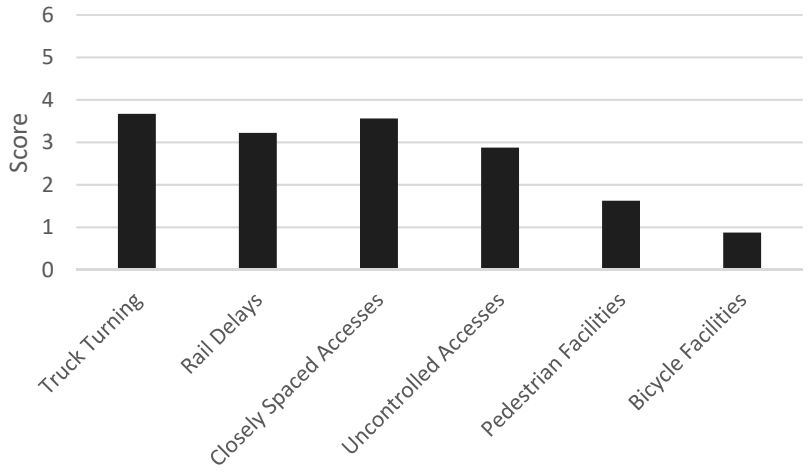
The existing and future conditions analysis identified six key issues that various improvement alternatives are intended to address:

- Truck turning challenges at the skewed intersections at Washington Street and Mill Road/5th Street.
- Rail induced delays and conflicts to vehicles, transit, bicycles, pedestrians, and emergency vehicles.
- Closely spaced traffic signals causing friction, rear-end crashes, and queueing issues.
- Dense access spacing creating safety issues.
- Lack of accessible pedestrian facilities, controlled pedestrian crossings, and desirable facilities.
- Limited bicycle facilities within the study area and an uncontrolled shared use path crossing on Washington Street.

The project's Steering Committee ranked these key issues, as shown in **Figure 1**. The committee ranked each of the six key issues on a scale of one to six, with a higher score indicating a higher priority.

The rankings were used to understand needs along the corridor in order to guide alternative development. Rankings were completed by the attendees of the first steering committee meeting, where representatives from the Forks MPO, NDDOT Grand Forks District, Grand Forks Engineering, Grand Forks Planning, Wilder Elementary School, the North Dakota State Mill, and two representatives from a local business were present. This included a representative from all of the different agencies and at-large groups other than FHWA and BNSF and represented just half of the entire steering committee as a whole.

Figure 1: SRC Prioritized Key Issues



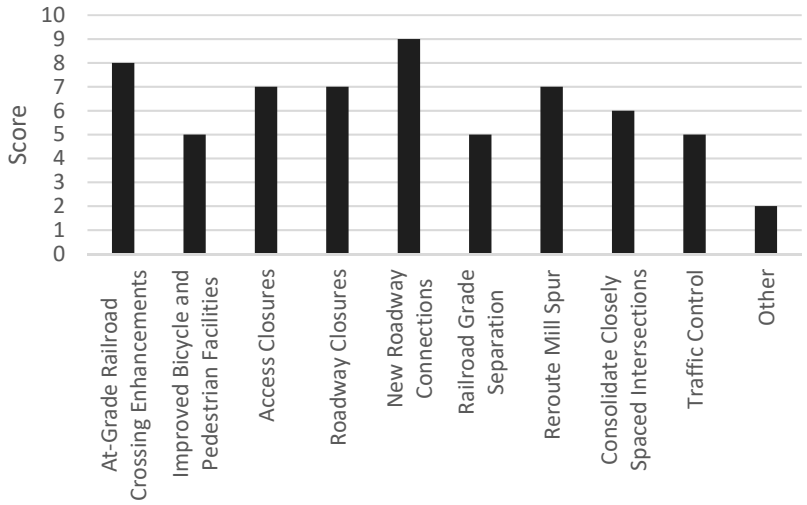
Improvement Considerations

There are many strategies that can be considered to address the key issues in the study area:

- At-grade railroad crossing enhancements
- Improved pedestrian facilities and better pedestrian and bicycle connectivity to transit
- Access closures to private businesses
- Roadway closures to private streets
- New roadway connections to reroute skewed movements
- Railroad grade separation
- Reroute the Mill Spur
- Consolidate closely spaced intersections
- Traffic control revisions

The Steering Committee was asked to select from these improvement strategies and provide other strategies that may be worth considering, as shown in **Figure 2**. The higher the number, the more Steering Committee members thought it was an important improvement strategy.

Figure 2: SRC Prioritized Improvement Strategies



Alternatives Development

To begin the alternatives development process, the steering committee was asked to draw concepts for further alternative analysis. Each concept was incorporated into subsequent alternative analysis. Many concepts were redundant and others incomplete, so additional alternatives were also incorporated into this report.

Alternatives Selected for Detailed Analysis

Using Steering Committee feedback and technical analysis from the existing and future conditions analysis, alternatives were developed with three different major themes:

1) No Railroad Changes Alternatives
   - Existing Footprint Improvement Plan
   - New Roadway Connection Improvement Plan
   - Skewed Movement Rerouting Improvement Plan
2) Grade Separation Alternatives
   - Grade Separate US 81/Washington Street and Mill Spur
   - Grade Separate US 81/Washington Street, Mill Spur, and Mill Road/5th Street
3) Railroad Realignment Alternatives
   - Roundabout with Railroad Realignment
   - Offset T-Intersections with Railroad Realignment
   - New Roadway Connection Plan with Railroad Realignment
   - Skewed Movement Rerouting Plan with Railroad Realignment
   - Existing Footprint Plan with Railroad Realignment

More detailed descriptions and conceptual drawings of each of the alternatives listed above can be found later in this document.

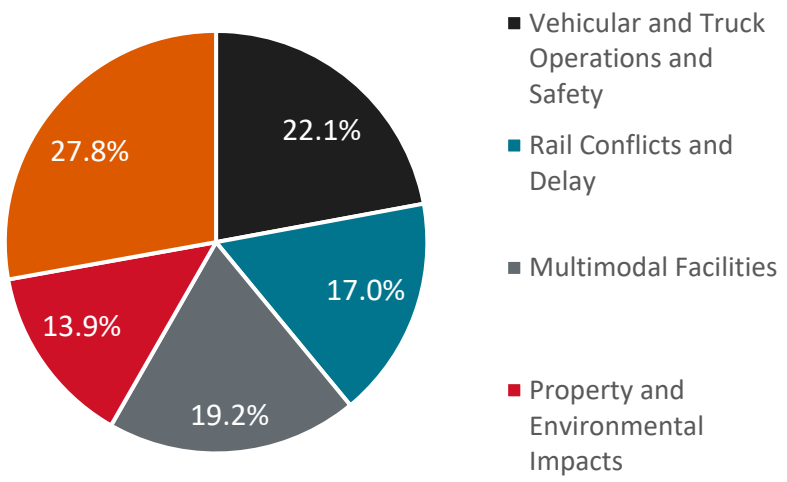
Improvement Priorities

To determine improvement priorities for the US 2/Gateway Drive skewed intersections, the Steering Committee rated the importance of the following elements:

- Vehicular and truck operations and safety
- Rail conflicts and delay
- Multimodal facilities (pedestrian and bicycle facilities)
- Property and environmental impacts
- Cost

The Steering Committee members were given 100 points to assign across the five elements above. The scoring values are shown in **Figure 3**.

Figure 3: Improvement Priorities



Evaluation and Ranking of Alternatives

Alternatives were evaluated in terms of each of the elements that were prioritized by the Steering Committee (vehicular and truck operations and safety, rail conflicts and delay, multimodal facilities and safety, property and environmental impacts, cost).

For each of the evaluation elements, a score between zero (○○○○○○○○○○) and ten (●●●●●●●●●●) was assigned. A score of zero indicates the alternative performs poorly for the given element and a score of ten indicates a significant improvement, or no consequences if the element's condition is already good.

Scores were assigned based on technical data and adjusted where appropriate using engineering judgment. Scores were assigned to alternatives relative to the other alternatives for comparison purposes. Scoring is designed to combine both quantitative and qualitative data, with detailed descriptions related to how alternatives provided in the subsequent discussion in this report.

Alternative scores are not intended to serve as recommendations, rather they are meant to be a metric to help the Study Review Committee and stakeholders better understand how different alternatives address the existing issues at each location.

Scoring Methods

Vehicular and Truck Operations

This criterion considers overall delays, traffic operations, and the number of expected conflicts during normal peak hours. This evaluation also considers issues with truck turning movements and impacts of alternative routing options. Traffic operations are for projected 2045 conditions.

Traffic operations, as well as the number of expected conflicts (i.e. crossing conflict, rear-end conflicts, or lane-change conflict) were estimated using Vissim traffic simulation models.

Rail Conflicts and Delay

This criterion considers overall delays induced during train event scenarios and potential conflicts with and without improved crossing infrastructure. This assumes current train lengths since current expectations are that future unit trains will occur at night, outside of peak traffic conditions that are being studied as part of this project.

Multimodal Facilities and Safety

This criterion considers bicycle and pedestrian safety and comfort. The current MPO Pedestrian and Bicycle Plan was used as a guide, and specific details related to each improvement is discussed for each alternative.

Property and Environmental Impacts

This criterion considers the number of impacted properties, the square footage of impacted areas, and the number of environmental factors that may be impacted.

Cost

This criterion is based on the estimated planning-level construction costs. For each cost estimate, this is an estimate for the cost of all improvements associated with an alternative.

Weighted Average Score

A weighted average score considering all categories described above was calculated using the Steering Committee input as the weighting criteria. An example is shown in Table 1.

In this example, the weighted score was calculated as follows:

$$Weighted\ Score = (Vehicular\ and\ Truck\ Operations\ and\ Safety\ \times Element\ Weight) + (Rail\ Conflicts\ and\ Delay\ Score\ \times Element\ Weight) + (Multimodal\ Facilities\ and\ Safety\ Score \times Element\ Weight) + (Property\ and\ Environmental\ Impacts\ \times Element\ Weight) + (Cost\ \times Element\ Weight)$$

$$Weighted\ Score = (3 \times 0.22) + (1 \times 0.17) + (2\ \times 0.19) + (10 \times 0.14) + (10 \times 0.28) = 5.4 \rightarrow \mathbf{5}$$

Table 1: Sample Alternative Scoring

Scoring Category	Category Weight	Category Score	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●○○○○○○○	●●●●●○○○○○ (5.4)
Rail Conflicts and Delay	17	●○○○○○○○○○	
Multimodal Facilities and Safety	19	●●○○○○○○○○	
Property and Environmental Impacts	14	●●●●●●●●●●	
Cost	28	●●●●●●●●●●	

Note: Colors in the "Category Weight" column are simply intended to visibly compare the weights for each scoring category.

In summary, the higher the score, the better the overall performance based on the weighting. It is impossible to achieve a perfect score of 10/10 because it is impossible to improve traffic operations, safety, etc. without any costs.

ALTERNATIVES WITH NO CHANGES TO THE MILL SPUR

The three alternatives discussed here do not make any changes to the Mill Spur but focus on changes that can be done to the study intersections while maintaining the railroad at-grade crossing.

ALT 1 EXISTING FOOTPRINT IMPROVEMENT PLAN

The existing footprint improvement plan would focus on three primary areas:

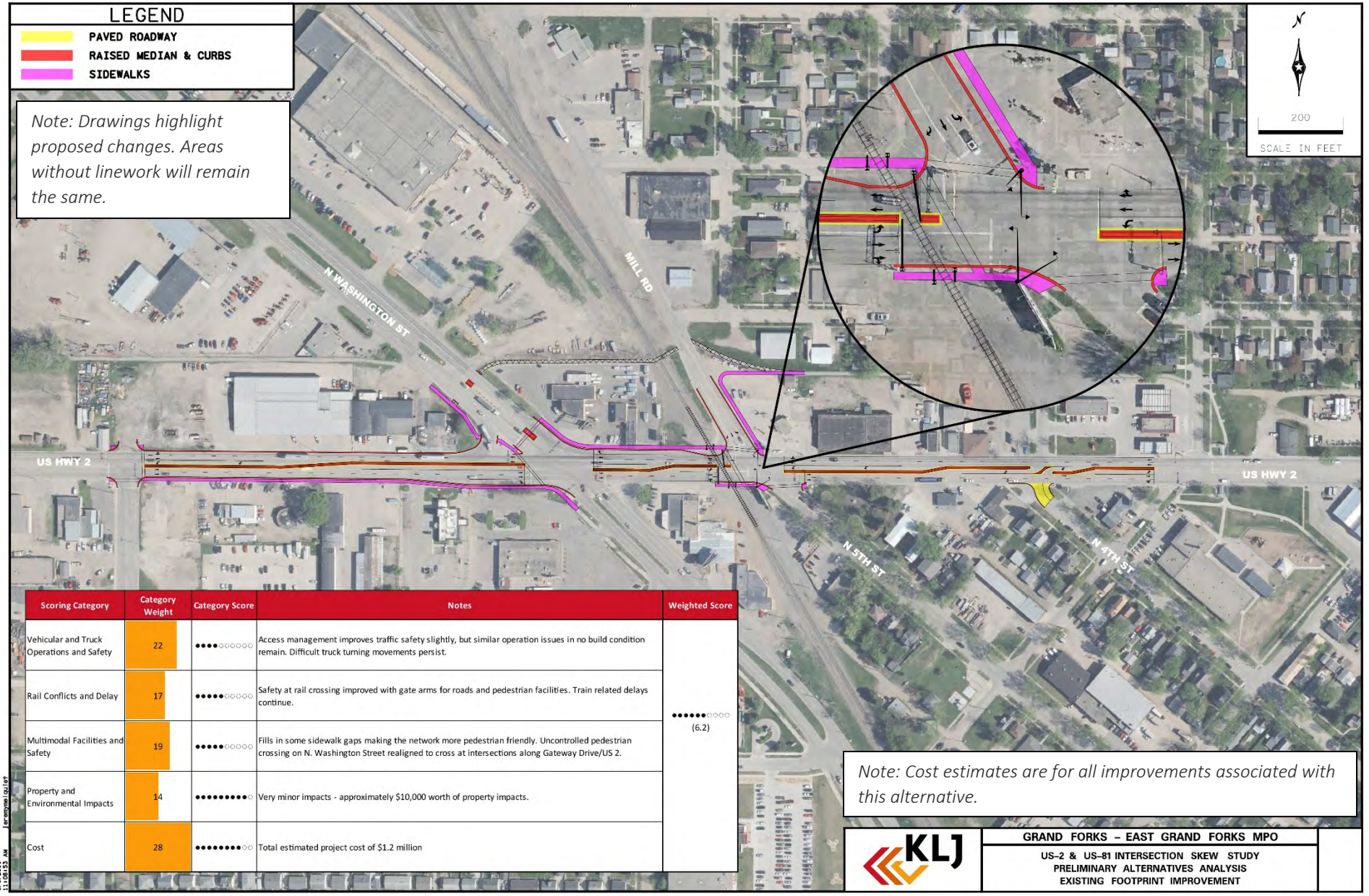
- **At-grade crossing safety** by adding railroad gate arms for the roadway and pedestrian crossings, with active warning systems and a raised median on US 2/Gateway Drive east of the Mill Road/5th Street intersection.
- **Bicycle and pedestrian facilities** by realigning the shared-use path through the skewed intersections to remove the uncontrolled crossing on Washington Street. This improves ADA compliance and crossing safety.
- **Access management** via access consolidation and closure, constructing a raised median west of Washington Street and east of Mill Road/5th Street. This aligns with the suggested improvement identified in the NDDOT Local Road Safety Program Report for this corridor.

Impacts

- **Vehicular and Truck Operations and Safety:** Intersection delay will not be significantly impacted, however access revisions reducing 14 accesses will reduce crash potential. Note this assumes the signal at US 2/Gateway Drive and 20th Street is maintained even though it is currently unwarranted since access management strategies in the area could draw more traffic to this signal.
- **Rail Conflicts and Delay:** This alternative will improve safety for all users by adding gate arms, warning systems, and a raised median, but will not mitigate railroad-related delays.
- **Multimodal Facilities and Safety:** The existing uncontrolled shared use path crossing across US 81/Washington Street and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersection of US 2/Gateway Drive and US 81/Washington Street and the intersection of US2/Gateway Drive and Mill Road (on the north approach). Signal control will simplify crossing maneuvers.
- **Property and Environmental Impacts:** Very minor impacts - approximately $10,000 worth of property impacts.
- **Cost:** Total estimated project cost of $1.2 million

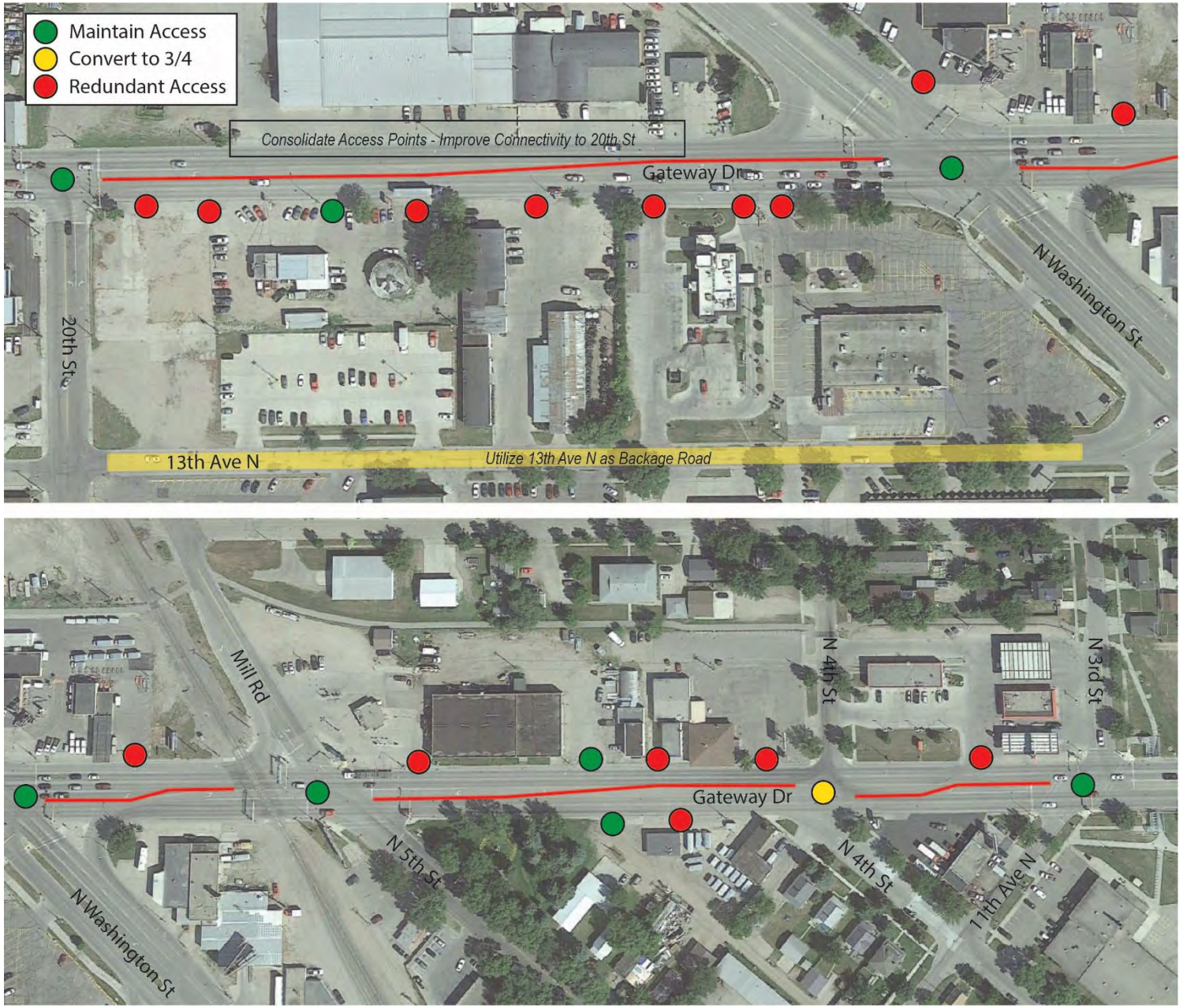
A concept drawing of the Existing Footprint Improvement Plan can be seen in **Figure 4**. A potential access management concept that can be implemented as part of this (or other) improvements can be seen in **Figure 5**.

Figure 4: Alt 1 Existing Footprint Improvement Plan



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●●○○○○○○	Access management improves traffic safety slightly, but similar operation issues in no build condition remain. Difficult truck turning movements persist.	●●●●●○○○○○ (6.2)
Rail Conflicts and Delay	17	●●●●●○○○○○	Safety at rail crossing improved with gate arms for roads and pedestrian facilities. Train related delays continue.	
Multimodal Facilities and Safety	19	●●●●●○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2.	
Property and Environmental Impacts	14	●●●●●●●●●○	Very minor impacts - approximately $10,000 worth of property impacts.	
Cost	28	●●●●●●●●○○	Total estimated project cost of $1.2 million	

Figure 5: Access Management Concept



ALT 2 NEW ROADWAY CONNECTION IMPROVEMENT PLAN

The new roadway connection improvement plan would create a new roadway connecting the west and north approaches of the intersection of US 2/Gateway Drive and US 81/Washington Street. The junction of this new connection at US 81/Washington Street would be south of the State Mill, aligning between Grand Forks County Correctional and River Cities Speedway. The other junction at US 2/Gateway Drive would be east of Gateway Sportz. Other specifics include:

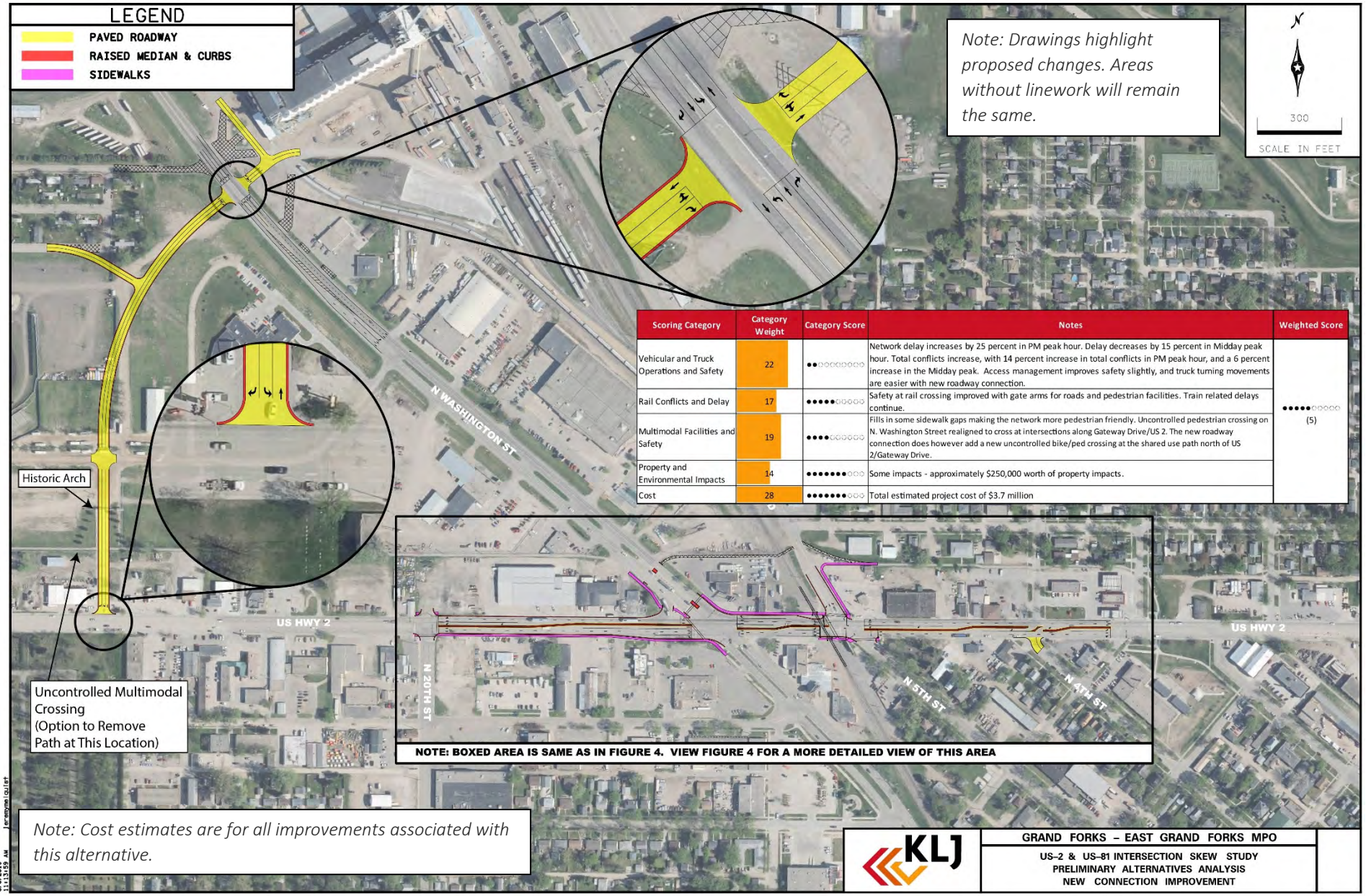
- This new roadway connection is intended to serve eastbound left turns and southbound right turns that currently use the intersection of US 2/Gateway Drive and US 81/Washington Street. Other movements would continue to operate as they currently do.
- The new intersections on US 81/Washington Street and US 2/Gateway Drive are not expected to meet signal warrants.
- This would close the current Valley Park access onto US 81/Washington Street and realign onto the new corridor.
- The multiple accesses from the State Mill would be consolidated into one.
- This alternative would also incorporate the at-grade crossing safety improvements, bicycle and pedestrian facilities, and access management from the Existing Footprint Improvement Plan.

Impacts

- **Vehicular and Truck Operations and Safety:**
  - Network delay is increased by 25 percent in the PM peak hour. Unsignalized left turn movements onto the new connection are expected to operate at LOS E in the PM peak however will provide an unskewed movement. Delays however are expected to decrease by 15 percent in the Midday rail peak hour.
  - Total conflicts are expected to increase by 14 percent in the PM peak and by 6 percent in the Midday rail peak. These increases are mainly attributable to crossing conflicts introduced by uncontrolled left turning movements at the new roadway connection intersections, with a 32 percent increase in crossing conflicts in the PM peak and a 50 percent increase in the Midday rail peak.
- **Rail Conflicts and Delay:** This alternative will improve safety for all users by adding gate arms, warning systems, and a raised median, but will not mitigate railroad-related delays.
- **Multimodal Facilities and Safety:** Existing sidewalk gaps will be filled in with new sidewalks, improving pedestrian accessibility and comfort. The existing uncontrolled shared use path crossing across US 81/Washington Street and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersection of US 2/Gateway Drive and US 81/Washington Street and the intersection of US2/Gateway Drive and Mill Road (on the north approach). Signal control will simplify crossing maneuvers. A potential consequence of this plan is that a new uncontrolled bicycle/pedestrian crossing would be added at the shared use path north of US 2/Gateway Drive if no revisions are made to this path.
- **Property and Environmental Impacts:** Some impacts - approximately $250,000 worth of property impacts, the majority of which are occurring on the new corridor connection points. Note the new roadway connection would cross an existing historical arch entering the fairgrounds. Previous planning efforts have generated similar concepts where no concerns were identified. Impacts to the arch will need to be considered in greater detail during project development.
- **Cost:** Total estimated project cost of $3.7 million ($2.5 million more than the Existing Footprint Improvement Plan)

A concept drawing of the New Roadway Connection Improvement Plan can be seen in **Figure 6**.

Figure 6: Alt 2 New Roadway Connection Improvement Plan



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●○○○○○○○○	Network delay increases by 25 percent in PM peak hour. Delay decreases by 15 percent in Midday peak hour. Total conflicts increase, with 14 percent increase in total conflicts in PM peak hour, and a 6 percent increase in the Midday peak. Access management improves safety slightly, and truck turning movements are easier with new roadway connection.	●●●●●○○○○○ (5)
Rail Conflicts and Delay	17	●●●●●○○○○○	Safety at rail crossing improved with gate arms for roads and pedestrian facilities. Train related delays continue.	
Multimodal Facilities and Safety	19	●●●●○○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2. The new roadway connection does however add a new uncontrolled bike/ped crossing at the shared use path north of US 2/Gateway Drive.	
Property and Environmental Impacts	14	●●●●●●●○○○	Some impacts - approximately $250,000 worth of property impacts.	
Cost	28	●●●●●●●○○○	Total estimated project cost of $3.7 million	

ALT 3 SKEWED MOVEMENT REROUTING IMPROVEMENT PLAN

The Skewed Movement Rerouting Improvement Plan is similar to the New Roadway Connection option above, but would reroute all movements that currently must navigate significant roadway skew. The new connections between US 81/Washington Street and US 2/Gateway Drive will also be smaller with greater use of existing roadways and intersections. Specifics include:

- New connection in northwest quadrant would connect through the Case IH implement dealer property at US 81/Washington Street and connect to US 2/Gateway Drive at 20th Street. Both terminal intersections would be signalized, with warrants expected to be met under 2045 traffic volumes.
- New connection in the southeast quadrant would have a new connection at 11th Avenue to US 81/Washington Street, aligning with 12th Avenue. The intersection of US 81/Washington Street and 11th Avenue would be signalized. This alternative would include adding an additional railroad crossing at this connection point.
    - These new connections would then service the skewed movements at the US 2/Gateway Drive and US 81/Washington Street intersection (northbound right, southbound right, eastbound left, and westbound left).
- At Mill Road/5th Street, the intersection would be realigned, separating the north and south approaches of the intersection, and converting them to ¾ access (no left-turns or through movements from the minor approaches). Each of these two intersections would be under minor approach stop control.
- This alternative would also incorporate the at-grade crossing safety improvements, bicycle and pedestrian facilities, and access management from the existing footprint improvement plan.

Impacts

- Vehicular and Truck Operations and Safety:
    - Network delay decreases by 13 percent in the PM peak hour and by 12 percent in the Midday rail peak hour. At the intersection of US 2/Gateway Drive and US 81/Washington Street, the overall intersection is improved to LOS D in the PM peak (LOS E in no build condition).
        - The improved operations compared to the New Roadway Connection option are due to using the existing signalized intersection at US 2/Gateway Drive and 20th Street as a rerouting intersection. This option would however add a new signal at US 81/Washington Street and 12th Avenue N satisfying unmet existing signal warrants.
        - Queue spillback between Us 81/Washington Street an Mill Road will be reduced, benefitting the corridor operations.
    - Conflicts are expected to increase by 80 percent in the PM peak hour, and increase by 16 percent in the Midday rail peak hour. These increases are mainly attributable to increases in crossing conflicts (158 percent increase in PM peak and 73 percent in Midday rail peak). The increase in crossing conflicts is due to the re-routed left turns being accommodated by protected/permitted left turn phasing at 20th Street and 11th Avenue rather than the existing protected-only phasing at the intersection of US 2/Gateway Drive and US 81/Washington Street.
- Rail Conflicts and Delay: This alternative will improve safety for all users by adding gate arms, warning systems, and a raised median, but will not mitigate railroad-related delays. Reducing queues at US 81/Washington and completely eliminating them at Mill road should mitigate the queueing across the tracks issue.
- Multimodal Facilities and Safety: Existing sidewalk gaps will be filled in with new sidewalks, improving pedestrian accessibility and comfort. Uncontrolled crossings across Washington Street and and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersections at US 2/Gateway Drive (on the north approach). Signal control will simplify crossing maneuvers. One potential consequence of this option is adding traffic to 11th Avenue North past Wilder Elementary, even though this is not the intended route.

- **Property and Environmental Impacts:** Moderate impacts - approximately $790,000 worth of property impacts due to new roadway construction and one building removal
- **Cost:** Total estimated project cost of $8.6 million ($7.4 million more than the Existing Footprint Improvement Plan).

A concept drawing of the Skewed Movement Rerouting Improvement Plan can be seen in **Figure 7**.

Sub-Option: ITS Routing Solution

A sub-option for all the alternatives that make no impacts to the Mill Spur at-grade crossing include an intelligent transportation systems (ITS) routing solution. This solution would implement a variety of technologies to warn drivers of an upcoming train event at the Mill Spur to allow them to select a different route that would add 5 additional minutes in travel time using Demers Avenue. This would help to minimize the impacts to operations and driver delay during train events but could be a net travel time impact. ITS solutions would include:

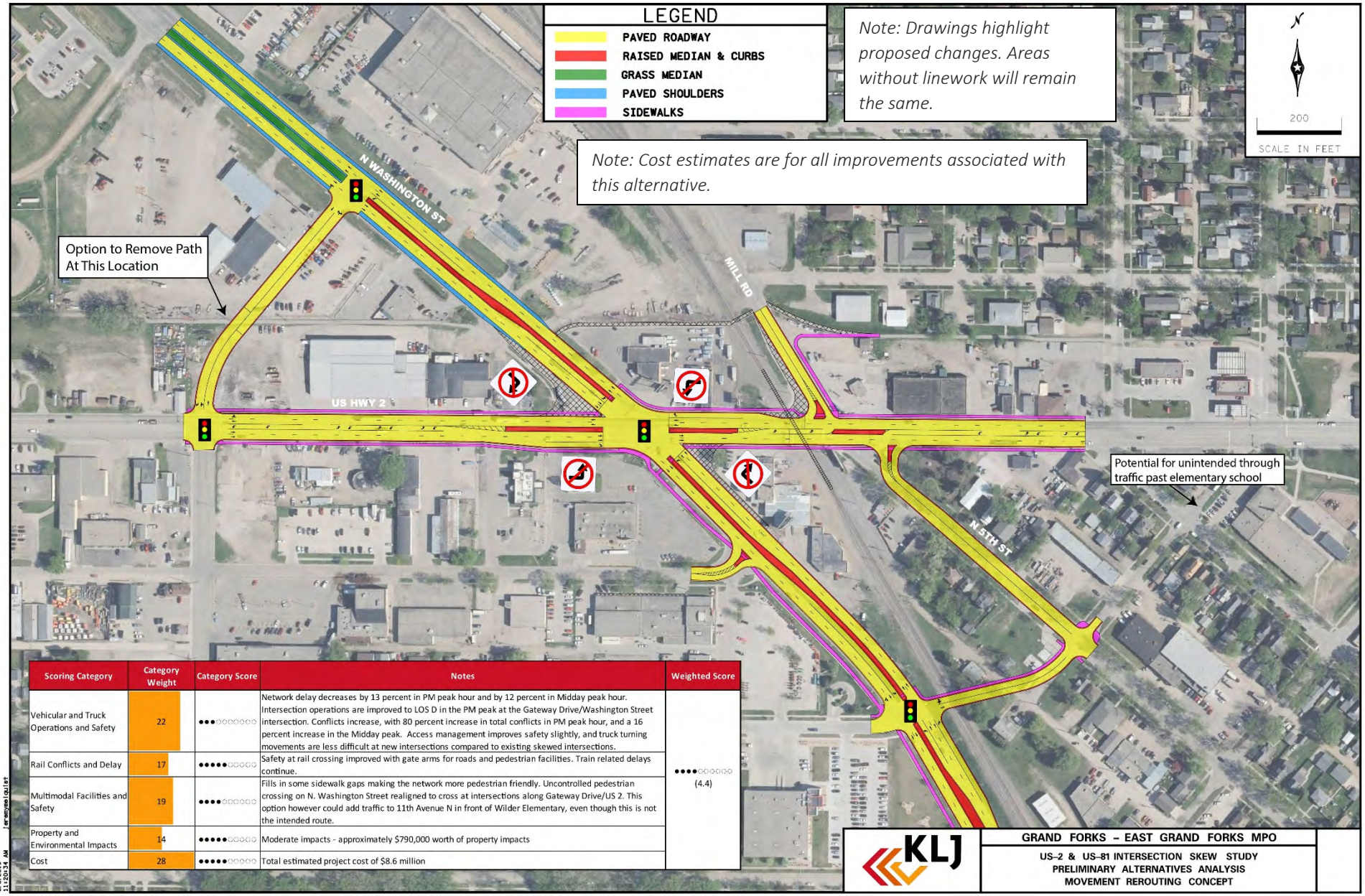
- Dynamic message signs strategically located along Grand Forks and East Grand Forks' most important travel corridors, including US 2/Gateway Drive, west of Columbia Road; US 81/N and east of the Red River. Washington Street north of US 2/Gateway Drive and south of DeMers Avenue/ND 197. These signs can also feed back information to emergency response centers like hospitals and fire departments, allowing for alternate route selections. This information can also be sent out to cell phones with push notifications
- Additional sensors for the railroad crossings, travel time, etc. to improve data collection and information collection.
- Traffic signals that can incorporate data from the new sensors to automatically adjust timing plans to reduce traffic delays.

Note that there are some existing ITS solutions for the neighborhoods to the east of the State Mill, but these do not impact through traffic on the surrounding arterials.

Impacts of Unit Trains

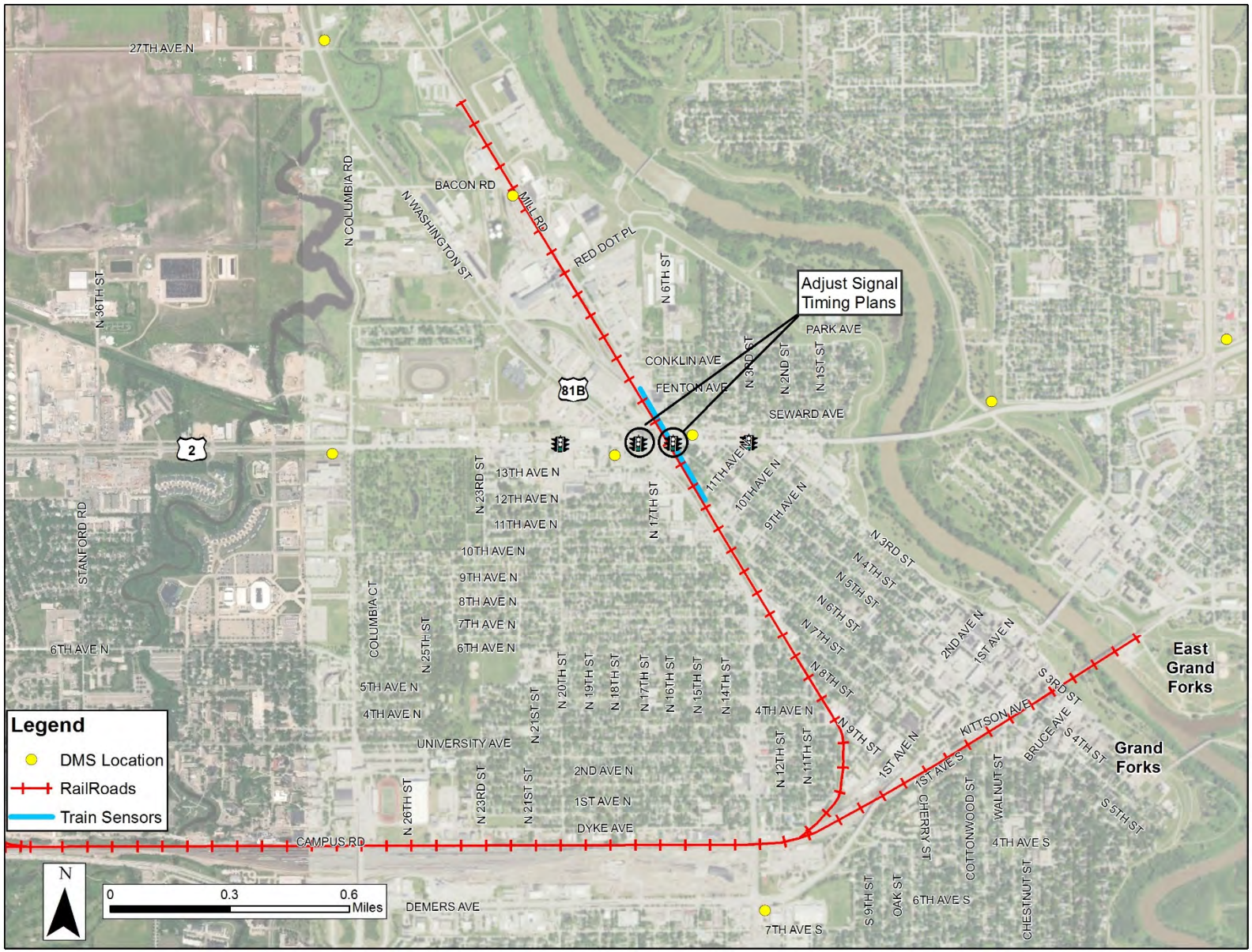
The North Dakota State Mill is planning for unit trains to deliver large loads of grain to their facility up to three times a month, typically occurring during the weekends and evenings. Unit trains are approximately 7,000 feet long, and previous analysis indicated expected delay for one unit train would be between 8.0 and 15.9 minutes. These impacts would be severe at the Gateway Drive/US 2 crossing without a grade separation, even while occurring during off-peak hours. These extended train events would have severe impacts to emergency response time. Including ITS routing and traveler information could help minimize driver delay by allowing for proactive rerouting during these extra-long train events.

Figure 7: Alt 3 Skewed Movement Rerouting Improvement Plan



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●○○○○○○○	Network delay decreases by 13 percent in PM peak hour and by 12 percent in Midday peak hour. Intersection operations are improved to LOS D in the PM peak at the Gateway Drive/Washington Street intersection. Conflicts increase, with 80 percent increase in total conflicts in PM peak hour, and a 16 percent increase in the Midday peak. Access management improves safety slightly, and truck turning movements are less difficult at new intersections compared to existing skewed intersections.	●●●●○○○○○○ (4.4)
Rail Conflicts and Delay	17	●●●●●○○○○○	Safety at rail crossing improved with gate arms for roads and pedestrian facilities. Train related delays continue.	
Multimodal Facilities and Safety	19	●●●●○○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2. This option however could add traffic to 11th Avenue N in front of Wilder Elementary, even though this is not the intended route.	
Property and Environmental Impacts	14	●●●●●○○○○○	Moderate impacts - approximately $790,000 worth of property impacts	
Cost	28	●●●●●○○○○○	Total estimated project cost of $8.6 million	

Figure 8: ITS Routing Sub-Option



ALTERNATIVES WITH RAILROAD GRADE SEPARATIONS

The two alternatives discussed here grade separate US 2/Gateway Drive from US 81/Washington Street and the Mill Spur.

ALT 4 GRADE SEPARATION OF US 81/WASHINGTON STREET AND MILL SPUR

This option would grade separate US 2/Gateway Drive above US 81/Washington Street and the Mill Spur. Specifics include:

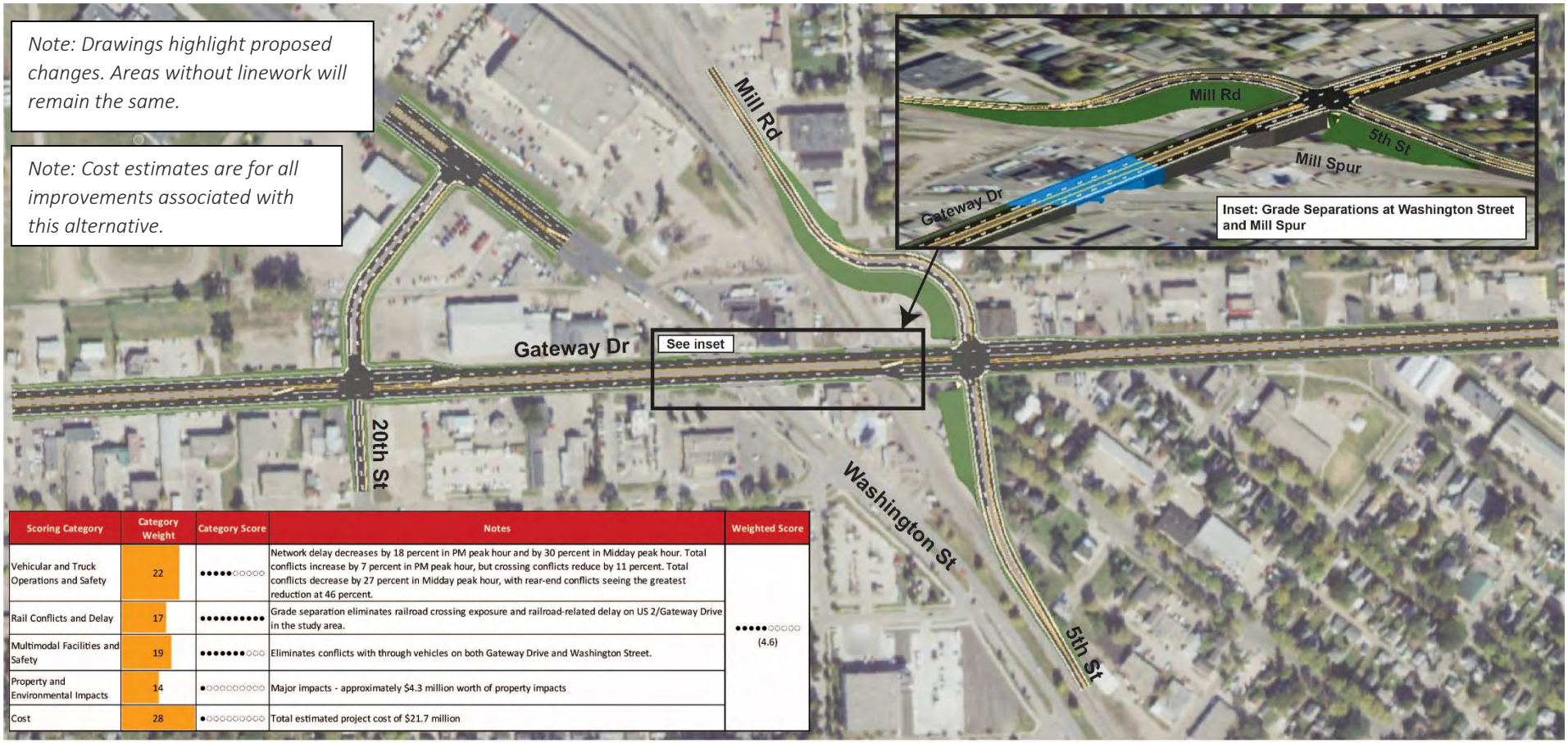
- No direct access between US 2/Gateway Drive and US 81/Washington Street
- Full access intersection at US 2/Gateway Drive and 20th Street, which includes adding a north approach that connects to US 81/Washington Street
- Full access intersection at US 2/Gateway Drive and Mill Road/5th Street blocking business access within 700 feet of the intersection.
- Close intersections of US 2/Gateway Drive at 4th Street and 3rd Street

Impacts

- **Vehicular and Truck Operations and Safety:**
  - Network delay decreases by 18 percent in the PM peak and by 30 percent in the Midday rail peak. The poorest performing intersection is US 2/Gateway Drive and 20th Street, which is expected to operate at LOS D in the PM peak. This option also eliminates the skewed intersections and proximity of the Washington St and Mill Road/5th Street closely spaced intersections.
  - Total conflicts increase by 7 percent in the PM peak, but crossing conflicts are reduced by 11 percent. In the Midday train peak, total conflicts are reduced by 27 percent, with rear-end crashes seeing the greatest reduction at 46 percent.
- **Rail Conflicts and Delay:** The grade separation eliminates railroad crossing exposure and railroad-related delay on US 2/Gateway Drive in the study area.
- **Multimodal Facilities and Safety:** Eliminates conflicts with through vehicles on both US 2/Gateway Drive and US 81/Washington Street
- **Property and Environmental Impacts:** Major impacts - approximately $4.3 million worth of property impacts and two building removals
- **Cost:** Total estimated project cost of $21.7 million ($20.5 million more than the Existing Footprint Improvement Plan).

A concept drawing of the Grade Separation of US 81/Washington Street and Mill Spur can be seen in Figure 9.

Figure 9: Grade Separation of US 81/Washington Street and Mill Spur



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●●●○○○○○	Network delay decreases by 18 percent in PM peak hour and by 30 percent in Midday peak hour. Total conflicts increase by 7 percent in PM peak hour, but crossing conflicts reduce by 11 percent. Total conflicts decrease by 27 percent in Midday peak hour, with rear-end conflicts seeing the greatest reduction at 46 percent.	●●●●●○○○○○ (4.6)
Rail Conflicts and Delay	17	●●●●●●●●●●	Grade separation eliminates railroad crossing exposure and railroad-related delay on US 2/Gateway Drive in the study area.	
Multimodal Facilities and Safety	19	●●●●●●●○○○	Eliminates conflicts with through vehicles on both Gateway Drive and Washington Street.	
Property and Environmental Impacts	14	●○○○○○○○○○	Major impacts - approximately $4.3 million worth of property impacts	
Cost	28	●○○○○○○○○○	Total estimated project cost of $21.7 million	

Alt 5 Grade Separation of US 81/Washington Street, Mill Spur, and Mill Road/5th Street

This operation would grade separate US 2/Gateway Drive above US 81/Washington Street, the Mill Spur, and Mill Road/5th Street. Specifics include:

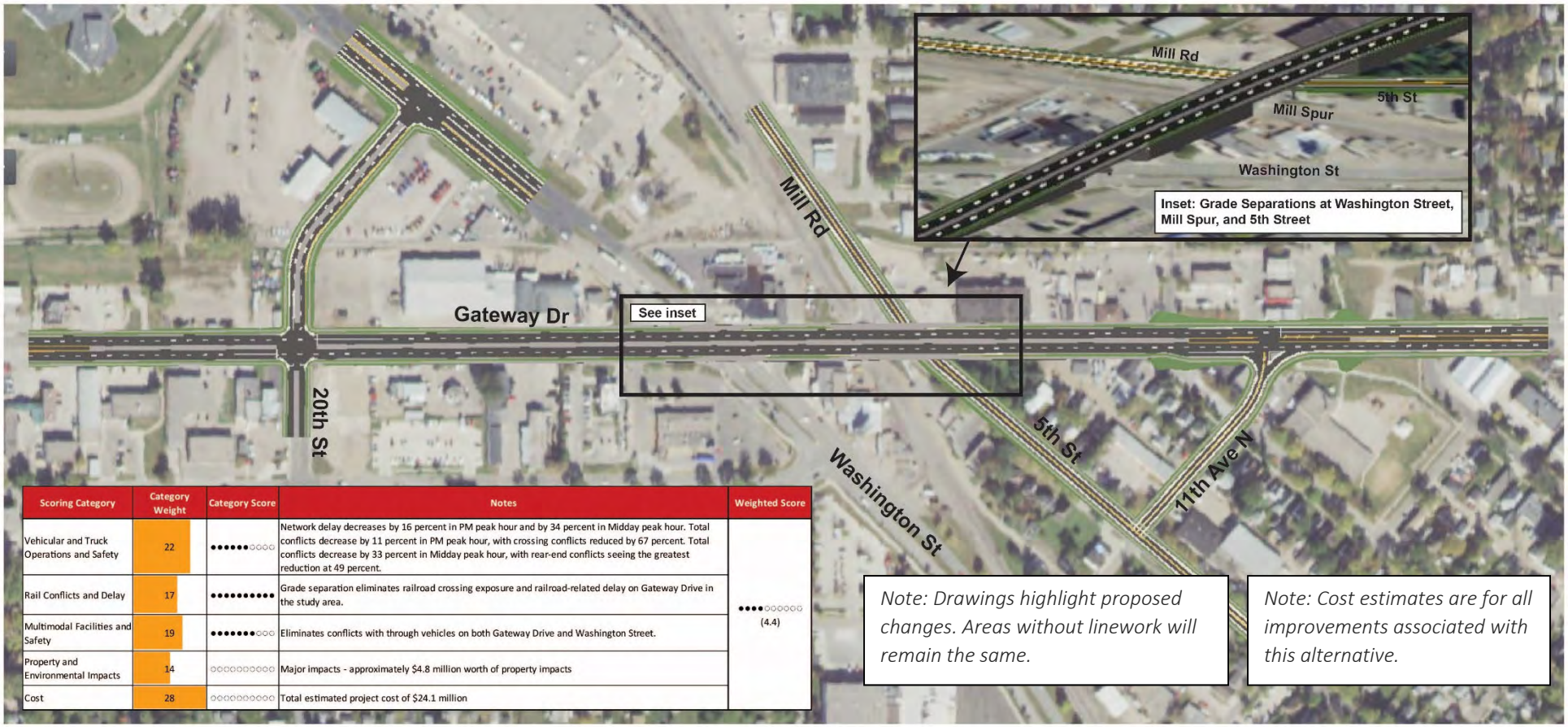
- No direct access between US 2/Gateway Drive and US 81/Washington Street
- No direct access between US 2/Gateway Drive and Mill Road/5th Street
- Full access intersection at US 2/Gateway Drive and 20th Street, which includes adding a north approach that connects to US 81/Washington Street
- Full access intersection at US 2/Gateway Drive and 4th Street with a mini roundabout assumed at 4th Street and Mill Road/5th Street.
- Close intersection of US 2/Gateway Drive and 3rd Street

Impacts

- **Vehicular and Truck Operations and Safety:**
  - Network delay decreases by 16 percent in the PM peak and by 34 percent in the Midday rail peak. The poorest performing intersection is US 2/Gateway Drive and 20th Street, which is expected to operate at LOS D in the PM peak. This option also eliminates the skewed intersections and proximity of the Washington St and Mill Road/5th Street closely spaced intersections.
  - Total conflicts reduce by 11 percent in the PM peak and by 33 percent in the Midday rail peak. The greatest reduction is for crossing conflicts, where they reduce by 67 percent in the PM peak and by 49 percent in the Midday rail peak.
- **Rail Conflicts and Delay:** The grade separation eliminates railroad crossing exposure and railroad-related delay on US 2/Gateway Drive in the study area.
- **Multimodal Facilities and Safety:** Eliminates conflicts with through vehicles on both US 2/Gateway Drive and US 81/Washington Street
- **Property and Environmental Impacts:** Major impacts - approximately $4.8 million worth of property impacts and two building removals
- **Cost**: Total estimated project cost of $24.1 million ($22.9 million more than the Existing Footprint Improvement Plan).

A concept drawing of the Grade Separation of US 81/Washington Street, Mill Spur, and 5th Street can be seen in Figure 10.

Figure 10: Grade Separation of US 81/Washington Street, Mill Spur, and 5th Street



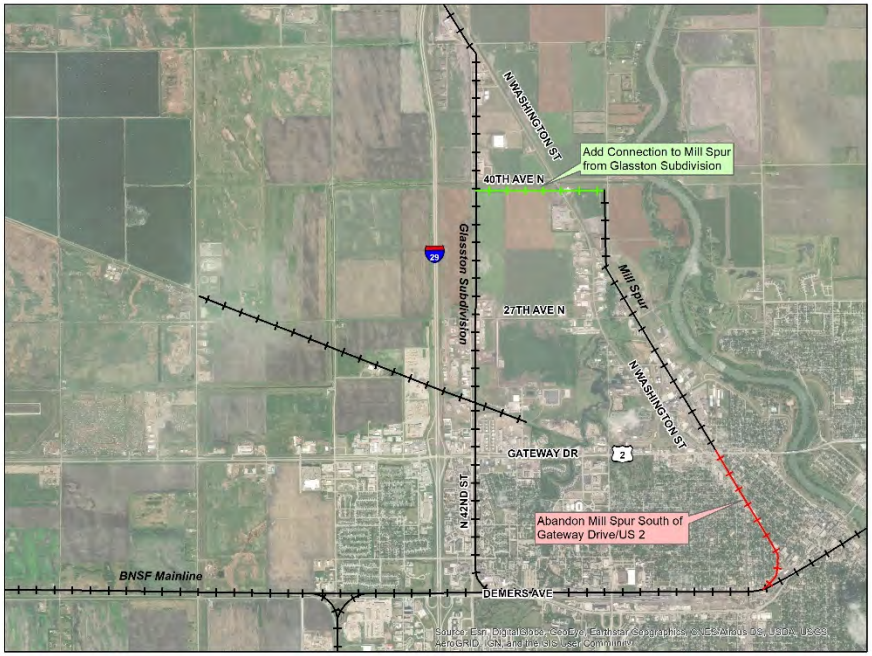
Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●●●●○○○○	Network delay decreases by 16 percent in PM peak hour and by 34 percent in Midday peak hour. Total conflicts decrease by 11 percent in PM peak hour, with crossing conflicts reduced by 67 percent. Total conflicts decrease by 33 percent in Midday peak hour, with rear-end conflicts seeing the greatest reduction at 49 percent.	●●●●○○○○○○ (4.4)
Rail Conflicts and Delay	17	●●●●●●●●●●	Grade separation eliminates railroad crossing exposure and railroad-related delay on Gateway Drive in the study area.	
Multimodal Facilities and Safety	19	●●●●●●●○○○	Eliminates conflicts with through vehicles on both Gateway Drive and Washington Street.	
Property and Environmental Impacts	14	○○○○○○○○○○	Major impacts - approximately $4.8 million worth of property impacts	
Cost	28	○○○○○○○○○○	Total estimated project cost of $24.1 million	

ALTERNATIVES WITH RAILROAD REALIGNMENT

In 2016, the Grand Forks – East Grand Forks MPO studied the Glasston Subdivision railroad crossings. This study discussed the possibilities for the Mill Spur line if the State Mill built a grain unit unloading facility with rail access from the Glasston Subdivision. This facility would make the Mill Spur obsolete, opening other opportunities for the railroad right-of-way. If the Mill Spur was abandoned between 2nd Avenue North and Gateway Drive, a new rail line connecting the Glasston Subdivision and the north end of the Mill Spur (north of Gateway Drive) would be constructed somewhere near 40th Avenue North. There are additional refinements necessary to this concept that are beyond the scope of this report. Details on these refinements can be found in Chapter 5 - Implementation Plan.

Any of the at-grade solutions could also be applied in this section with obvious benefits from removing the mill spur. The purpose of these alternatives is to leverage the extra space and elimination of railroad crossing conflicts to develop a solution that eliminate the skew turning movements and closely spaced traffic signals which would still be an issue with the railroad line was removed. The two alternatives discussed here would require the realignment of the Mill Spur to the north. It would vacate the Mill Spur right-of-way and eliminate the train-vehicle interactions.

Figure 11: Potential Railroad Realignment



Alt 6 Railroad Realignment + Consolidate US 81/Washington Street and Mill Road/5th Street into Roundabout Intersection

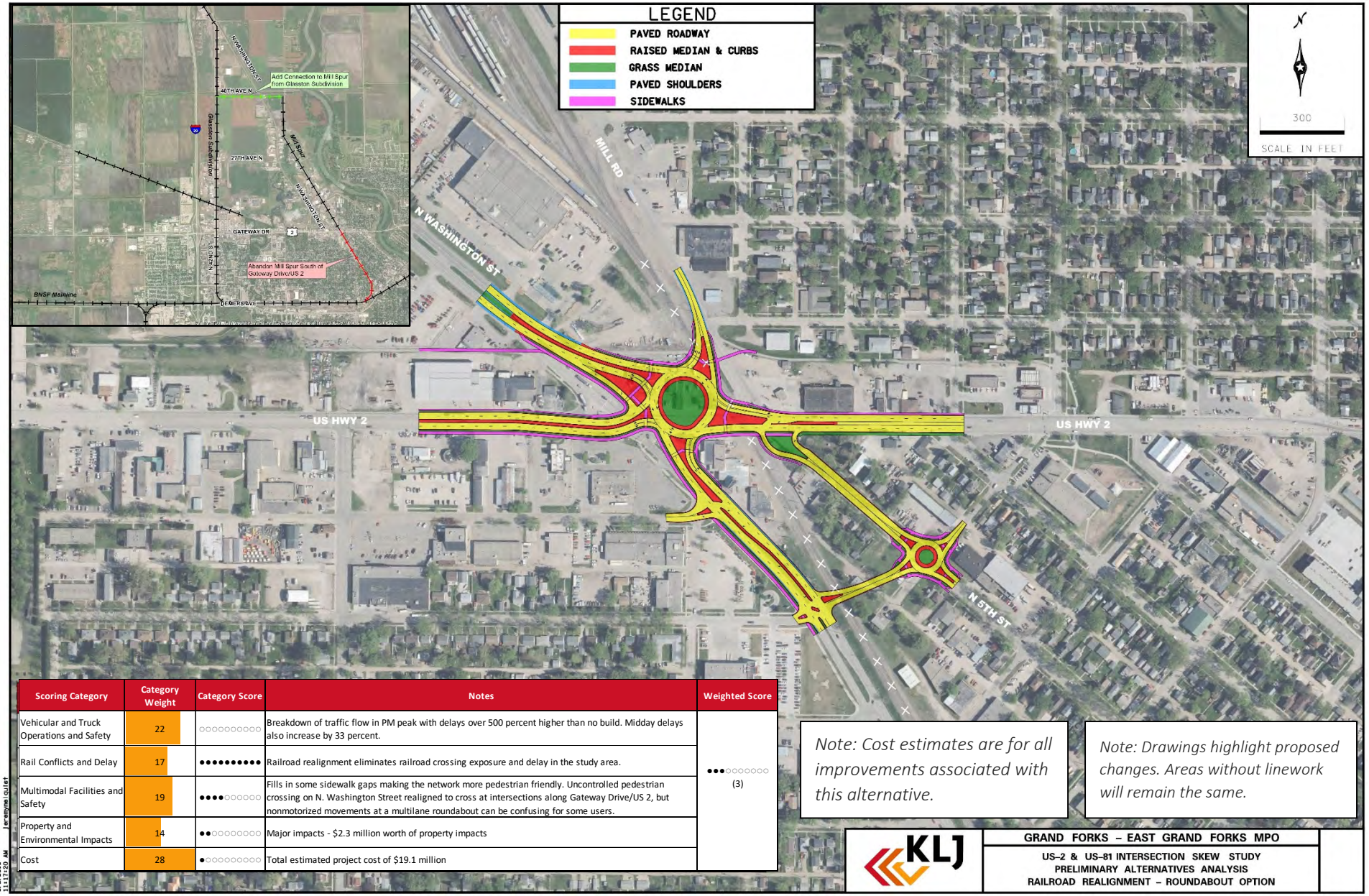
This option would consolidate the US 2/Gateway Drive intersections with US 81/Washington Street and Mill Road/5th Street into one multilane roundabout. A single lane roundabout would also be constructed at 5th Street and 11th Avenue N. The single lane roundabout will have a connection to US 81/Washington Street, south of US 2/Gateway Drive.

Impacts

- **Vehicular and Truck Operations and Safety:** Traffic flow breaks down in PM peak hour, with 500 percent more delay than no-build condition and the multilane roundabout operating at LOS F. This also consolidates Washington Street and Mill Road/5th Street into one intersection. Midday delay also increases by 33 percent, with the roundabout operating at LOS D.
- **Rail Conflicts and Delay:** Railroad realignment eliminates railroad crossing exposure and delay in the study area.
- **Multimodal Facilities and Safety:** Some existing sidewalk gaps will be filled in with new sidewalks, improving pedestrian accessibility and comfort. The existing uncontrolled pedestrian crossing across US 81/Washington Street is realigned to cross at intersections along US 2/Gateway Drive, but nonmotorized movements at a multilane roundabout can be confusing for some users.
- **Property and Environmental Impacts:** Major impacts - $2.3 million worth of property impacts and 6 building removals
- **Cost:** Total estimated project cost of $19.1 million ($6 million of which in railroad realignment costs). This is $17.9 million more than the Existing Footprint Improvement Plan.

A concept drawing of the Railroad Realignment and Roundabout can be seen in **Figure 12**.

Figure 12: Railroad Realignment with Roundabout



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	○○○○○○○○○○	Breakdown of traffic flow in PM peak with delays over 500 percent higher than no build. Midday delays also increase by 33 percent.	●●●○○○○○○○ (3)
Rail Conflicts and Delay	17	●●●●●●●●●●	Railroad realignment eliminates railroad crossing exposure and delay in the study area.	
Multimodal Facilities and Safety	19	●●●●○○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2, but nonmotorized movements at a multilane roundabout can be confusing for some users.	
Property and Environmental Impacts	14	●●○○○○○○○○	Major impacts - $2.3 million worth of property impacts	
Cost	28	●○○○○○○○○○	Total estimated project cost of $19.1 million	

ALT 7 SEPARATED T-INTERSECTION OF US 81/WASHINGTON STREET APPROACHES

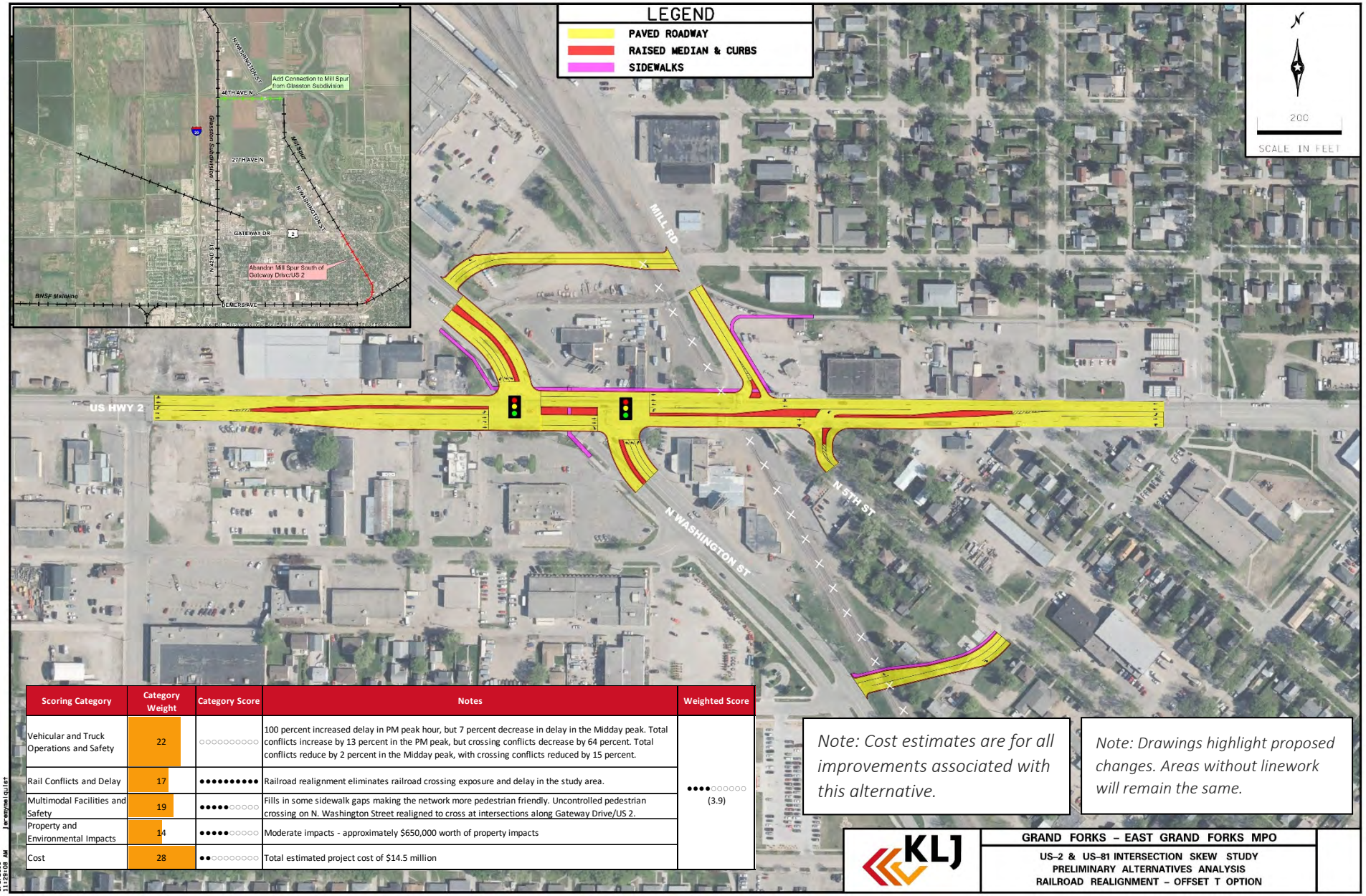
The separated T-intersection of US 81/Washington Street approaches would realign the north and south approaches of US 81/Washington Street into two signalized t-intersections. A similar configuration would be implemented at Mill Road/5th Street, but each of these t-intersections will be ¾ accesses that restrict minor approach left turns.

Impacts

- **Vehicular and Truck Operations and Safety:**
  - Network delay increases by over 200 percent in the PM peak hour, with the US 2/Gateway Drive and US 81/Washington Street separated t-intersection configuration operating at LOS F. This is due to the capacity and phasing constraints need for the NBT and SBT movements on Washington Street being consolidated into a single lane. Network delay decreases by 7 percent in the Midday rail peak.
  - Total conflicts increase by 75 percent in the PM peak. Total conflicts increase by 47 percent in the Midday rail peak, with crossing conflicts reduced by 4 percent.
- **Rail Conflicts and Delay:** Railroad realignment eliminates railroad crossing exposure and delay in the study area.
- **Multimodal Facilities and Safety:** Existing sidewalk gaps will be filled in with new sidewalks, improving pedestrian accessibility and comfort. The existing uncontrolled multimodal crossing across US 81/Washington Street and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersection of US 2/Gateway Drive and US 81/Washington Street (on the north approach). Signal control will simplify crossing maneuvers.
- **Property and Environmental Impacts:** Moderate impacts - approximately $650,000 worth of property impacts
- **Cost:** Total estimated project cost of $14.5 million ($6 million of which in railroad realignment costs). This is $13.3 million more than the Existing Footprint Improvement Plan.

A concept drawing of the Railroad Realignment and Offset T Intersection can be seen in **Figure 13**.

Figure 13: Railroad Realignment with Offset T Intersection



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	○○○○○○○○○○	100 percent increased delay in PM peak hour, but 7 percent decrease in delay in the Midday peak. Total conflicts increase by 13 percent in the PM peak, but crossing conflicts decrease by 64 percent. Total conflicts reduce by 2 percent in the Midday peak, with crossing conflicts reduced by 15 percent.	●●●●○○○○○○ (3.9)
Rail Conflicts and Delay	17	●●●●●●●●●●	Railroad realignment eliminates railroad crossing exposure and delay in the study area.	
Multimodal Facilities and Safety	19	●●●●●○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2.	
Property and Environmental Impacts	14	●●●●●○○○○○	Moderate impacts - approximately $650,000 worth of property impacts	
Cost	28	●●○○○○○○○○	Total estimated project cost of $14.5 million	

Note: Cost estimates are for all improvements associated with this alternative.

Note: Drawings highlight proposed changes. Areas without linework will remain the same.

KLJ

GRAND FORKS – EAST GRAND FORKS MPO
US–2 & US–81 INTERSECTION SKEW STUDY
PRELIMINARY ALTERNATIVES ANALYSIS
RAILROAD REALIGNMENT – OFFSET T OPTION

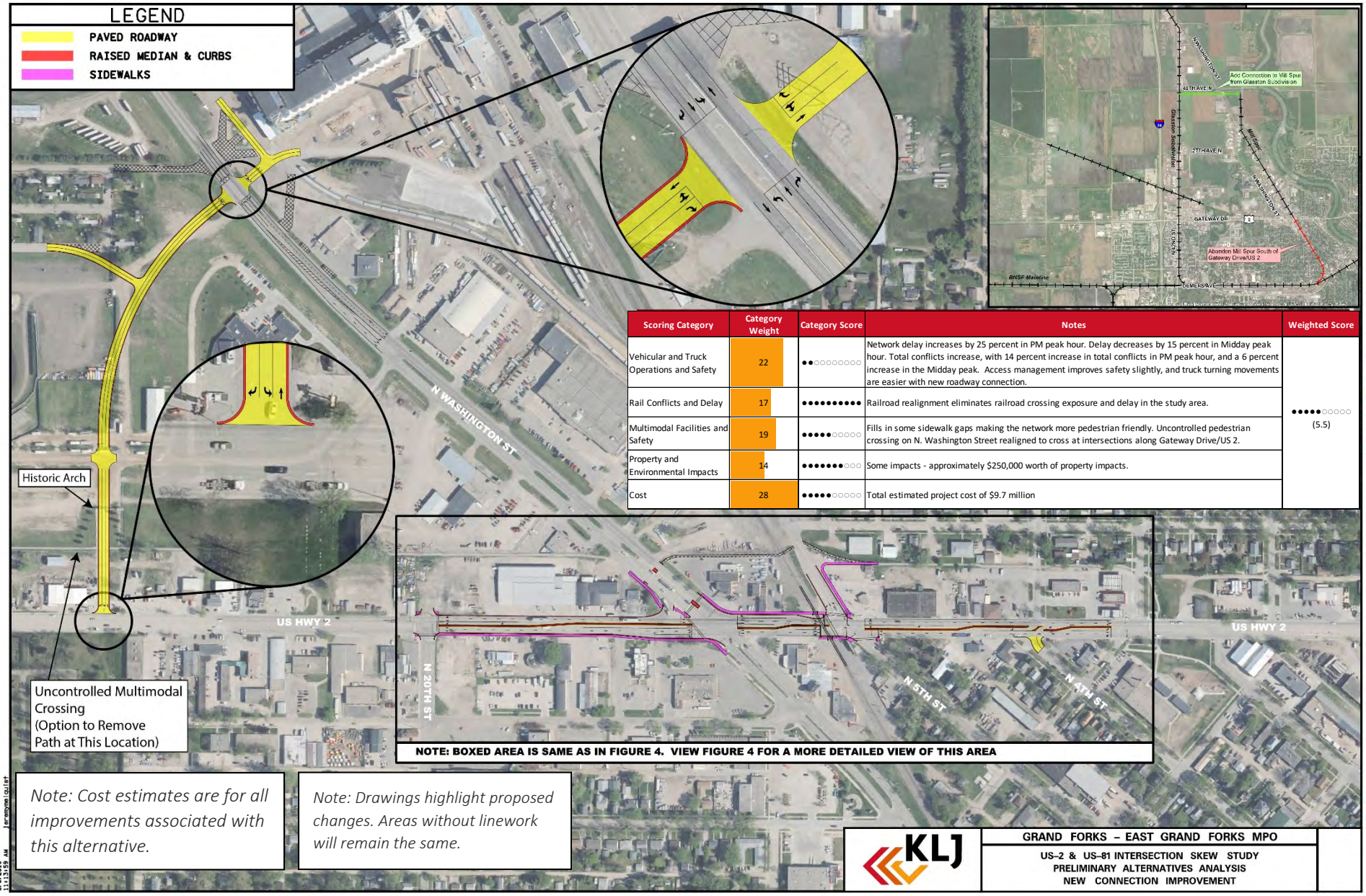
ALT 8 NEW ROADWAY CONNECTION PLAN (WITH RAILROAD REALIGNMENT)

This option is a modification to Alternative 2 (New Roadway Connection) discussed above, but with the inclusion of railroad realignment. This alternative can be seen in **Figure 14**.

Impacts

- **Vehicular and Truck Operations and Safety:**
  - Network delay is increased by 25 percent in the PM peak hour. Delays however are expected to decrease by 15 percent in the Midday rail peak hour.
  - Total conflicts are expected to increase by 14 percent in the PM peak and by 6 percent in the Midday rail peak.
- **Rail Conflicts and Delay:** Railroad realignment eliminates railroad crossing exposure and delay in the study area.
- **Multimodal Facilities and Safety:** Existing sidewalk gaps will be filled in with new sidewalks, improving pedestrian accessibility and comfort. The existing uncontrolled shared use path crossing across US 81/Washington Street and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersection of US 2/Gateway Drive and US 81/Washington Street and the intersection of US2/Gateway Drive and Mill Road (on the north approach). Signal control will simplify crossing maneuvers.
- **Property and Environmental Impacts:** Some impacts - approximately $250,000 worth of property impacts, the majority of which are occurring on the new corridor connection points.
- **Cost:** Total estimated project cost of $9.7 million, with $6 million of this total attributable to the railroad realignment. This is $8.5 million more than the Existing Footprint Improvement Plan.

Figure 14: New Roadway Connection with Railroad Realignment



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●○○○○○○○○	Network delay increases by 25 percent in PM peak hour. Delay decreases by 15 percent in Midday peak hour. Total conflicts increase, with 14 percent increase in total conflicts in PM peak hour, and a 6 percent increase in the Midday peak. Access management improves safety slightly, and truck turning movements are easier with new roadway connection.	●●●●●○○○○○ (5.5)
Rail Conflicts and Delay	17	●●●●●●●●●●	Railroad realignment eliminates railroad crossing exposure and delay in the study area.	
Multimodal Facilities and Safety	19	●●●●●○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2.	
Property and Environmental Impacts	14	●●●●●●●○○○	Some impacts - approximately $250,000 worth of property impacts.	
Cost	28	●●●●●○○○○○	Total estimated project cost of $9.7 million	

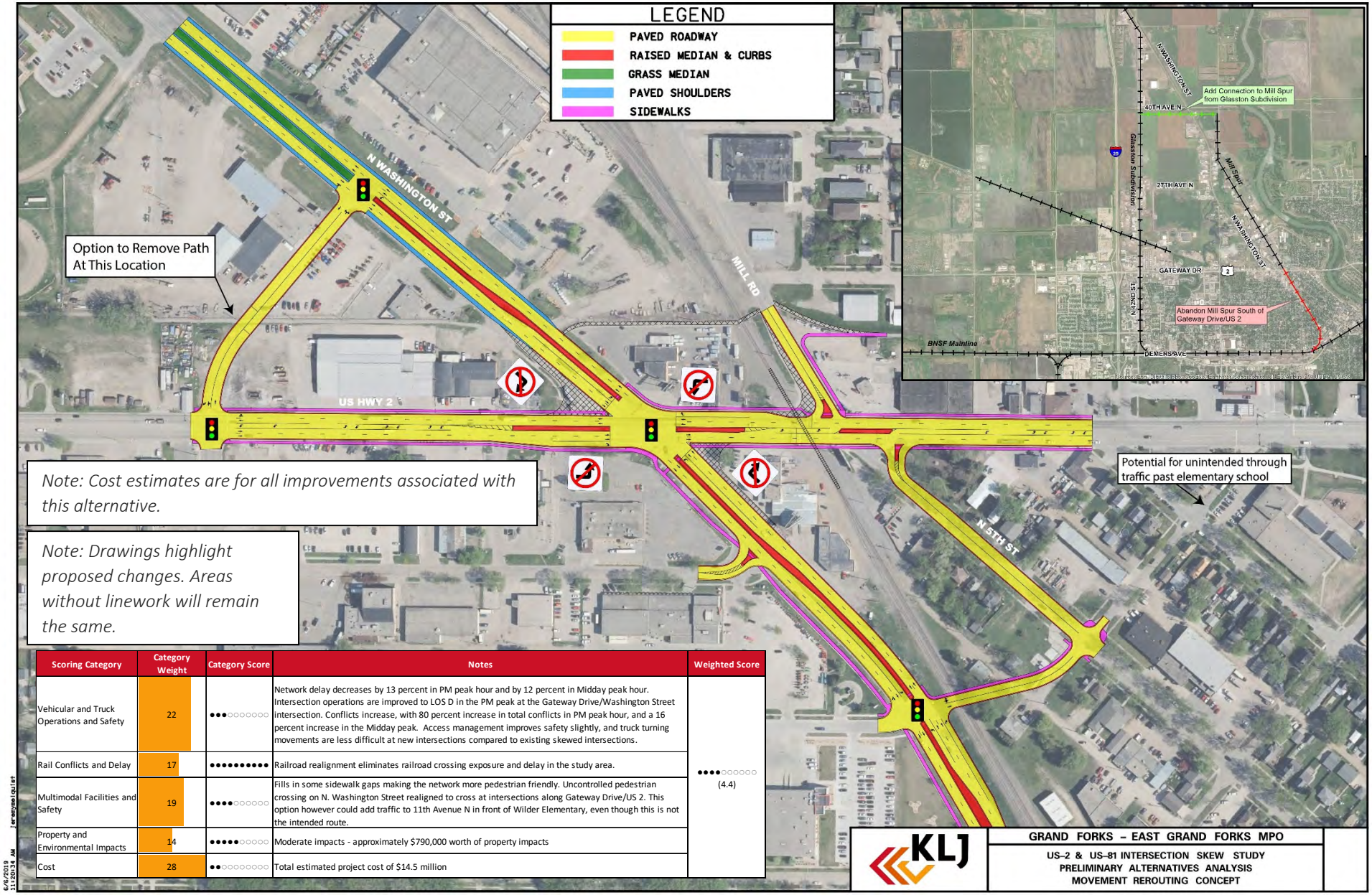
ALT 9 SKEWED MOVEMENT REROUTING PLAN (WITH RAILROAD REALIGNMENT)

This option is a modification to Alternative 3 (Skewed Movement Rerouting) discussed above, but with the inclusion of railroad realignment. This alternative can be seen in **Figure 15**.

Impacts

- **Vehicular and Truck Operations and Safety:**
  - Network delay decreases by 13 percent in the PM peak hour and by 12 percent in the Midday rail peak hour. At the intersection of US 2/Gateway Drive and US 81/Washington Street, the overall intersection is improved to LOS D in the PM peak (LOS E in no build condition).
  - Conflicts are expected to increase by 80 percent in the PM peak hour, and increase by 16 percent in the Midday rail peak hour.
- **Rail Conflicts and Delay:** Railroad realignment eliminates railroad crossing exposure and delay in the study area.
- **Multimodal Facilities and Safety:** Existing sidewalk gaps will be filled in with new sidewalks, improving pedestrian accessibility and comfort. and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersection of US 2/Gateway Drive and US 81/Washington Street and the intersection of US2/Gateway Drive and Mill Road (on the north approach). Signal control will simplify crossing maneuvers. One potential consequence of this option is adding traffic to 11th Avenue North past Wilder Elementary, even though this is not the intended route.
- **Property and Environmental Impacts:** Moderate impacts - approximately $790,000 worth of property impacts due to new roadway construction and one building removal
- **Cost:** Total estimated project cost of $14.5 million, with $6 million of this total attributable to the railroad realignment. This is $13.3 million more than the Existing Footprint Improvement Plan.

Figure 15: Skewed Movement Rerouting with Railroad Realignment



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●○○○○○○○	Network delay decreases by 13 percent in PM peak hour and by 12 percent in Midday peak hour. Intersection operations are improved to LOS D in the PM peak at the Gateway Drive/Washington Street intersection. Conflicts increase, with 80 percent increase in total conflicts in PM peak hour, and a 16 percent increase in the Midday peak. Access management improves safety slightly, and truck turning movements are less difficult at new intersections compared to existing skewed intersections.	●●●●○○○○○○ (4.4)
Rail Conflicts and Delay	17	●●●●●●●●●●	Railroad realignment eliminates railroad crossing exposure and delay in the study area.	
Multimodal Facilities and Safety	19	●●●●○○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2. This option however could add traffic to 11th Avenue N in front of Wilder Elementary, even though this is not the intended route.	
Property and Environmental Impacts	14	●●●●●○○○○○	Moderate impacts - approximately $790,000 worth of property impacts	
Cost	28	●●○○○○○○○○	Total estimated project cost of $14.5 million	

Alt 10 Existing Footprint Plan With Railroad Realignment

This option is a modification to Alternative 1 (Existing Footprint Plan) discussed above, but with the inclusion of railroad realignment. This alternative can be seen in **Figure 16**.

Impacts

- **Vehicular and Truck Operations and Safety:** Intersection delay will not be significantly impacted, however access revisions reducing 14 accesses will reduce crash potential. Note this assumes the signal at US 2/Gateway Drive and 20th Street is maintained even though it is currently unwarranted since access management strategies in the area could draw more traffic to this signal.
- **Rail Conflicts and Delay:** This alternative will improve safety for all users by adding gate arms, warning systems, and a raised median, but will not mitigate railroad-related delays.
- **Multimodal Facilities and Safety:** The existing uncontrolled shared use path crossing across US 81/Washington Street and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersection of US 2/Gateway Drive and US 81/Washington Street and the intersection of US2/Gateway Drive and Mill Road (on the north approach). Signal control will simplify crossing maneuvers.
- **Property and Environmental Impacts:** Very minor impacts - approximately $10,000 worth of property impacts.
- **Cost:** Total estimated project cost of $7.2 million, with $6 million of this total attributable to the railroad realignment. This is $6 million more than the Existing Footprint Improvement Plan.

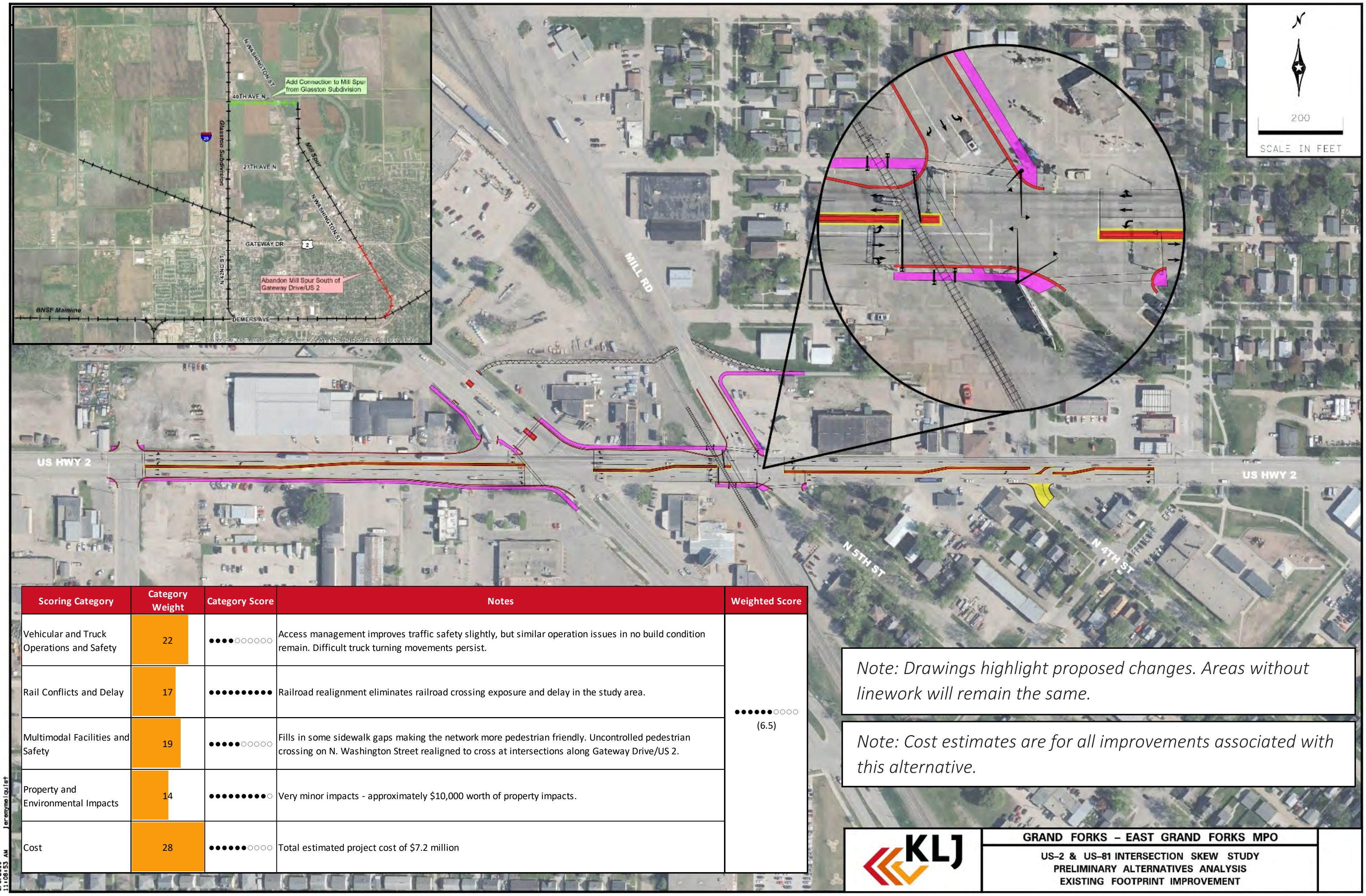
SUMMARY

A summary of the performance of all alternatives across all considered evaluation criteria can be seen in **Table 2**.

NEXT STEPS

Once the Steering Committee has had an opportunity to review this document and provide feedback and potential refinements to the alternatives, the alternatives will be presented to the public. After public input has been obtained, the recommended alternatives will be identified, and an implementation workshop will be held to determine an implementation plan for improvements.

Figure 16: Existing Footprint Improvement Plan with Railroad Realignment



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●●○○○○○○	Access management improves traffic safety slightly, but similar operation issues in no build condition remain. Difficult truck turning movements persist.	●●●●●●○○○○ (6.5)
Rail Conflicts and Delay	17	●●●●●●●●●●	Railroad realignment eliminates railroad crossing exposure and delay in the study area.	
Multimodal Facilities and Safety	19	●●●●●○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2.	
Property and Environmental Impacts	14	●●●●●●●●●○	Very minor impacts - approximately $10,000 worth of property impacts.	
Cost	28	●●●●●●○○○○	Total estimated project cost of $7.2 million	

Table 2: Summary of Alternatives

Alternative	Scoring Category	Category Weight	Category Score	Weighted Score
No Build	Vehicular and Truck Operations and Safety	22	●●●○○○○○○○	●●●●●○○○○○ (5.4)
	Rail Conflicts and Delay	17	●○○○○○○○○○	
	Multimodal Facilities and Safety	19	●●○○○○○○○○	
	Property and Environmental Impacts	14	●●●●●●●●●●	
	Cost	28	●●●●●●●●●●	
Alternative 1: Existing Footprint Improvement Plan	Vehicular and Truck Operations and Safety	22	●●●●○○○○○○	●●●●●●○○○○ (6.2)
	Rail Conflicts and Delay	17	●●●●●○○○○○	
	Multimodal Facilities and Safety	19	●●●●●○○○○○	
	Property and Environmental Impacts	14	●●●●●●●●●○	
	Cost	28	●●●●●●●●○○	
Alternative 2: New Roadway Connection Improvement Plan	Vehicular and Truck Operations and Safety	22	●●○○○○○○○○	●●●●●○○○○○ (5)
	Rail Conflicts and Delay	17	●●●●●○○○○○	
	Multimodal Facilities and Safety	19	●●●●○○○○○○	
	Property and Environmental Impacts	14	●●●●●●●○○○	
	Cost	28	●●●●●●●○○○	
Alternative 3: Skewed Movement Rerouting Improvement Plan	Vehicular and Truck Operations and Safety	22	●●●○○○○○○○	●●●●○○○○○○ (4.4)
	Rail Conflicts and Delay	17	●●●●●○○○○○	
	Multimodal Facilities and Safety	19	●●●●○○○○○○	
	Property and Environmental Impacts	14	●●●●●○○○○○	
	Cost	28	●●●●●○○○○○	
Alternative 4: Grade Separation of US 81/Washington Street and Mill Spur	Vehicular and Truck Operations and Safety	22	●●●●●○○○○○	●●●●●○○○○○ (4.6)
	Rail Conflicts and Delay	17	●●●●●●●●●●	
	Multimodal Facilities and Safety	19	●●●●●●●○○○	
	Property and Environmental Impacts	14	●○○○○○○○○○	
	Cost	28	●○○○○○○○○○	
Alternative 5: Grade Separation of US 81/Washington Street, Mill Spur, and Mill Road/5th Street	Vehicular and Truck Operations and Safety	22	●●●●●●○○○○	●●●●○○○○○○ (4.4)
	Rail Conflicts and Delay	17	●●●●●●●●●●	
	Multimodal Facilities and Safety	19	●●●●●●●○○○	
	Property and Environmental Impacts	14	○○○○○○○○○○	
	Cost	28	○○○○○○○○○○	

Alternative	Scoring Category	Category Weight	Category Score	Weighted Score
Alternative 6: Railroad Realignment with Roundabout	Vehicular and Truck Operations and Safety	22	○○○○○○○○○○	●●●○○○○○○○ (3)
	Rail Conflicts and Delay	17	●●●●●●●●●●	
	Multimodal Facilities and Safety	19	●●●●○○○○○○	
	Property and Environmental Impacts	14	●●○○○○○○○○	
	Cost	28	●○○○○○○○○○	
Alternative 7: Railroad Realignment with Offset T-Intersection	Vehicular and Truck Operations and Safety	22	○○○○○○○○○○	●●●●○○○○○○ (3.9)
	Rail Conflicts and Delay	17	●●●●●●●●●●	
	Multimodal Facilities and Safety	19	●●●●●○○○○○	
	Property and Environmental Impacts	14	●●●●●○○○○○	
	Cost	28	●●○○○○○○○○	
Alternative 8: Railroad Realignment with New Roadway Connection Plan (Modified Alternative 2)	Vehicular and Truck Operations and Safety	22	●●○○○○○○○○	●●●●●○○○○○ (5.5)
	Rail Conflicts and Delay	17	●●●●●●●●●●	
	Multimodal Facilities and Safety	19	●●●●●○○○○○	
	Property and Environmental Impacts	14	●●●●●●●○○○	
	Cost	28	●●●●●○○○○○	
Alternative 9: Railroad Realignment with Skewed Movement Rerouting Improvement Plan (Modified Alternative 3)	Vehicular and Truck Operations and Safety	22	●●●○○○○○○○	●●●●○○○○○○ (4.4)
	Rail Conflicts and Delay	17	●●●●●●●●●●	
	Multimodal Facilities and Safety	19	●●●●○○○○○○	
	Property and Environmental Impacts	14	●●●●●○○○○○	
	Cost	28	●●○○○○○○○○	
Alternative 10: Railroad Realignment with Existing Footprint Improvement Plan (Modified Alternative 1)	Vehicular and Truck Operations and Safety	22	●●●●○○○○○○	●●●●●●○○○○ (6.5)
	Rail Conflicts and Delay	17	●●●●●●●●●●	
	Multimodal Facilities and Safety	19	●●●●●○○○○○	
	Property and Environmental Impacts	14	●●●●●●●●●○	
	Cost	28	●●●●●●○○○○	

ENGINEERING, REIMAGINED

US 2/US 81 SKEWED INTERSECTION STUDY

Chapter 4 – Public Review of Alternatives

Overcoming Barriers Strengthening Connections

Grand Forks - East Grand Forks Metropolitan Planning Organization

Ensuring Opportunities Planning One Community

PUBLIC REVIEW OF ALTERNATIVES

A public input meeting was held on Wednesday August 7th, 2019 at Grand Forks City Hall. Thirteen people attended the meeting, including business and property owners, residents of the neighborhoods surrounding the study area, and a City Council member.

The public was notified of the meeting via postcards sent directly to adjacent property owners, social media posts through the City of Grand Forks, and a box ad in the Grand Forks Herald. A second mailing of postcards was sent out after the meeting to solicit additional public feedback. The project website was noted as part of all advertisements and received 181 visits surrounding the time of the public input meeting.

The purpose of this meeting was to present, review, refine, and evaluate potential improvement strategies. Nine separate improvement options were presented to the public for comment, review, and ranking. The community was asked to fill out a worksheet that scored and ranked alternatives. In total five official comments were received, including three completed worksheets.

While only five official comments were received, a variety of questions and discussion occurred at the meeting. Below is a summary of the key themes from formal and informal feedback:

- The consensus of the feedback was that the concept of realigning the Mill Spur was the best improvement option. The supporting commentary noted that not only did this have the greatest benefit, it was more reasonably priced compared to a grade separation. Additionally, several members from the public noted that there are several additional benefits that would be achieved beyond the current study (i.e. train noise and safety at the at-grade crossing on the Mill Spur).
- The alternative garnering the most support was Alternative EF+R: Existing Footprint with Railroad Realignment. Alternative SM+R: Skewed Movement Rerouting with Railrod Realignment also garnered support but also had some opposition as well.
- Several members of the public noted that they felt the grade separation was not a viable solution based on costs and impacts.
- Several members of the public felt that if a railroad realignment alternative could not be implemented that the ITS Routing Option was a good short-term solution.
- Several business owners voiced concerns related to access management strategies along the corridor, both direct access changes and implementation of a raised median.

Figure 1 - Public Input Meting on August 7th, 2019

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ENGINEERING, REIMAGINED

US 2/US 81 SKEWED INTERSECTION STUDY

Chapter 5 – Implementation Plan

Overcoming Barriers Strengthening Connections

M.P.O. M.P.O. M.P.O.

Grand Forks - East Grand Forks
Metropolitan Planning Organization

Ensuring Opportunities Planning One Community

ALTERNATIVES FEEDBACK

The steering committee and public were asked to evaluate, refine and score the proposed alternatives. Four worksheets were filled out by the Steering Committee, including responses from the NDDOT Grand Forks District, the ND State Mill, and representatives from both the business community and the Near North Neighborhood. Formal feedback was not provided by the City of Grand Forks Engineering or Planning Departments, Cities Area Transit, BNSF, FHWA, or NDDOT Local Government.

The public input process only rendered two worksheet responses despite postcard mailers being sent out to all the properties along the corridor before and after the final public input meeting, along with several social media posts and a Grand Forks Herald box ad and story. The project website was noted as part of all advertisements and received 181 visits surrounding the time of the public input meeting. This indicates that visitors were reviewing the sites and alternatives and were not choosing to provide comment.

Despite these limitations, several trends were observed from the official feedback. Below is a summary of the combined feedback from both the Steering Committee and Public, including formal public comments related to alternatives even if they did not include a completed worksheet.

- 71% of feedback supported a railroad realignment option as the preferred long-term improvement strategy
- 88% of feedback supported a railroad realignment option as a top three long-term improvement strategy
- 43% of feedback ranked the Existing Footprint + Railroad Realignment as the preferred realignment alternative.
- 57% of feedback indicated that a grade separation was not a feasible alternative
- 14% of feedback indicated that Do Nothing was not a feasible alternative or ranked last of all the alternatives they scored.
- 57% of feedback indicated that the ITS Routing Solution would be beneficial
- 29% of the feedback indicated that access management should be incorporated as part of the improvements

Unofficially, the public sentiment was clear at the public input meeting. The consensus of the feedback was that realigning the Mill Spur was the best improvement option. The supporting commentary noted that not only did this have the greatest benefit, it was more reasonably priced compared to a grade separation. Additionally, several members from the public noted that there are many additional benefits that would be achieved beyond the current study (i.e. train noise and safety at the at-grade crossing on the Mill Spur). The alternative garnering the most support was Alternative EF+R: Existing Footprint with Railroad Realignment. Alternative SM+R: Skewed Movement Rerouting with Railroad Realignment also garnered support but also had some opposition as well.

A few additional key takeaways were made based on discussions with the Steering Committee, public or both:

- Eliminating skewed turning movements comes at a heavy cost either financially, environmentally or to operations
- It's more expensive and impactful to grade separate then realign the railroad
- Traffic forecasts on Gateway Drive are high and make solutions without added capacity challenging. Forecasts should be monitored.
- Consolidating Washington with 5th/Mill Spur is not likely accomplished with acceptable operations.

IMPROVEMENT PLAN

Maintaining the existing roadway footprint in conjunction with realigning the Mill Spur (Alternative EF+R) received the highest technical score during alternatives evaluation and received the greatest stakeholder support. Detailed information related to alternatives evaluation can be seen in Chapter 3.

To recap Alternative EF+R, minor roadway improvements would be implemented within the existing roadway footprint in conjunction with abandoning the Mill Spur south of US 2/Washington Street. Minor roadway improvements would include access management strategies, a shared use path, intersection crossing improvements, and sidewalk connections.

Impacts

- **Vehicular and Truck Operations and Safety:** Intersection delay during normal operations will not be significantly impacted, however access revisions reducing 14 accesses will reduce crash potential. Note this assumes the signal at US 2/Gateway Drive and 20th Street is maintained even though it is currently unwarranted since access management strategies in the area could draw more traffic to this signal. This will need to be verified once access management strategies are refined during the project development phase of the project.
- **Rail Conflicts and Delay:** Railroad realignment eliminates railroad crossing exposure and delay in the study area. This improves overall travel time reliability and improves safety at each of the eight at-grade railroad crossings south of Gateway Drive. This also provides noise benefits to residents in this area. There is also the opportunity to redevelop this abandoned rail line into something beneficial to the neighborhoods, such as a shared use path.
- **Multimodal Facilities and Safety:** The existing uncontrolled shared use path crossings across US 81/Washington Street and Mill Road (north of US 2/Gateway Drive) will be relocated to the intersection of US 2/Gateway Drive and US 81/Washington Street and the intersection of US2/Gateway Drive and Mill Road (on the north approach). Signal control will simplify crossing maneuvers.
- **Property and Environmental Impacts:** Very minor impacts - approximately $10,000 worth of property impacts. This would require a new at-grade railroad crossing to be established on Washington Street (US Highway 81) north of the study area to connect to the Glasston Rail line.
- **Cost:** Total estimated project cost of $6.8 million, with $5.6 million of this total attributable to the railroad realignment

One notable omission is that this concept does not address the issues with skewed movements at the Gateway intersections with Washington Street and Mill Road/5th Street. From both a technical standpoint and then confirmed through discussions with key stakeholders, the issues of skewed truck movements was deemed to be a lesser issue then rail delays, normal delays and safety.

REFINEMENTS

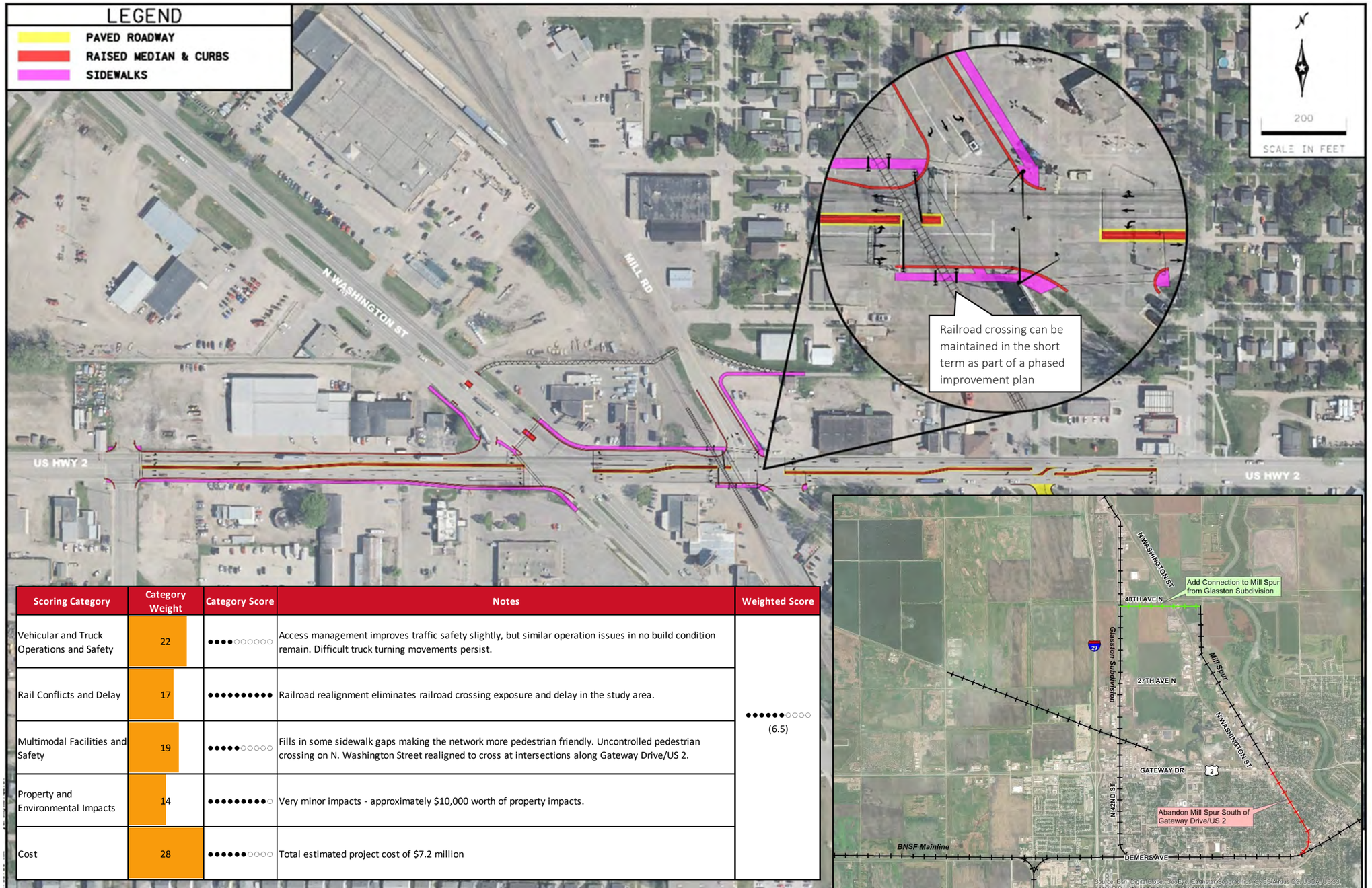
During the alternative development process, discussions with ND State Mill and BNSF led to a variety of railroad concept refinements. First, the alignment was shifted from 27th Avenue as was established in the Glasston Subdivision Railroad Crossings Mitigation Study, to just south of 40th Avenue. The reasoning for this change was the recent extension of the Mill Spur line within the ND state Mill property to accommodate unit trains. The second change was the cost estimation for a new rail line. Original estimates were deemed lower than expected. See **Figure 1** for a concept layout of the alternative as well as an overview of benefits and impacts. See **Table 2** for cost estimate details for the alternative. Both the Figure and Table are revised based on the feedback received during the Alternatives Development Phase.

Eliminated Alternatives

Often, eliminating alternatives prior to project development can be just as valuable as identifying alternatives. This allows valuable resources to be concentrated on best fit projects and facilities planning and environmental linkages, an FHWA objective to streamline project development. In this vein, there are a variety of concept packages that should be eliminated from future consideration based on technical analysis and supported by stakeholder feedback. Specifically, it is suggested the following alternatives types be discarded from future consideration;

- ***Grade Separation:*** given the widespread impacts and cost requirements for a grade separation, this solution is potentially infeasible and clearly less beneficially to the overall transportation system then rerouting the railroad alignment.
- ***Intersection Consolidation:*** consolidating the Gateway Drive intersections with Washington Street and 5th Street/Mill Road cannot be accomplished without widespread environmental impacts and/or major operational deficiencies.

Figure 1 - Existing Footprint with Railroad Realignment Concept Layout



Scoring Category	Category Weight	Category Score	Notes	Weighted Score
Vehicular and Truck Operations and Safety	22	●●●●○○○○○○	Access management improves traffic safety slightly, but similar operation issues in no build condition remain. Difficult truck turning movements persist.	●●●●●●○○○○ (6.5)
Rail Conflicts and Delay	17	●●●●●●●●●●	Railroad realignment eliminates railroad crossing exposure and delay in the study area.	
Multimodal Facilities and Safety	19	●●●●●○○○○○	Fills in some sidewalk gaps making the network more pedestrian friendly. Uncontrolled pedestrian crossing on N. Washington Street realigned to cross at intersections along Gateway Drive/US 2.	
Property and Environmental Impacts	14	●●●●●●●●●○	Very minor impacts - approximately $10,000 worth of property impacts.	
Cost	28	●●●●●●○○○○	Total estimated project cost of $7.2 million	

Table 1 - Preliminary Cost Estimate for Existing Footprint Improvement Plan + Railroad Realignment

U.S. 2 & U.S. 81 INTERSECTION ALTERNATIVES PRELIMINARY COST ESTIMATE				
ITEM DESCRIPTION	UNITS	UNIT BID PRICE	ESTIMATED QUANTITY	ESTIMATED PRICE
ALTERNATIVE			A. EXISTING FOOTPRINT IMPROVEMENT + RAIL REALIGNMENT	
ROADWAY ITEMS				
REMOVE CURB & GUTTER	LIN FT	$5.00	3,400	$17,000.00
REMOVE PAVEMENT	SQ YD	$7.50	3,358	$25,185.00
GRANULAR EMBANKMENT	CU YD	$14.50	3,259	$47,255.50
AGGREGATE BASE	CU YD	$26.00	1,402	$36,452.00
NON-WEARING COURSE	TON	$72.00	196	$14,112.00
WEARING COURSE	TON	$68.00	261	$17,748.00
CONCRETE WALK	SQ FT	$6.00	16,801	$100,806.00
CONCRETE CURB & GUTTER	LIN FT	$25.00	7,468	$186,700.00
CONCRETE MEDIAN	SQ YD	$9.00	709	$6,381.00
			SUBTOTAL	$451,639.50
LUMP SUM ITEMS				
TRAFFIC CONTROL	LUMP SUM	5%	1	$22,600.00
SIGNING & STRIPING	LUMP SUM	2%	1	$9,100.00
LIGHTING	LUMP SUM	10%	1	$45,200.00
EARTHWORK	LUMP SUM	15%	1	$67,800.00
TURF AND EROSION CONTROL	LUMP SUM	1%	1	$4,600.00
DRAINAGE	LUMP SUM	20%	0.5	$45,200.00
REVISE SIGNAL SYSTEM	SYSTEM	$150,000.00	2	$300,000.00
			SUBTOTAL	$494,500.00
PROJECT ITEMS				
			SUBTOTAL	$946,200.00
Contigency	LS	20%		$189,300.00
			TOTAL	$1,135,500.00
Railroad Realignment	LS	$6,000,000.00	RR Realignment	$6,000,000.00
Mobilization	LS	7%		$79,500.00
Real Estate	DOL			$10,000.00
GRAND TOTAL			$7,225,000.00	

Project Phasing

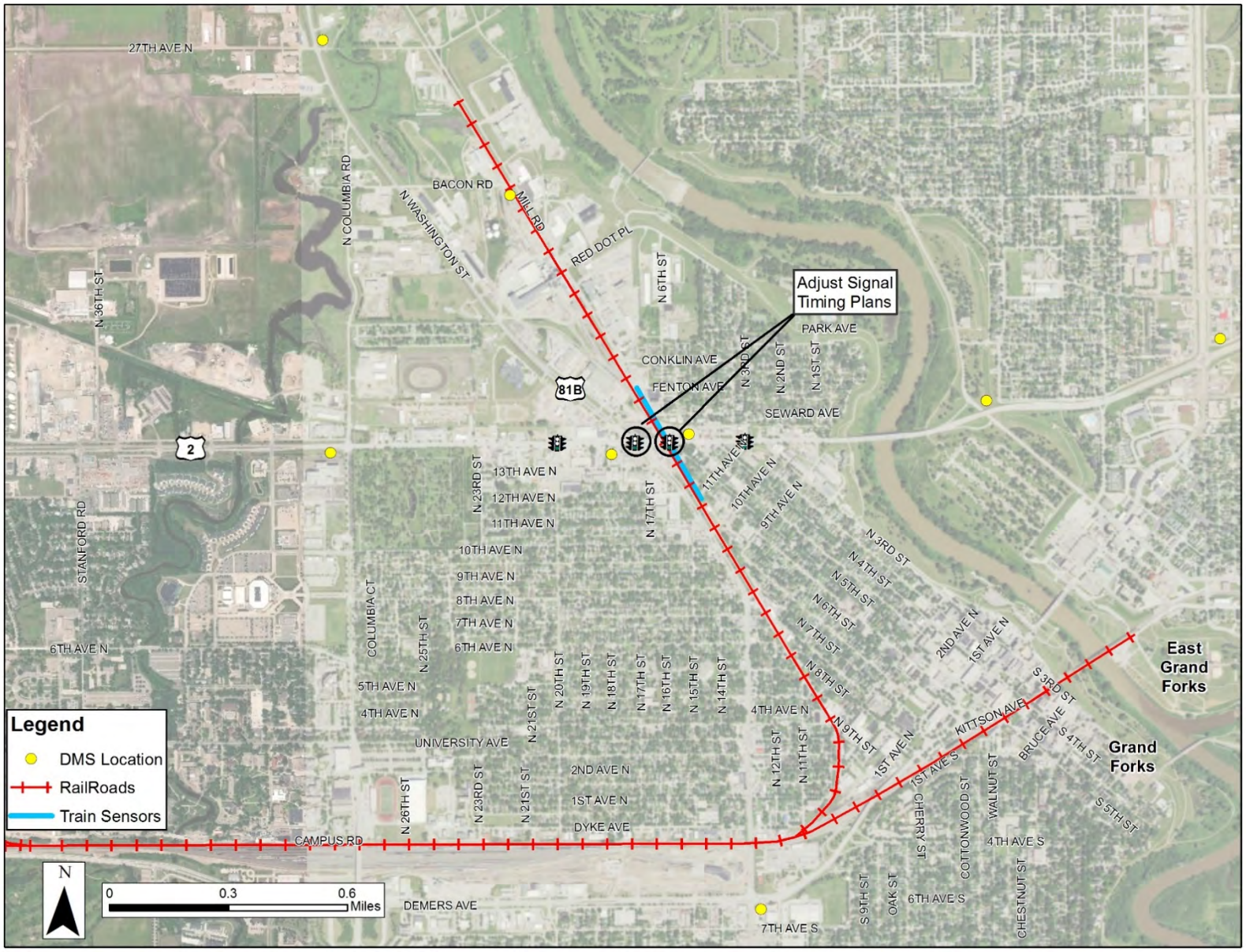
Given the costs and coordination associated with railroad realignment, improvements could be completed in phases. Roadway improvements like sidewalk improvements and median construction can be completed prior to realigning rail access to the State Mill. A potential opportunity for such improvements is including them as part of a NDDOT State of Good Repair project for US 2/Gateway Drive that is listed as a Short-Range project in the current Long-Range Transportation Plan.

If the railroad realignment lags behind the roadway improvements, it is recommended that the ITS Routing Concept be incorporated into planned improvements. This improvement plan has the potential to redistribute traffic away from the blocked crossings. This is particularly beneficial for traffic coming from the North, South and East, where simple rerouting options are available. Traffic from the west has fewer options that would provide a net benefit in travel time. The ITS system would however provide useful information for all routes related to the duration of railroad delays. Rail delays can often feel much longer then they really are because of the unknown nature and length of the delay. To properly develop a cost estimate for this ITS Routing System, more detailed systems engineering would be required to understand available infrastructure, the types of dynamic message signs to be used, the use of a cellphone application, the use of delay system, among other considerations. It also needs to be established whether the City/NDDOT would require special software licensing if off-the-shelf products were purchased. Depending on these details, a project like this can range from below $500,000 to above $1,000,000, with higher costs associated with dynamic message signs.

Below is a summary of a possible phased improvement strategy;

- At-Grade Improvements (Access Management, Ped/Bike Improvements – Short-Term
- Railroad Realignment – Short to Long-Term – depending on funding availability
- ITS Routing System – Short to Mid-Term – depending on timing of railroad alignment (see **Figure 2**)

Figure 2 - ITS Routing System



NEXT STEPS

The goal of this study is to establish an improvement plan to secure funding for eventual project programming and construction. This study is not intended to establish all roadway design specifics nor is it intended to provide comprehensive environmental impact analysis. Specific areas of refinement needed prior to project programming include:

- Establish how a new ND State Mill railroad connection from the Glasston Subdivision would operate with other users with rail needs in the area. It needs to be established whether this connection can be shared in a similar fashion to the current Mill Spur or if further investment and connections are necessary.
- More refined benefit and cost analyses. The removal of the Mill Spur would have widespread safety and noise reduction benefits beyond the study area that are not quantified as part of this project. This level of analysis will be critical in developing applications for grant money and communicating the project to the public.
- Funding mechanisms need to be identified, including establishing how costs will be shared between participating agencies.
- Access management needs to be studied further. This study identified an improvement strategy that would have substantial operational and safety benefits from access management. However, access management concepts were widely opposed from local businesses. During project development, individual communication needs to occur with each property owner to understand their site-specific needs and whether each driveway adjustment is feasible.
- Once the improvement concept is refined, environmental impacts such as access management and right-of-way impacts need to be assessed and documented.

Potential Funding Mechanisms

The Grand Forks – East Grand Forks MPO recently completed their Long-Range Transportation Plan (LRTP) with a $25 million project for this location listed in the illustrative list, indicating no specific funding is reasonably expected for its construction before 2045. However, the preliminary planning level cost estimate for the prioritized alternative shows a need closer to $7 million. The lowered cost may provide more opportunities for implementation.

- In the short term, NDDOT is expected to complete a pavement repair project along this segment of Gateway Drive/US 2. Improvements identified in this project should be coordinated with NDDOT to try to get them incorporated into that project as reasonable.
- Another short to mid-term option is use of Highway Safety Improvement Program funds (HSIP). Specifically, improvements such as access management that have already been identified in the Local Road Safety Program (LRSP) have a strong potential to be funded in this fashion. Grand Forks has recently been successful on multiple HSIP applications.
- In the long term, the City of Grand Forks has multiple unspecified projects for intersection control that could potentially be amended to construct improvements at this location, depending on its priority against other potential intersection improvement projects.

The LRTP did incorporate local sales tax revenue into their financial forecasts. There are additional locally collected and directed funding sources may provide additional opportunities for implementation.

- The City of Grand Forks is authorized to use special assessments to fund infrastructure projects. Special assessments could be used to fund some or all of this project, depending on its priority to the city.
- Upcoming Prairie Dog Infrastructure funds would provide the City of Grand Forks additional revenue for infrastructure projects. Preliminary estimates show Grand Forks receiving around $12 million in the first biennium which would more than cover the cost of this project.