EAST MAIN AVENUE CORRIDOR STUDY

BISMARCK, ND

MAY 2023

FINAL

STUDY REPORT

EAST MAIN AVENUE
CORRIDOR STUDY

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

EAST MAIN AVENUE
CORRIDOR STUDY

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Introduction

The Bismarck-Mandan Metropolitan Planning Organization (BMMPO) and City of Bismarck are conducting the East Main Avenue Corridor Study, hereafter referred to as the "Study". The Study documents existing conditions along East Main Avenue and identifies strategies to ensure safety, mobility, and access for all future users. The Study considers historic, current, and projected future traffic impacts, multimodal transportation options such as walking, bicycling, and transit, and explores future development opportunities along the corridor to support economic development.

The Study team conducted an in-depth analysis of current and future operations, access, multimodal safety, and land use conditions along the corridor. Ultimately, the Study provides a plan for decision-makers to improve safety, mobility, efficiency, and reliability of the corridor and explore potential future land use or redevelopment areas along the corridor.

History

East Main Avenue has been a part of Bismarck's history since before approximately 1875, when the City was incorporated, before North Dakota was a State (Dakota Territory). From horse-drawn carriage to Ford Mustang Mach-E, the corridor has seen some changes over the years. However, even though the adjacent buildings, businesses, and transportation technologies have changed, East Main Avenue has always paralleled the railroad, connected core commercial areas of Bismarck and Mandan, and increased the mobility of people, goods, and services east and west across the region, fostering the region's economic growth and development. The biggest shift in the Study area over the last century has been from an industrial railroad focus, to that of a commercial auto-oriented focus.

The current pavement and five-lane urban cross section was originally constructed in 1989. In 2016 and 2017, the City of Bismarck initiated concrete pavement repair projects paid through special assessments to the adjacent properties. Property owners adjacent to the East Main Avenue project area protested the concrete pavement repair projects, and as a result, the projects did not take place.

Soon after the City of Bismarck completed its Downtown Subarea Study in 2013, East Main Avenue west of the Study area from just west of Washington Street to 7th Street was converted from a five-lane to a three-lane street. The Downtown Subarea Study identified the need for a three-lane street to enhance pedestrian accessibility and safety through Bismarck's central commercial district.

Figure 1. East Main Avenue 65 Years of Change

Corridor Study Development Process

The Study has been developed collaboratively with engaged stakeholders and interested community members. A variety of meetings took place in Bismarck, as well as online. Feedback received directly guides the Study as written today.

Table 1. Study Development Process

Phase 1: Baseline Input	**Phase 2:** Issues & Needs	**Phase 3:** Alternative Development	**Phase 4:** Alternative Evaluation	**Phase 5:** Finalization & Implementation
• Study Goals • Data Collection	• Existing Conditions Analysis • Existing & 2045 Traffic Analysis • Traffic Model Runs • Identify Issues & Needs Assessment	• Develop Corridor Alternatives	• Evaluation Criteria & Alternative Analysis	• Locally Feasible Alternative Identification • Purpose and Need Statement • Implementation Recommendations • Final Report • Executive Summary
	Public Engagement Round One		Public Engagement Round Two	Public Engagement Round Three
Study Review Committee #1	Study Review Committee #2	Study Review Committee #3	Study Review Committee #4	Study Review Committee #5
Public Involvement Plan				Final Report
Existing Conditions Analysis Report		Alternative Analysis Report		Executive Summary
East Main Avenue Corridor Study				

Agency and Public Involvement

Agency and public involvement occurred throughout the Study at critical milestones or decision-making points and is invaluable to the successful development of the Study.

Study Review Committee

The Study was led by a Study Review Committee (SRC), comprised of the core consultant team, inter-governmental collaborators, and other stakeholders. The SRC provided critical guidance for the Study providing feedback on draft material, strategizing the public engagement approach to provide an approachable and accessible process, and ensuring the schedule and deadlines were on track. The following SRC members should be acknowledged for their hard work in successfully guiding this Study:

- **Dean Schloss, NDDOT**
- **Deidre Hughes, Bis-Man Transit**
- **Daniel Nairn, City of Bismarck Planning**
- **Glen Hellebust, Prairie Farms Dairy, Inc.**
- **Kate Herzog, Bismarck Downtowners**
- **Mark Berg, City of Bismarck Engineering**
- **Michael Mart, City of Bismarck Engineering**
- **Ranae Tunison, FTA**
- **Kristen Sperry, FHWA**
- **Wayne Zacher, NDDOT**
- **Kimberly Riepl, BMMPO**

SRC Meeting #1 – April 21, 2022

The purpose of this meeting was to introduce the SRC to the Study. Discussion topics included introductions, ice breaker, project overview and approach, public involvement plan, website, preliminary data insights, existing plans, and next steps.

SRC Meeting #2 – June 23, 2022

The purpose of this meeting was to review with the SRC the initial "Purpose" Statement and Issues and Needs for the Study. A public engagement update was also provided. Discussion topics included the initial Purpose Statement, Issues and Needs review, public engagement update, and next steps.

Round 1 Public Open House(s) and Community Workshop – July 13 & 14, 2022

The first round of public engagement was held in mid-July to garner feedback about the issues and opportunities present on East Main Avenue. Outreach included traditional newspaper advertisement, social media, flyers, and mailing directly to adjacent property owners. Business and property owners within the Study area were invited to attend open houses scheduled at various times throughout July 13th. A community workshop was held the following evening, July 14th, and included a presentation regarding Study background and existing conditions. The open houses and community workshop were essentially the same, the only difference being a presentation given at the workshop. The meetings provided information about existing conditions, interactive activities such as comment mapping about issues and opportunities, build your own cross section exercise, and

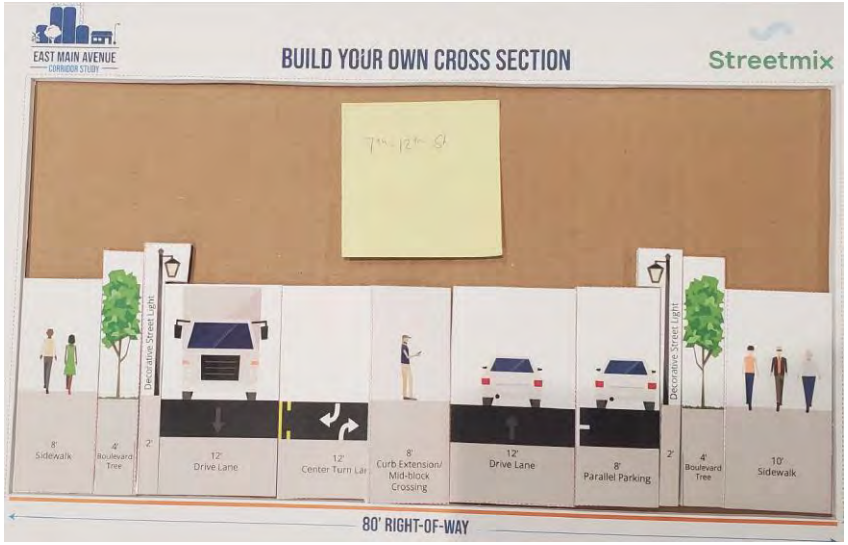
discussion/feedback opportunities with the project team. During this time, there was also an online comment mapping tool available to those who couldn't attend a meeting.

Figure 2. July Meetings Comment Mapping

Tactical Engagement July – August, 2022

After the first round of public engagement, the project team conducted one-on-one interviews with property and business owners adjacent to East Main Avenue in the Study area. This was done to get more comprehensive feedback from those who were unable to attend the first round of open houses. Interviews were conducted at businesses and properties in the Study area, at SRF Consulting Group's Bismarck Office, and over the phone.

Figure 3. July Build Your Own Cross Section Activity



SRC Meeting #3 – September 28, 2022

The purpose of this meeting was to provide the SRC with a summary for the first round of stakeholder and public engagement. Discussion topics included summary of initial phase of stakeholder and public engagement, review preliminary development opportunities, and review corridor alternatives.

SRC Meeting #4 – November 16, 2022

The purpose of this meeting was to review the initial alternatives analysis results with the SRC. Discussion topics included alternatives overview, alternatives analysis summary, review approach for upcoming round of stakeholder and public meetings, and next steps.

Round 2 Public Open House(s) and Community Workshop – November 30 & December 1, 2022

The second round of public engagement was held in late-November/early-December to garner feedback about the alternatives developed for East Main Avenue. Outreach included traditional newspaper advertisement, social media, flyers, and mailing directly to adjacent property owners. Business and property owners within the Study area were invited to attend open houses scheduled at various times throughout November 30th. A community workshop was held the following evening, December 1st, and included a presentation regarding Study background and corridor alternatives. Again, the open houses and community workshop were setup the same, the only difference being a presentation given at the workshop. The meetings provided informational boards about the alternatives and criteria used to analyze each, interactive activities included comment mapping on the alternatives, a short survey about the alternatives and evaluation criteria, and discussion/feedback opportunities with the project team. During this time period, the survey about alternatives and evaluation criteria was provided online, and advertised to those who couldn't attend a meeting.

Tactical Engagement January 19-26, 2023

During the second round of public engagement, the project team heard a lot about people walking along and crossing East Main Avenue. During a project team walk-through of the corridor the week prior, there was anecdotal evidence of foot-traffic along the corridor through significant snow piles and drifts. The corroboration from the general public in the

Figure 4. November 30th Business/Property Owner Open House

second round of public engagement meetings spurred the project team to push for more engagement of underrepresented pedestrians walking along and crossing

the corridor. A tactical focused effort was developed to reach out to critical social services located just north of the Study area including Ministry on the Margins, Native Inc., and Heaven's Helpers Soup Café. The intent of the focused effort was to garner more participation from underrepresented users of East Main Avenue whom may not have access to a vehicle. Paper copies of the corridor alternatives and evaluation criteria survey, including instructions for taking the survey, were distributed to the organizations to encourage participation.

SRC Meeting #5 – February 27, 2023

The final SRC meeting included a review of final input collected from social service organization clients and a review of the draft study report, with a particular focus on new information, including the locally feasible alternative and implementation. A preview of the final public meeting was provided.

Study Area

As shown in Figure 5, the Study focuses on a 1.5-mile segment of East Main Avenue between 7th Street on the west, and 26th Street on the east. In addition, some areas outside of the Study area were reviewed to understand system-wide transportation impacts. The Study area segment is located entirely within Bismarck city limits, with the western terminus in Bismarck's Downtown.

Segment 1 – 7th Street to 12th Street

The western-most segment along the project corridor, segment 1 is located within Bismarck's defined Downtown district. East Main Avenue between 7th Street and 12th Street is defined by commercial, industrial, office, and health and medical land use. A majority of the land use on the north side of the street is surface parking for Sanford and CHI St. Alexius healthcare facilities located directly to the north of this segment. Dissimilar from most other parts of Downtown, adjacent businesses to segment 1 have off-street parking. West of 7th Street, East Main Avenue is a three-lane street and east of 12th Street, a five-lane. The street cross section transitions from five-lane to three-lane between 9th Street and 12th Street. It should be noted that in segment 1, East Main Avenue intersects with the one-way-pair of 7th Street and 9th Street, a heavily trafficked north-south set of arterials through Bismarck's core commercial and neighborhood areas.

Segment 2 –12th Street to Airport Road

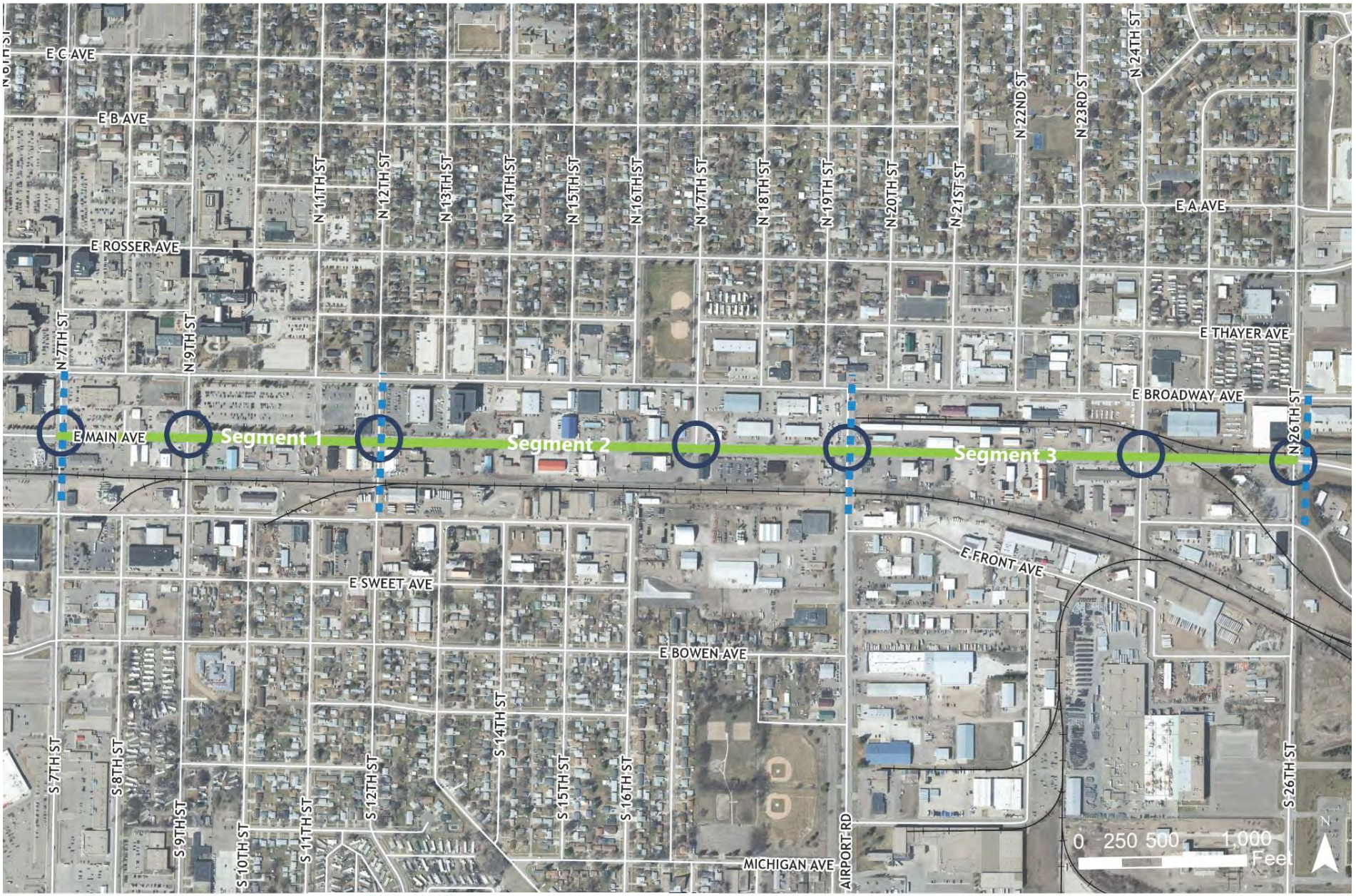
The longest segment, segment 2, is the middle portion of the Study area. Segment 2, located between 12th Street and Airport Road is defined by health and medical, commercial, and industrial land use. This area of East Main Avenue is five-lane throughout, with numerous private access approaches, varying degrees of building setback, and a general character of heavy-commercial and light-industrial orientation.

Segment 3 – Airport Road to 26th Street

The eastern-most segment along the project corridor, segment 3, is located between Airport Road and 26th Street. The area is defined by industrial, commercial, and office land use. Five-lanes throughout, this area of East Main Avenue has a general character of industrial on the north side of the street, and mix of commercial, heavy-commercial, and office on the south side. Between 24th Street and 26th Street there was previously a BNSF railroad spur that extended across the road, servicing industries on the north side of the street. The rail spur has since been abandoned and removed.


24th Street
East Main Avenue
Big Boy
12 PC MEAL
3599

Figure 5. Study Area Map



Corridor Analysis

The corridor analysis is a summarization of the Existing Conditions, Issues & Needs Technical Report which can be found as the Existing Conditions Memorandum (Appendix A).

Issues and Needs

East Main Avenue is an important corridor for personal and freight transportation, connecting local and regional users to Downtown Bismarck and beyond.

To get the best understanding of existing conditions within the Study area, the project team compiled a comprehensive analysis of factors associated with the future of East Main Avenue. Based upon the factors analyzed, the issues and needs summary was developed to highlight the key components to develop a successful future construction project. After analysis of the current conditions impacting the roadway, the following issues have been identified:

Table 2. Issues and Needs Summary

Transportation System	
Issues	**Needs**
• Pavement Condition Index (PCI) and International Roughness Index (IRI) data show signs of deterioration. • Frequency and concentration of private access approaches is a considerable safety concern. • All segments are identified as a freight route. • Federal Functional Classification (FFC) is Principal Arterial. • Sidewalks are inconsistent in parts of the study area and there are large gaps between dedicated pedestrian crossings.	• Pavement conditions need to be addressed in any future construction project. • Need to move and/or consolidate private access approaches, provide for access management. • Future projects will need to consider mobility of freight, goods, and services, unless the route is changed. • Balancing FFC and the urban context needed. • Need to fill pedestrian network gaps and ensure ADA requirements are met, as applicable.

Transportation Operations	
Issues	**Needs**
• Current 5-lane urban roadway capacity (27,200 ADT) greatly exceeds the projected 2045 volumes (17,600 ADT).	• Will need to balance future operations, including all needed modes of transportation, and fiscal constraint.

Social, Environmental, and Economic Context	
Issues	**Needs**
• Recent downtown Bismarck planning efforts to enhance pedestrian safety have spurred redevelopment and redevelopment discussion on East Main Avenue. • Auto-oriented commercial and industrial land uses exist along all segments of the corridor. • There are vulnerable populations within and adjacent to the Study area including communities of low-income, disabled, and non-white populations.	• Future construction projects should consider proximity to Downtown, previous downtown planning efforts, and redevelopment potential. • A balance of existing uses and future redevelopment efforts is needed. • Future projects need to consider impacts to the most vulnerable community members.

Safety	
Issues	**Needs**
• 444 crashes have occurred within the Study area in the past five years. • All of the segments and most of the intersections in the Study area have calculated crash rates over the critical crash rates[1]. The length of the segments and the characteristics of the intersections and corridor contribute to these higher rates.	• Numerous factors need to be considered to address safety through the corridor including but not limited to access management, signal timing, and pedestrian infrastructure.

[1] Refer to the Corridor Safety section on page 29 for more information.

Safety (Continued)	
Issues	**Needs**
• A majority of crashes along the corridor are likely a result of several tightly spaced accesses (especially private driveway access), unsignalized intersections with high turning maneuvers, no mainline right-turn lanes, and risky turning maneuvers/poor driver gap acceptance. Unrestricted accesses and intersections have a higher number of conflict points than restricted access intersections (i.e., right-in/right-out or three-quarter). When turning in/out of accesses vehicles are crossing multiple lanes which also increases the risk of potential crashes. These issues also pose risks to pedestrians.	• Numerous factors need to be considered to address safety through the corridor including but not limited to access management, signal timing, and pedestrian infrastructure.

Related Planning Efforts

As with any planning process, East Main Avenue alternatives and recommendations need to comply and align with goals and objectives of prior planning efforts. To do this, the project team reviewed applicable local and regional plans. A summary of each plan's goals was developed as applicable to the corridor. Plans reviewed as part of the existing conditions analysis include:

- *Together 2045*, Bismarck Comprehensive Plan
- *Arrive 2045,* Metropolitan Transportation Plan
- Bis-Man Transit Development Plan 2020
- Bismarck Mandan Bicycle and Pedestrian Plan
- Bismarck Infill and Redevelopment Plan
- Downtown Bismarck Subarea Plan
- Bismarck Zoning Ordinance
- City of Bismarck Downtown Streetscape Standards

Transportation System Overview

Typical Cross Section, Right-of-Way, Jurisdiction, and Federal Functional Classification

Most of East Main Avenue is a five-lane urban street with a typical cross section of four through-lanes and a center left-turn lane (60-feet curb to curb width). Right-of-way (ROW) is consistently 80-feet wide in all segments and widens to approximately 130-feet east of 26th Street. The roadway is a business route of Interstate 94 maintained by the City of Bismarck, and is under State of North Dakota jurisdiction with a Federal Functional Classification of Principal Arterial.

Pavement Condition

Pavement conditions are deteriorating and vary between marginal and adequate. Based on the International Roughness Index (IRI), which measures the smoothness of ride or 'rideability,' most of the corridor is within the marginal range. Based on the Pavement Condition Index (PCI), which measures structural integrity and surface operational condition, the pavement is in the adequate range; a few segments are approaching the marginal range. The IRI and PCI information shown in Table 3 was collected in 2020 (MPO Pavement Conditions and Analysis Report).

Access

There are approximately 86 private access points or approaches along the corridor including 70 commercial, eight (8) industrial, and eight (8) dirt lot or other access points. There are also seven (7) public street access points or intersections along the corridor. It is understood that nearly all the private and public access points pre-date Bismarck's access control policy and spacing guidelines.

Parking

Parking near East Main Avenue in the Study area includes both on-street and off-street parking. Off-street parking is composed of surface lots, ramps, and garage options, while the on-street parking consists of parallel parking. There are 16 parallel on-street parking spaces located on the north side of East Main Avenue between 7th Street and 9th Street, which is the only on-street parking within the study area.

Multimodal (Bicyclists, Pedestrians, and Transit Riders)

There are no existing multi-use trails or on-street bicycle facilities along the corridor. East Rosser Avenue, three blocks north, has on-street bike lanes for east-west bicycle mobility. However, there are no bicycle facilities connecting north-south in the Study area except for bicycle lanes on 26th Street running from East Main Avenue south to Bismarck Expressway.

Within the Study area there is a gap where no sidewalk exists on the north side of East Main Avenue between 24th Street and 26th Street. The only intersecting streets with complete

Table 3. Existing Pavement Condition

	East Main Avenue Segment		Length (ft)	IRI	IRI Range	PCI	PCI Range
	From	To					
Segment 1	6th Street	7th Street	372.42	276.85	Marginal	83.18	Adequate
	7th Street	8th Street	384.91	239.40	Marginal	72.18	Adequate
	8th Street	9th Street	378.79	225.60	Marginal	72.18	Adequate
	9th Street	12th Street	1,145.21	204.10	Marginal	77.18	Adequate
Segment 2	12th Street	17th Street	1,897.9	214.75	Marginal	78.18	Adequate
	17th Street	Airport Road	904.38	198.20	Smooth	80.18	Adequate
Segment 3	Airport Road	24th Street	1,757.46	182.20	Smooth	86.18	Adequate
	24th Street	90' E of 26th Street	1,003.01	233.10	Marginal	84.18	Adequate

sidewalks, or with sidewalks on both sides of the street, are 8th Street and 9th Street.

City of Bismarck data identifies hazardous curb ramps at intersections of East Main Avenue including the southeast corner of 12th Street, south side of 17th Street, and the southeast corner of Airport Road.

An important issue is snow maintenance along the entire corridor's sidewalks. After heavy snow events in 2022 and 2023, it took several days to clear the snow from the entirely of the corridor right of way. This can force pedestrians and bicyclists into the street. This can be seen as an environmental justice issue, as many pedestrians and bicyclists along the corridor may have no access or limited access to a vehicle.

The roadway is cleared of snow by the City of Bismarck Public Works Department the same day as the snow event. Public Works crews will come back to clean the sidewalks after all other City streets have been cleared, but this may be delayed during frequent snowfall events as was the case in the winter of 2022-2023. Property owners are responsible for clearing snow remaining on sidewalks after Public Works crews have cleared the sidewalks of the bulk of the snow (Public Works does not brush or hand-shovel the sidewalks).

Capital Area Transit (Bis-Man Transit) has two fixed-routes that run along or through the corridor. Route one (black route) travels west on East Main Avenue between 7th Street and 9th Street, and route five (orange route) travels west on East Main Avenue between 26th Street and Airport Road. The black route provides serve to north Bismarck from the Downtown area and the orange route serves the east side of the City. There are no designated transit stops with shelters or other improvements within the study corridor. The current 35 mph speed limit and five lane cross section is a constraint to safely using the fixed route flagging system without designated stops.

Figure 6: Old Snow on Sidewalk

BNSF Railway

A Burlington Northern Santa Fe Railway line runs parallel to the corridor to the south. Traffic operations analysis for the study did incorporate rail crossing information, including crossing delays and impacts, for routes that cross East Main

Avenue and the railway. As of 2023, the Federal Railroad Administration (FRA) is conducting a long-distance service study that is evaluating the feasibility of bringing passenger rail service back to Bismarck along the BNSF railway. Study recommendations and future plans from BNSF for the railway are unknown at this time, such as potential track improvements or expansion that may impact the East Main Avenue corridor area.

Transportation Operations

Data Collection

To quantify current traffic volumes along the corridor, peak hour traffic counts were obtained in May 2022 for all corridor intersections. Counts were also taken of corridor private driveways consisting of ½ hour periods in the morning peak hour, midday, and evening peak hour.

Historic Daily Traffic Volumes

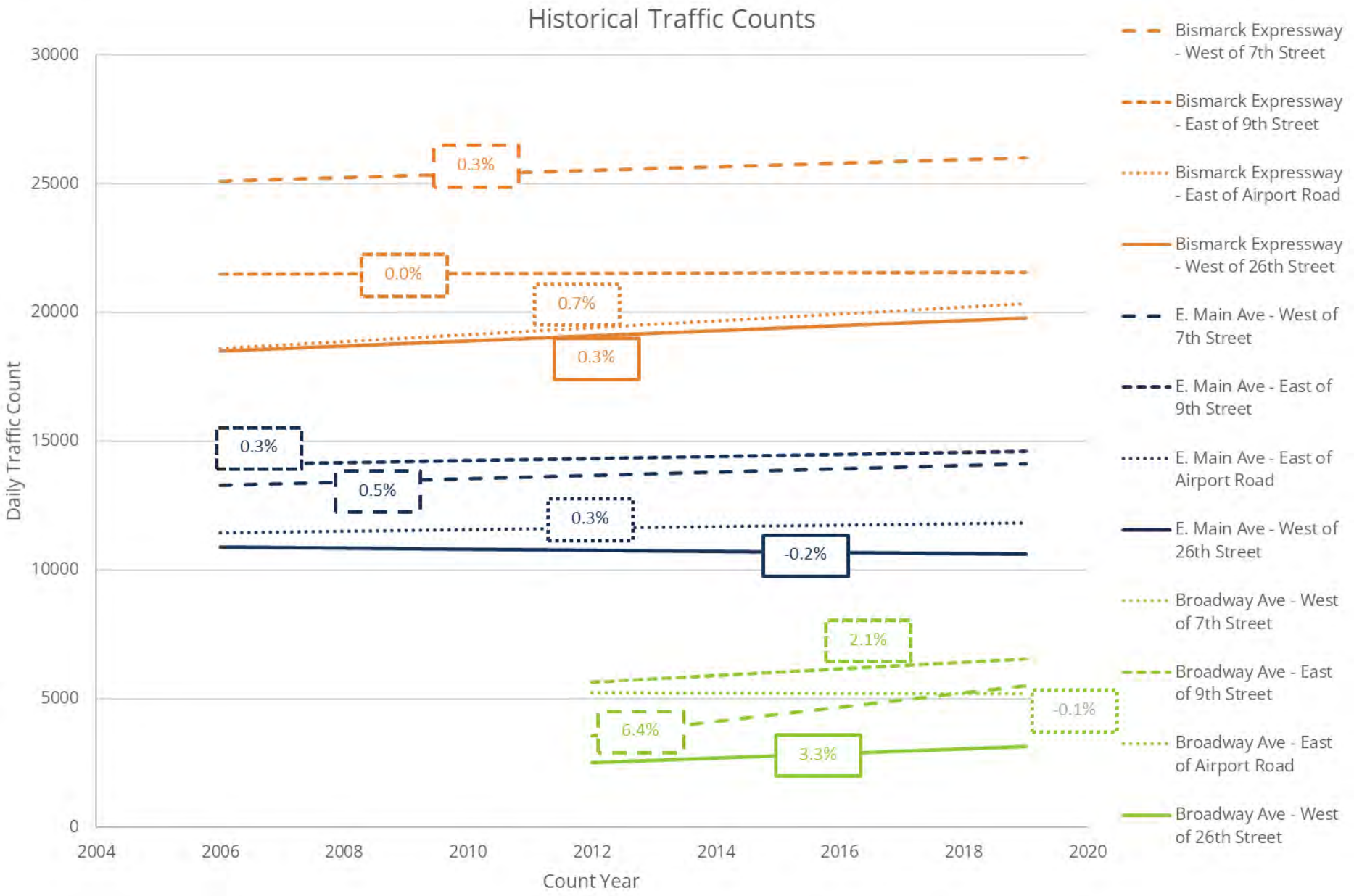
Historic traffic counts date from 2006 to 2019 were obtained and reviewed. Parallel corridors and East Main Avenue have seen traffic grow modestly, as shown in Figure 7.

2045 Traffic Forecast Methodology

The year 2045 is used as a forecast year to align with the current Bismarck-Mandan Metropolitan Transportation Plan. Year 2045 forecasts are generated by the Bismarck-Mandan MPO's travel demand model. The travel demand model is a tool that forecasts travel behavior in the future. The modeling considers the demand on the transportation system anticipated by planned changes in land use, notably the location and scale of jobs and households. North Dakota State University's Advanced Traffic Analysis Center (ATAC) evaluated the region's travel demand model specific to East Main Avenue traffic volumes forecasted in 2045.


Occupational Medicine Clinic
26th Street
East Main Avenue
AVAILABLE

Figure 7. Historic Traffic Counts: E Main Ave. and Major Parallel Routes



Roadway Capacity

Typical Average Daily Traffic (ADT) capacity ranges were reviewed, which are derived from the Highway Capacity Manual and professional engineering judgement. Ranges are provided because capacity is a theoretical measure and is affected by functional classification, traffic peaking characteristics, access spacing, speed, intersection geometry, and other roadway characteristics.

Congestion, in technical terms, exists when the ratio of traffic volume to roadway capacity (v/c ratio) approaches or exceeds one (1.0). In other words, the volume exceeds the capacity of the roadway, causing congestion. Another useful capacity analysis index is the level of traffic considered 'approaching capacity', which is when a traffic volume equals or exceeds 85 percent of roadway capacity (v/c > 0.85).

A planning level review of existing and forecasted roadway capacity is summarized in Table 4. The 2045 forecast ADT volumes represent an annual growth rate of one-quarter (0.25) percent along East Main Avenue. Compared to other streets in Bismarck, East Main Avenue is not as high for example, State Street in Bismarck projects three (3.0) percent annual traffic growth to 2045. This is in part because of the

Table 4. Existing and Forecast ADT and V/C Ratio

	Main Avenue Segment	Daily Capacity Ranges (ADT)	Approaching Capacity (ADT) v/c > 0.85	Existing ADT (2022)	Existing v/c Ratio	Forecast ADT (2045 No Build)	Forecast v/c Ratio
1	**7th Street to 9th Street**	28,000 - 32,000[1]	23,800 - 27,200	15,300	0.55 – 0.48	16,200	0.58 – 0.51
	9th Street to 12th Street	28,000 - 32,000[1]	23,800 - 27,200	16,400	0.59 – 0.51	17,400	0.62 – 0.54
2	**12th Street to 17th Street**	28,000 - 32,000[1]	23,800 - 27,200	15,900	0.57 - 0.50	16,800	0.60 – 0.53
	17th Street to Airport Road	28,000 - 32,000[1]	23,800 - 27,200	15,300	0.55 - 0.48	16,200	0.58 – 0.51
3	**Airport Road to 24th Street**	28,000 - 32,000[1]	23,800 - 27,200	15,100	0.54 - 0.47	16,000	0.57 – 0.50
	24th Street to 26th Street	28,000 - 32,000[1]	23,800 - 27,200	15,300	0.55 - 0.48	16,200	0.58 – 0.51

[1] *Highway Capacity Manual:* Capacity for Five-Lane Urban (Four-Lane Divided with Turn Lanes)

Study area's surrounding land use and anticipated redevelopment potential (i.e., the addition of employment and jobs). East Main Avenue's existing cross section has excess capacity in fact, traffic forecasts of the existing five-lane through 2045 calculate the highest v/c ratio to be 0.62, about 0.23 points less than what would be considered approaching capacity (v/c > 0.85 is considered approaching capacity, > 1.0 is over capacity) .

Intersection Capacity

Existing and forecast intersection capacity analyses were conducted by the project team using VISSIM, a traffic flow simulation software that digitally reproduces traffic patterns. The analysis focused on the a.m. and p.m. peak hours at the study intersections.

Capacity analysis results shown in Table 5, identify Level of Service (LOS) which indicates the quality of traffic flow through an intersection. See for more background on LOS. According to the *NDDOT Traffic Operations Manual* (January 2023), NDDOT's goal is to meet or exceed an overall LOS D.

There are existing queuing concerns at westbound 9th Street during both the A.M and P.M peak hours, and at northbound 26th Street during the P.M peak hour, with maximum queue length greater than 300-feet. The Big Boy drive-through queue also backs up between 24th Street and 26th Street, often into the East Main Avenue southern-most driving lane. The Big Boy queues typically occur at lunch time/noon-hour and do not impact peak hour traffic operations.

An intersection capacity analysis was also completed for the year 2045 conditions. As shown in Table 5, all key intersections, with existing traffic controls and geometric layouts, operate at an acceptable overall LOS C or better during the a.m. and p.m. peak hours.

Table 5. Existing Peak Hour Intersection Capacity Analysis vs 2045 Peak Hour Capacity Analysis

East Main Avenue Intersection	Existing Peak Capacity		2045 Peak Capacity	
	A.M. Peak Hour	P.M. Peak Hour	A.M. Peak Hour	P.M. Peak Hour
7th Street	B	B	B	B
9th Street	B	B	B	**C**
12th Street	B	B	B	B
Airport Road	B	B	B	B
26th Street	B	C	B	C

Bold font indicates worse 2045 LOS than Existing LOS

Table 6. LOS Criteria for Signalized and Unsignalized Intersections

LOS Designation	LOS Description[1]	Signalized Intersection Average Delay/Vehicle (seconds)	Unsignalized Intersection Average Delay/Vehicle (seconds)
A	Free Flow	≤ 10	≤ 10
B	Stable Flow (slight delays)	> 10 - 20	> 10 - 15
C	Stable Flow (acceptable delays)	> 20 - 35	> 15 - 25
D	Approaching Unstable Flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)	> 35 - 55	> 25 - 35
E[2]	Unstable Flow (intolerable delay)	> 55 - 80	> 35 - 50
F[2]	Forced Flow (congested and queues fail to clear)	> 80	> 50

[1]Source: Highway Capacity Manual 2010
[2]Unacceptable LOS based on *NDDOT Traffic Operations Manual* (January 2023)

Corridor Safety

Crash History

There are locations within the Study area with known historic safety concerns. For example, NDDOT has identified the intersections of East Main Avenue with 7th Street and 9th Street as 'Urban High Crash Locations' (2018-2020). In addition, the Bismarck-Mandan MPO's current Metropolitan Transportation Plan also identifies those intersections as high crash locations (2013-2017), ranking within the top 5 highest for every safety data category.

For this Study, the project team analyzed crash data from March, 2017 through February, 2022 courtesy of the NDDOT. Within the past five years, there have been 444 recorded crashes on East Main Avenue in the Study area (between 7th Street and 26th Street), 73 percent of which occurred within 150-feet of intersections. 83 percent of incapacitating injury crashes along the corridor occurred at intersections, with the 7th Street intersection contributing 50 percent of all incapacitating injury crashes.

The frequency of crashes within the Study area is shown on Figure 8. There were no fatalities and six (6) serious injury crashes. 74 percent of crashes were property damage only.

As shown in Table 7, approximately 37 percent of crashes in the Study area were rear end crashes, 36 percent were angle crashes, and 15 percent were same direction sideswipes. Eastbound and westbound crashes were similar, 33 percent and 31 percent, respectively, with southbound and northbound each making up 18 percent of crashes.

Figure 8. Crash Heat Map

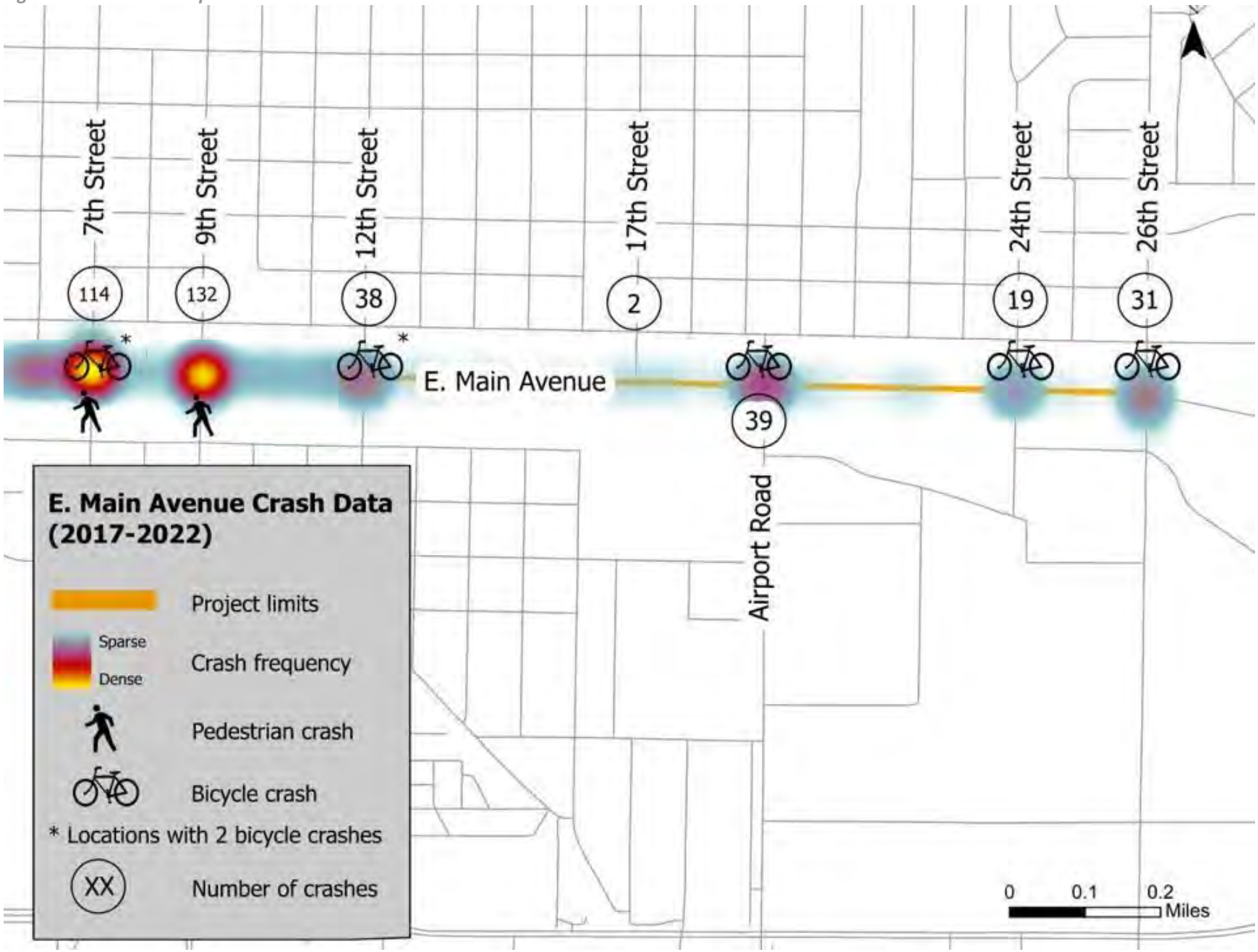


Table 7. Crash Type

Crash Description		Number of	Percentage
Object	Curb	5	1.1%
	Other Fixed	2	0.5%
	Traffic Signal	2	0.5%
	Utility Post	2	0.5%
MV in Transport	Angle (Not	161	36.3%
	Cargo Loss or	1	0.2%
	Head On	14	3.2%
	Non-Coll.	1	0.2%
	Rear End	166	37.4%
	Right Angle	1	0.2%
	Sideswipe	4	0.9%
	Sideswipe	70	15.8%
Other Non-Collision		2	0.5%
Overturn / Rollover		1	0.2%
Bicycle		7	1.6%
Pedestrian		5	1.1%
Total		444	100%

Crash Analysis

The project team evaluated safety along the corridor and at intersections in the Study area by calculating crash and severity rates based upon observed or existing data. The next step took observed data and compared them with rates from other roadways with similar characteristics or expected rates.

In general, the expected rates represent average rates for streets and intersections with similar characteristics. Minnesota Department of Transportation's crash analysis tool kit was used to provide a reference point for evaluation purposes by segment and different intersection types. Corridor intersections were compared with intersections with similar volumes, speeds, and traffic control. Corridor segments were compared with segments with a similar cross section (5-lane, undivided), in an urban area, and volumes.

Observed rates above expected crash rates do not indicate a crash issue; however, a crash or severity rate above the critical rate indicates an issue area that should be investigated further. The critical crash rate is calculated by adjusting the system-wide average, or expected crash rate, based on the amount of exposure (volume of traffic) and a statistical constant indicating level of confidence. Observed rates above the critical crash rate indicate a statistically significant crash issue that may require engineering intervention.

Based on this approach, the Study corridor has observed crash rates at several segments and intersections which are higher than the critical crash rate, indicating there is a safety issue located along the corridor. The East Main Avenue intersections with observed crash rates lower than critical rates are at 17th Street and 26th Street. As for segments (between intersections), every segment of the corridor has an observed crash rate higher than the critical rate.

Social, Environmental, and Economic Considerations

The project team considers the social, environmental, and economic context of East Main Avenue a vital component of a successful corridor Study. The urban context including but not limited to land use, historical and emerging populations,

and economic context play key roles in shaping the future of East Main Avenue.

Existing Land Use

There are a variety of land uses along the corridor, adjacent to the Study Area. Most existing land use is commercial or industrial, however there are other scattered uses fronting the corridor, generating trips from users with varying degrees of need from the transportation system.

Future Land Use

Together 2045, Bismarck's Comprehensive Plan outlines future land uses adjacent to East Main Avenue in the Study area:

Downtown (DT)
Between 7th Street and 9th Street. This future land use is characterized as the heart of the community and historic center of Bismarck.
Industrial Mixed Use (IMU)
Between 9th Street and Airport Road. This future land use is characterized as a vibrant mixed use district with an emphasis on arts and entertainment.
Community Mixed Use (CMU)
Between Airport Road and 26th Street. This future land use is characterized as a place of commerce, employment, and residence for the community.
Industrial Flex (IF)
East of 26th Street, north of East Main Avenue. This future land use is characterized as an employment center for a range of businesses.
Institutional (INS)
East of 26th Street, south of East Main Avenue. This future land use is characterized as a place of cultural, political, or administrative significance to the general public

Resources and Hazards

The project team conducted a table-top analysis of existing resources and potential hazards adjacent to or near East Main Avenue. The scan identified the following:

- There are no natural resources.
- There are no State or Federal threatened or endangered species.
- There are no properties listed on the National Register of Historic Places; further investigation may be required to identify properties of concern related to Section 106 of the National Historic Preservation Act.
- There are no Section 4(f) properties; further investigation may be required to understand if the State of North Dakota property on the southeast corner of the intersection of East Main Avenue and 26th Street is utilized as a public park, recreation area, or has any historical significance.
- There are no Section 6(f) properties.

Potentially Contaminated Sites

There exists a possibility of contaminated sites within the Study area based upon existing land uses. With proximity to Downtown Bismarck, there is also potential for undocumented fill on properties adjacent to East Main Avenue. Another potential occurrence in the Study Area is

underground storage tanks (fuel) due to the historic industrial and commercial nature of the corridor. No specific sites have been identified through this Study; however, at least a Phase I Environmental Site Assessment is recommended prior to any reconstruction activities to understand the specific location of documented and potentially contaminated sites.

Environmental Justice (EJ) Populations

Data from the American Community Survey (ACS), published by the U.S. Census Bureau in 2020 identified areas of low-income, minority, senior (65+), youth (<15), and disabled populations. Any future environmental review process is required to identify potential adverse and disproportionate impacts to vulnerable populations as required by NEPA.

Figure 9. Non-White Population

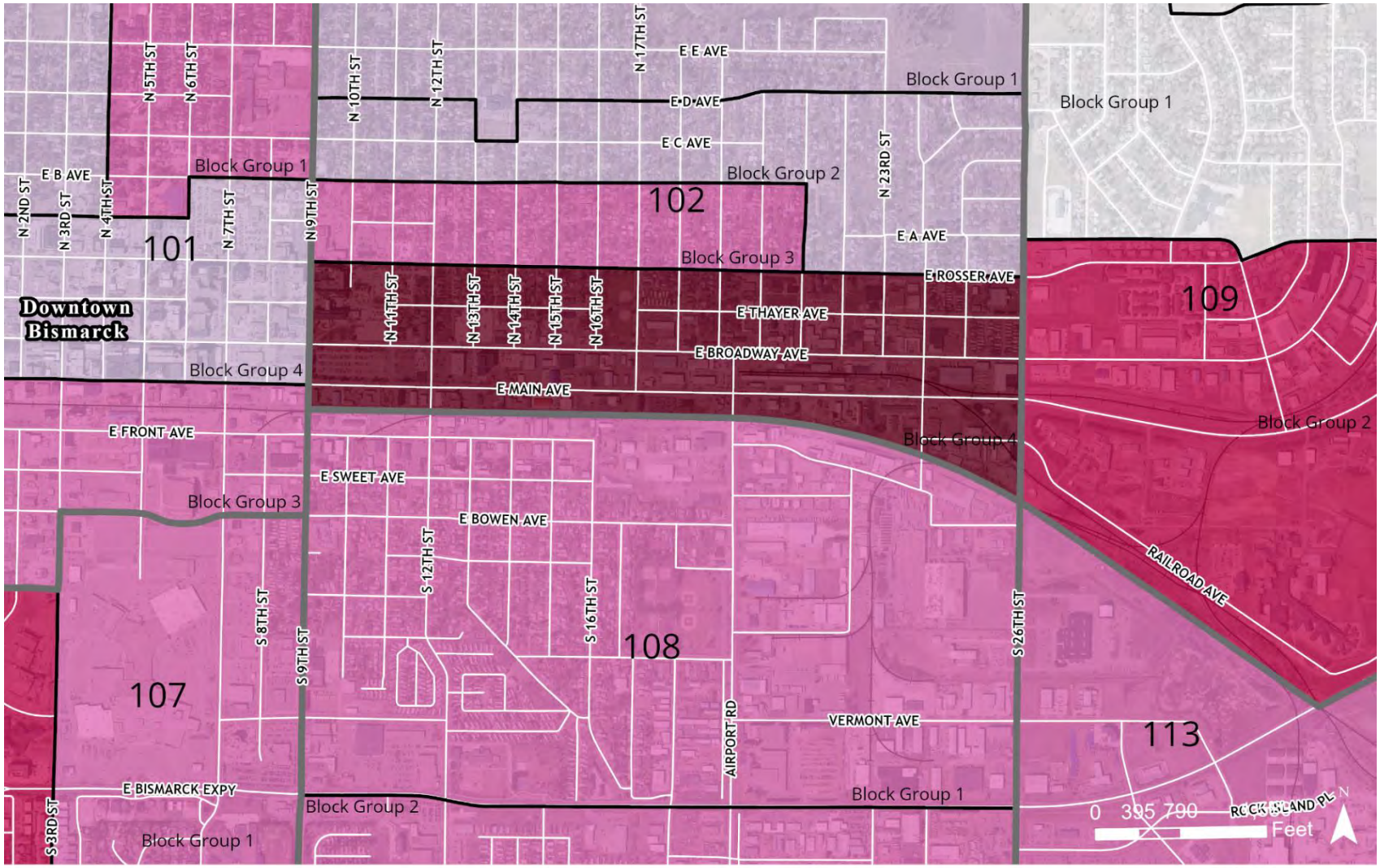


Figure 15 | Non-White Population

Legend

- Census Tract
- Block Group
- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%

EAST MAIN AVENUE CORRIDOR STUDY

Table 8. Environmental Justice Factors by Block Group

EJ Factor	ND	Burleigh	Bismarck	Tract 101				Tract 102				Tract 107		
				BG 1	BG 2	BG 3	BG 4	BG 1	BG 2	BG 3	BG 4	BG 1	BG 2	BG 3
Pop.	779,094	95,509	73,622	799	1,012	541	698	1,792	1,414	774	671	1,174	1,102	1,723
0-Vehicle HHs	5.1%	5.2%	6.1%	1.8%	**14.2%**	**41.6%**	**25.9%**	9.3%	0.0%	6.5%	3.6%	0.0%	6.4%	1.3%
% Below Poverty	10.7%	8.1%	13.5%	13.5%	12.7%	**31.5%**	**30.3%**	4.9%	7.5%	8.5%	**22.0%**	**27.4%**	14.7%	1.4%
% age 65+	15.3%	16.2%	17.3%	5.5%	18.7%	19.0%	14.7%	**37.0%**	8.4%	10.5%	15.6%	12.9%	11.4%	15.0%
% age <15				18.4%	13.0%	21.3%	0.0%	6.4%	24.1%	0.4%	5.3%	21.0%	8.0%	22.0%
% Disabled	11.0%	10.2%	11.9%	2.2%	12.8%	20.0%	0.0%	6.8%	17.6%	3.8%	**24.6%**	12.4%	11.8%	10.0%
% Non-White	18.0%	14.0%	16.2%	20.5%	19.1%	**24.4%**	16.2%	13.6%	16.5%	20.3%	**41.0%**	22.9%	**35.8%**	8.7%

Areas of Persistent Poverty & Historically Disadvantaged Communities

Based upon the U.S. Department of Transportation's latest compilation of data and indices, no Census Tracts within the Study area are designated as an Area of Persistent Poverty (APP) or Historically Disadvantaged Community (HDC). Environmental justice (EJ) factors may point to an emerging vulnerable population along and near the corridor, and future environmental review should include consult with the latest data available.

EJ Factor	Tract 108		Tract 109			Tract 113
	BG 1	BG 2	BG 1	BG 2	BG 3	BG 3
Pop.	1,813	1,743	1,833	1,316	1,877	1,987
0-Vehicle HHs	10.1%	7.4%	1.6%	**18.0%**	1.8%	5.2%
% Below Poverty	8.2%	4.9%	15.5%	**42.4%**	1.2%	9.4%
% age 65+	17.2%	14.3%	24.5%	7.9%	16.9%	4.8%
% age <15	16.6%	18.0%	17.1%	6.3%	23.1%	39.9%
% Disabled	16.6%	7.3%	7.5%	**22.6%**	5.3%	2.1%
% Non-White	22.1%	**25.3%**	8.6%	**35.4%**	7.6%	22.7%

***Bold indicates rates 10 percentage points higher than the county or city average; or the rate is greater than 50%. Thresholds are from NDDOT's EJ Analysis Guidance.**

Corridor Alternatives

Corridor alternatives were developed in response to the issues and needs of East Main Avenue in the Study area. The project team diligently reviewed public feedback regarding issues and opportunities to ultimately shape the alternatives shown in this report. A critical outcome of conducting the technical analysis and engaging the public is identifying the Study's purpose and need.

Purpose and Need Statement

The purpose of the Study is to achieve the following goals for East Main Avenue, from 7th Street to 26th Street, by year 2045:

- Improve deteriorating corridor pavement.
- Ensure all modes of transportation are safely and comfortably accommodated.
- Support economic development opportunities.
- Minimize impacts to adjacent corridors.
- Provide a gateway to Bismarck & Downtown Bismarck

The need for the Study is underscored by the following issues:

- Pavement deterioration.
- Snow control/maintenance.
- Safety, including crash history, access management, pedestrians, bicyclists, and transit access.
- Pedestrian and bicyclist gaps and comfort.
- Access to transit service.
- Environmental justice population access and mobility.
- Freight access and mobility.
- Redevelopment accommodation and economic development pressure.
- Corridor image and aesthetic.

Corridor Alternatives

Using the purpose and need as a guide, alternative development uses a comprehensive range of inputs, including technical data, public feedback, design parameters, and direction from the Study Review Committee (SRC).

The SRC and project team identified three build alternatives and one no-build alternative for East Main Avenue between 7th Street and 26th Street. All three build alternatives involve full replacement of corridor pavement (roadway and sidewalk), which extends the lifetime of corridor pavement by approximately 30 years. The concrete pavement repair (CPR) alternative identified below is a minimum improvement related to the no-build alternative to ensure the corridor continues to function if not fully reconstructed, and would extend corridor pavement life 5-10 years. Refer to figures 10-22 for depictions of the alternative cross sections and layout. The following alternatives are intended to provide contrasting approaches following the Study's purpose and need.

Five-Lane

This cross section maintains five lanes, including two through lanes in each direction, and a center/left turn lane. A key difference with the existing cross section is that the sidewalk will be separated from the curb by a two-foot buffer to be used for snow storage and light poles. Optional elements of this alternative include the location of pedestrian crossings. Two alternative crossing locations are identified between 9th Street and 12th Street where pedestrian crossing demand has been noted by corridor stakeholders. For example, medical staff frequent the Bitty Bean and Simonson establishments from CHI St. Alexius and other medical facilities to the north. Also, any future development within the current CHI St. Alexius parking lot north of East Main Avenue and between 9th Street and 12th Street is likely to generate additional pedestrian traffic. Specific crossing design would be provided in the design phase of project development, but a pedestrian signal and a raised median refuge are likely to be needed.

Another important pedestrian crossing location will be at 24th Street. Area stakeholders noted the importance of this intersection for pedestrian movements, especially for clients of social service organizations. As noted for the alternative crossings between 9th Street and 12th Street, a pedestrian signal and a raised median refuge are likely to be needed.

Three-Lane

This cross section provides three lanes, including one through lane in each direction, and a center/left turn lane. The lane reduction provides additional room for pedestrian and buffer/boulevard space, allowing for a 10-15 foot wide area. This means additional space for snow storage and amenities, such as landscaping or street furniture.

Additional alternative elements that can enhance pedestrian comfort and safety include intersection and mid-block pedestrian crossing bulbouts (raised curb extensions that narrow the travel lane at intersections or midblock locations).

The cross section also provides room available for on-street parking. The current demand for on-street parking is low, especially east of 12th Street where off-street parking and loading space is more generous. On-street parking could be phased in as redevelopment takes place, especially near Downtown where redevelopment opportunities have been noted by many area stakeholders.

Three-Lane with Median

This cross section is similar to the three-lane alternative but adds a raised median. The key difference is that the raised median would extend, for the most part, through each corridor segment between intersections. The effect is to severely limit left-turns and potential traffic conflict points. The greatest benefit of the media is the potential to improve vehicular safety throughout the corridor.

No-Build

The No-Build alternative means that no improvements would be made to the corridor, except for minimal maintenance activity, such as pavement patching or sidewalk joint grinding to remove trip hazards. This means that noted corridor deficiencies would continue to worsen into the future.

Concrete Pavement Repair (CPR)

As noted earlier, this alternative is similar to the No-Build, but involves the replacement of deficient concrete panels to extend corridor pavement life 5-10 years. No other changes to the existing cross section are involved.

Figure 10: 5-Lane Alternative Cross Section

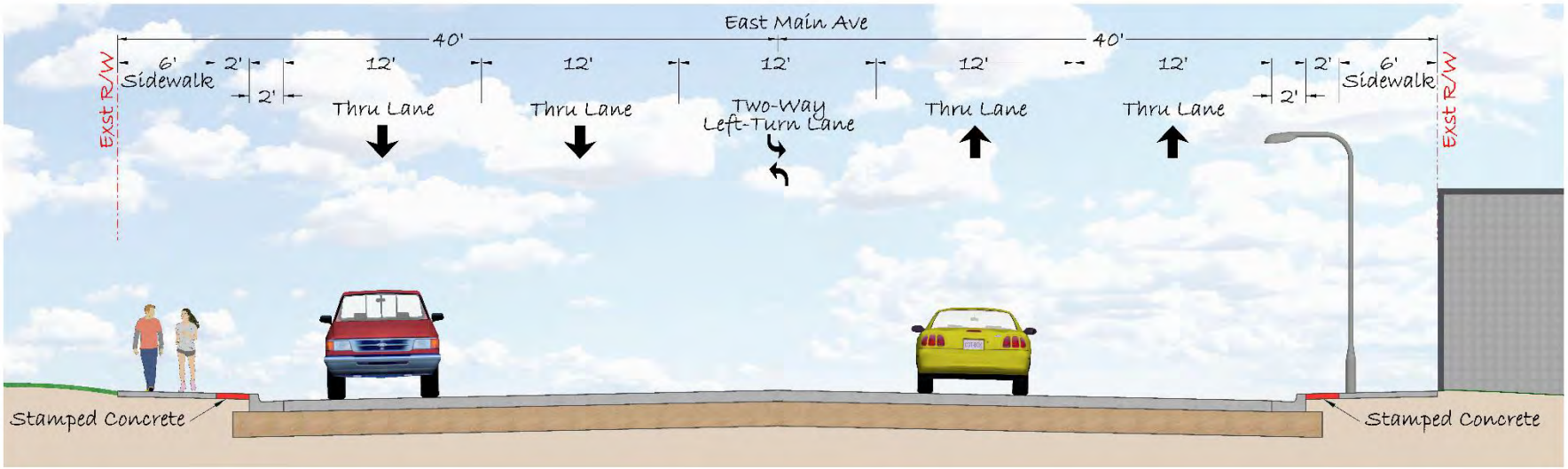


Figure 11: 3-Lane Alternative Cross Section

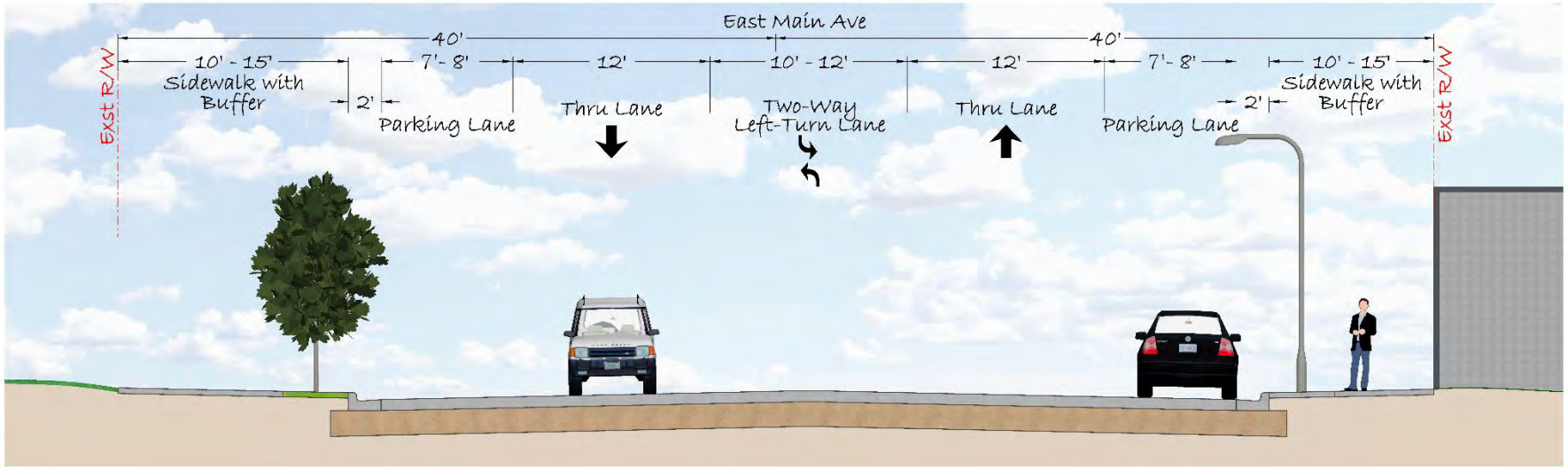


Figure 12: 3-Lane with Median Alternative Cross Section

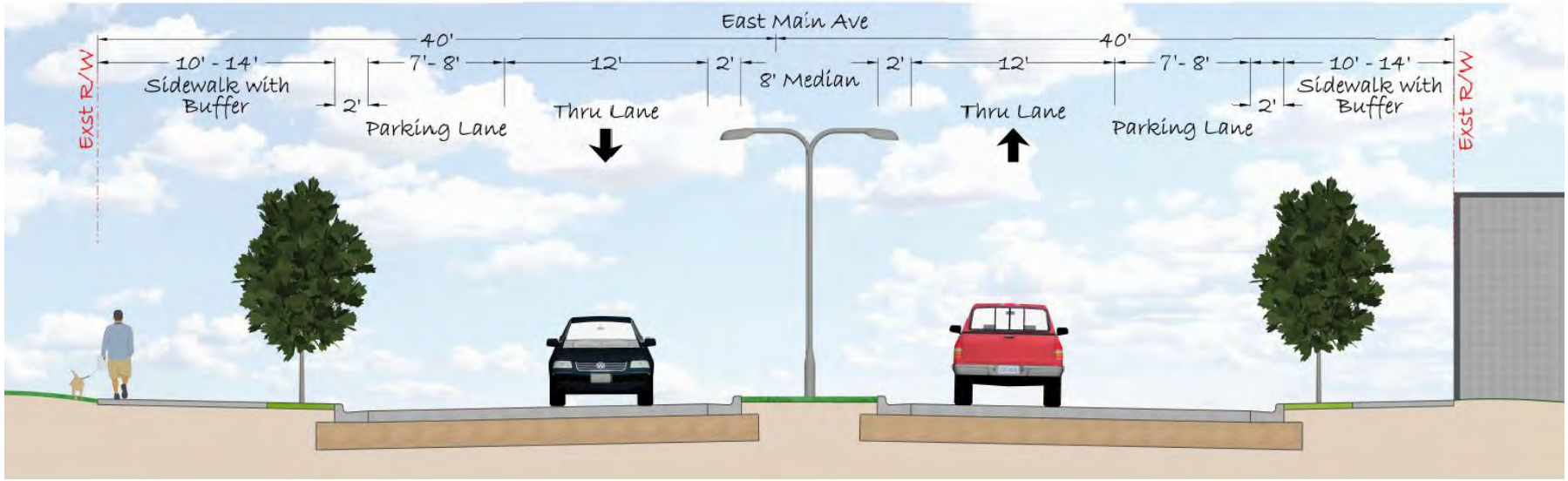


Figure 13. Segment 1, 7th Street to 12th Street: 5 Lane Alternative

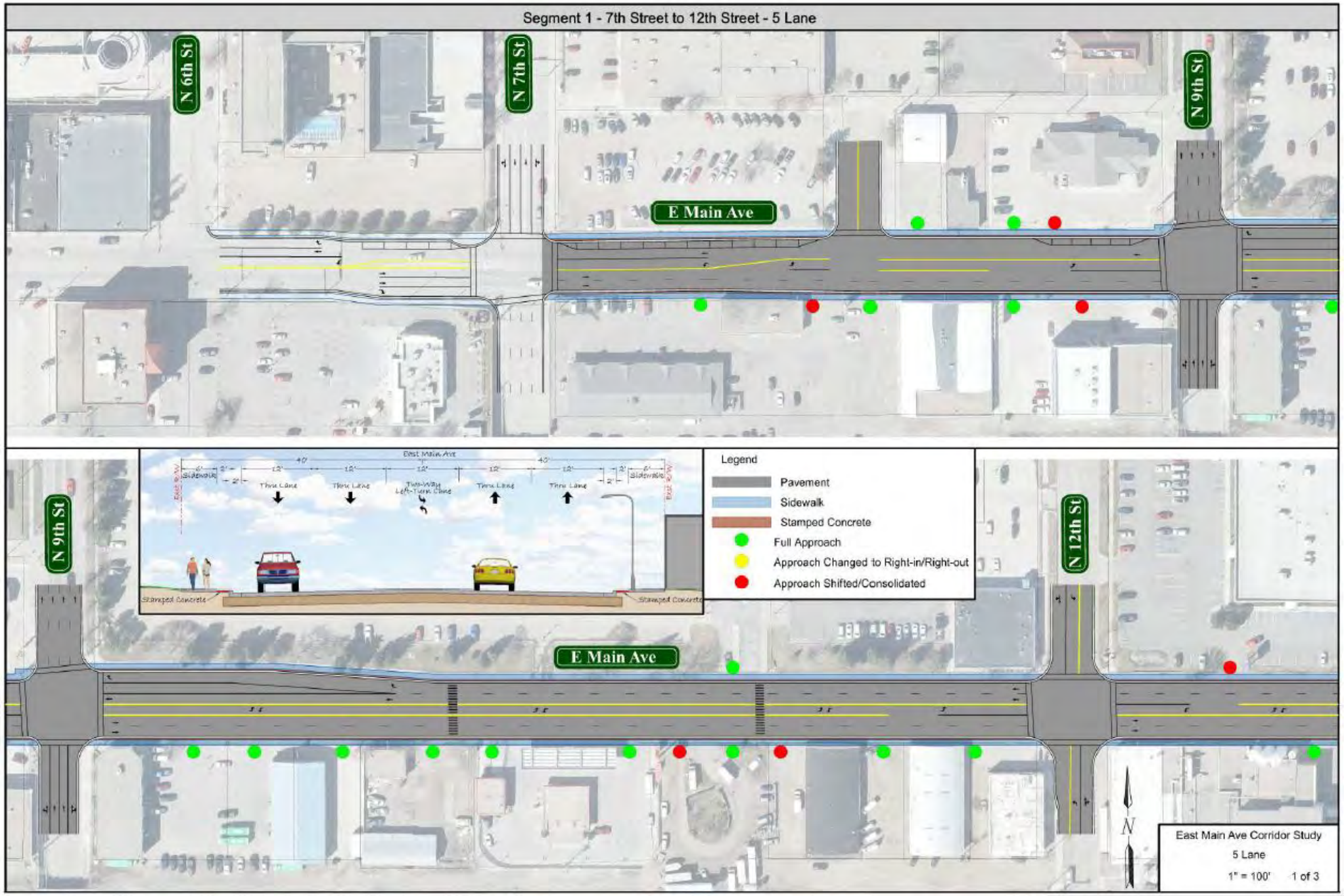


Figure 14. Segment 2, 12th Street to Airport Road: 5 Lane Alternative

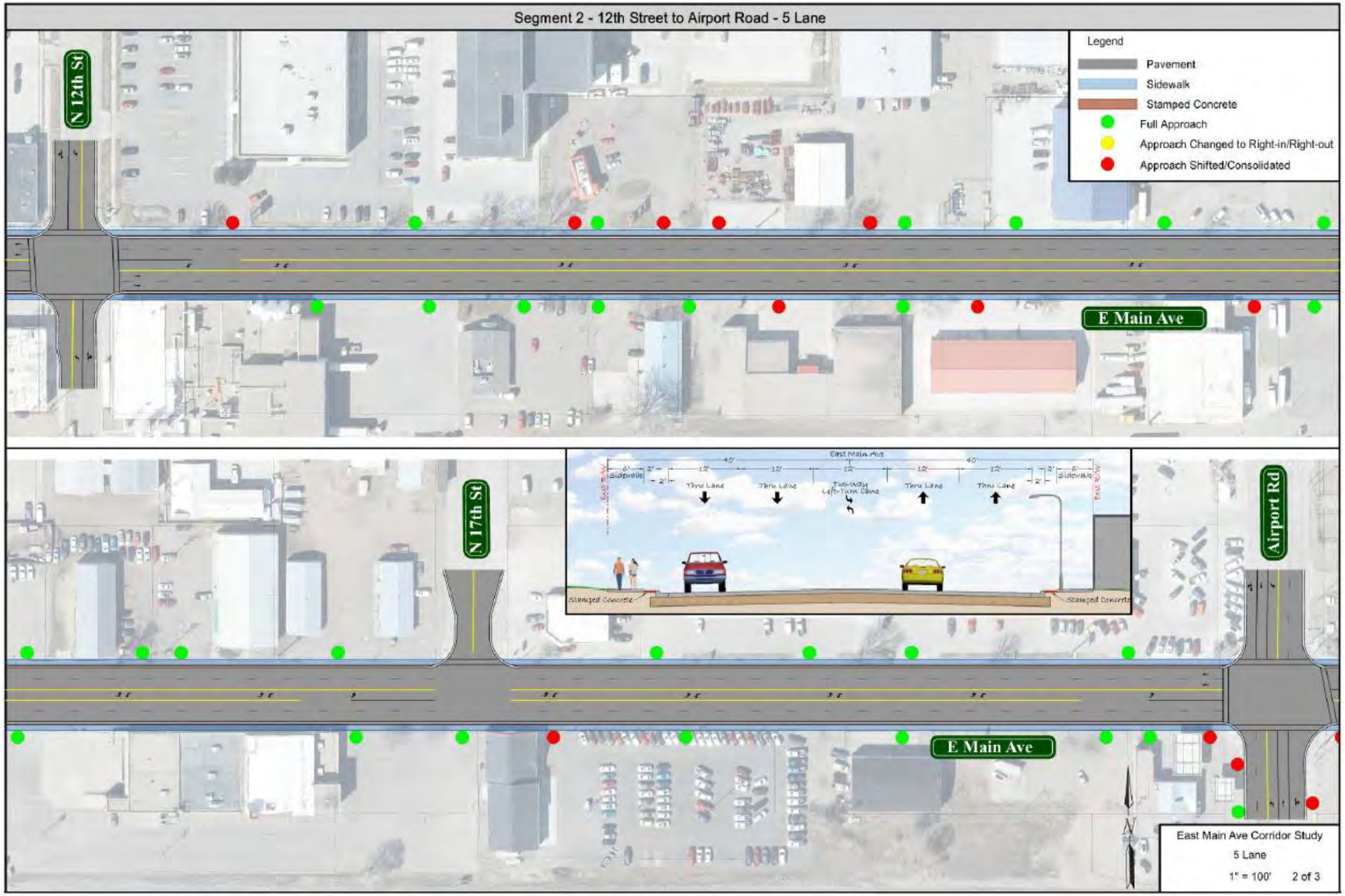


Figure 15. Segment 3, Airport Road to 26th Street: 5 Lane Alternative

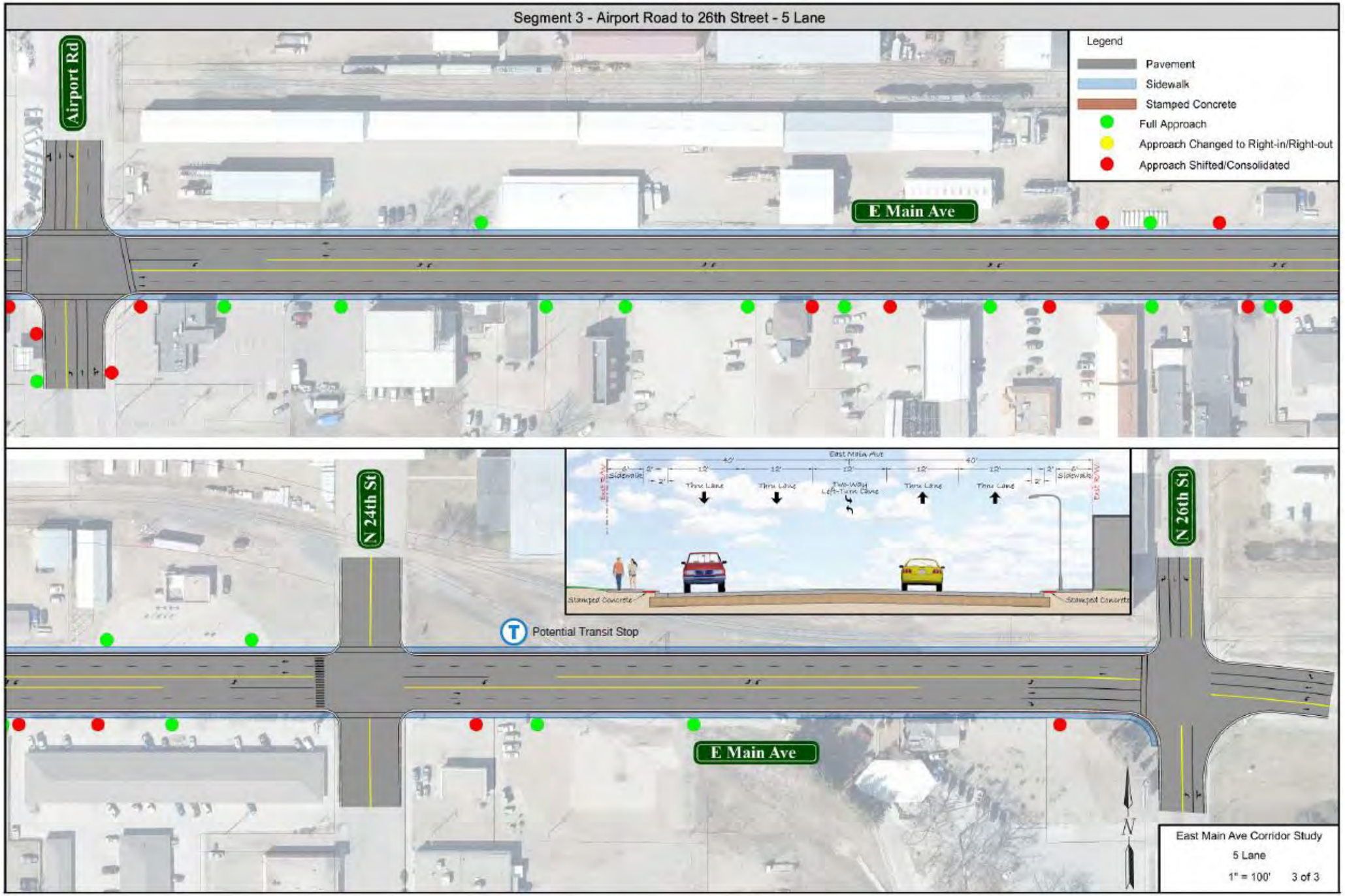


Figure 16: Segment 1, 7th Street to 12th Street: 3 Lane Alternative

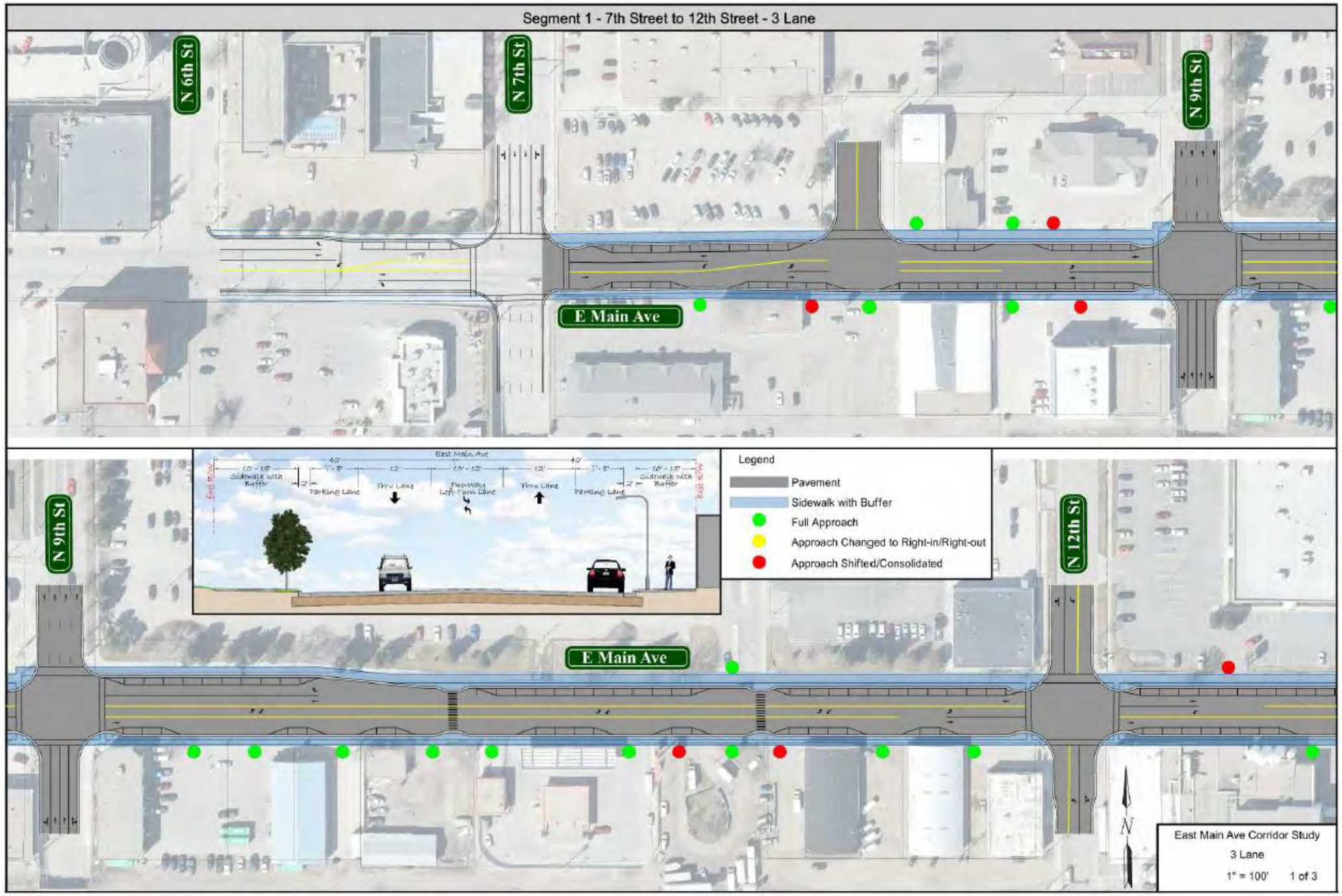


Figure 17: Segment 2, 12th Street to Airport Road: 3 Lane Alternative

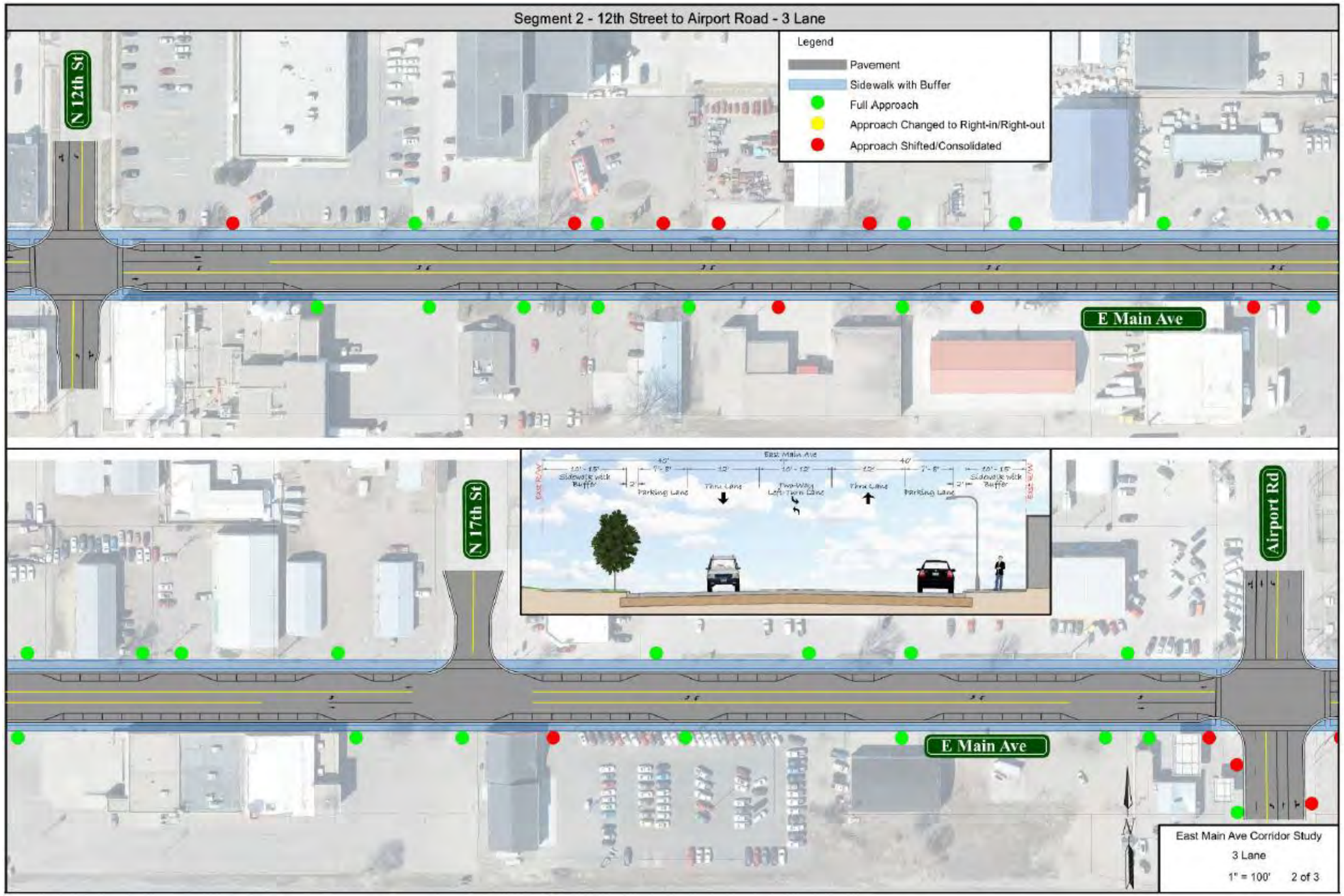


Figure 18: Segment 3, Airport Road to 26th Street: 3 Lane Alternative

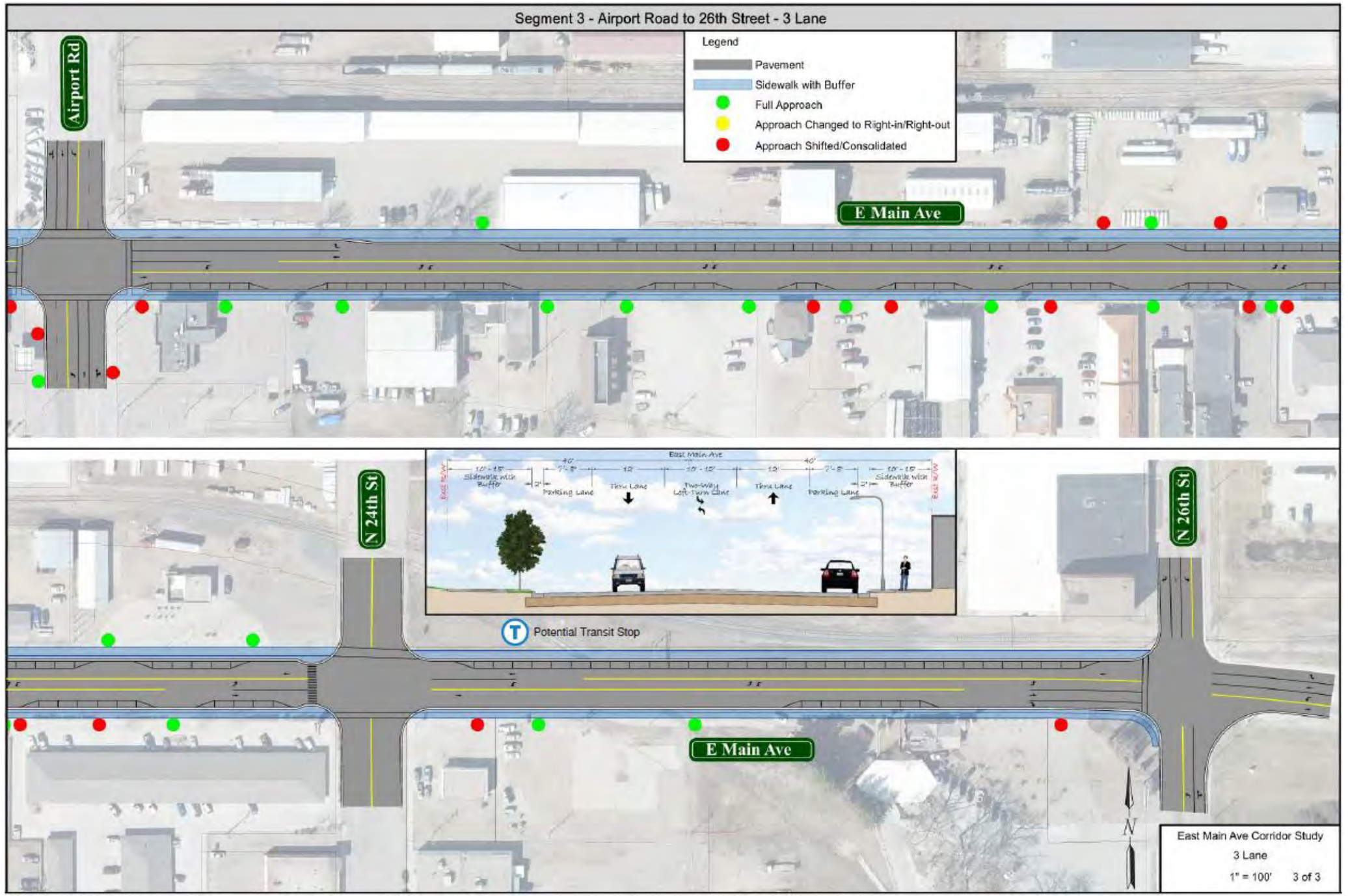


Figure 19: Segment 1, 7th Street to 12th Street: 3 Lane with Median Alternative

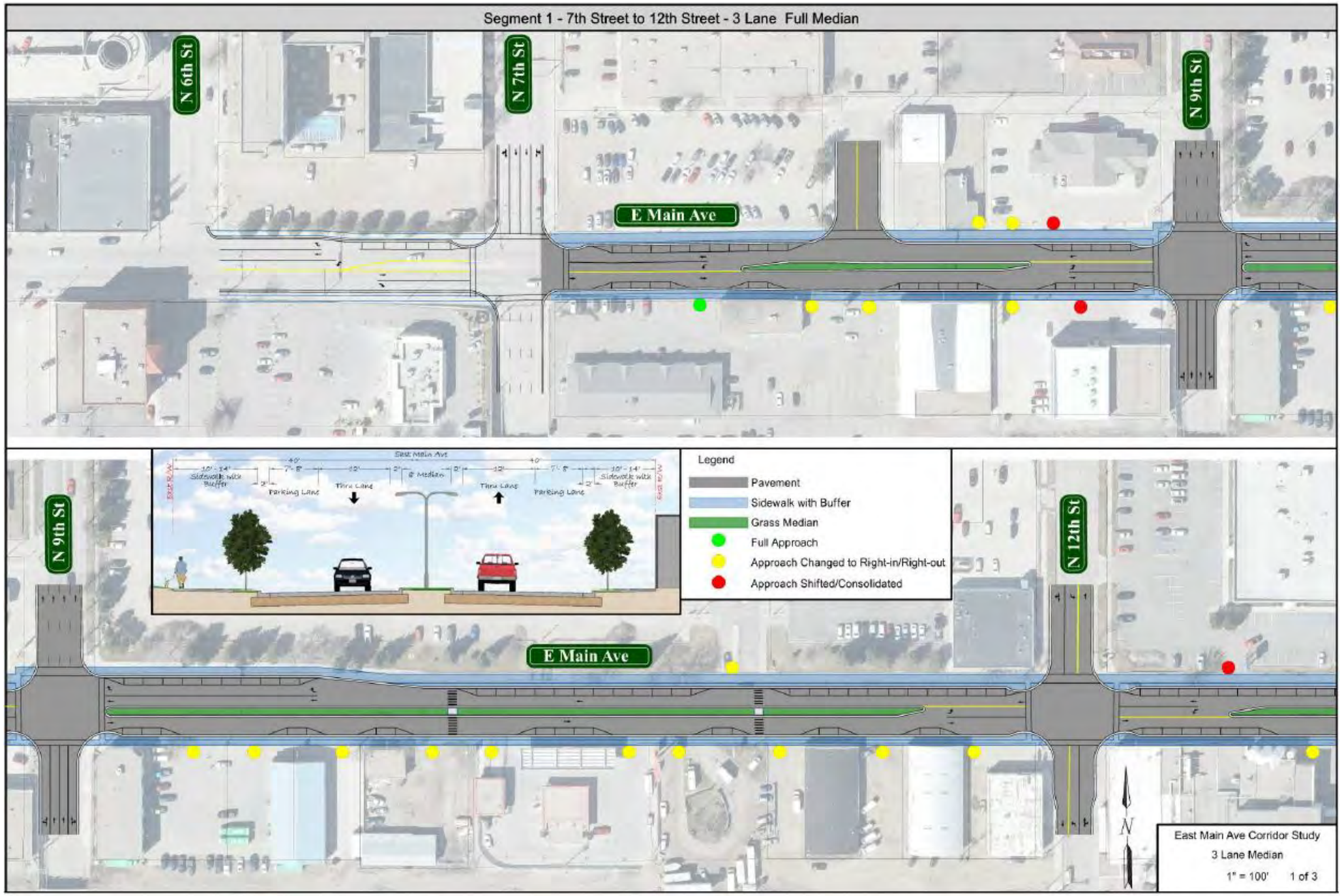


Figure 20. Segment 2, 12th Street to Airport Road: 3 Lane with Median Alternative

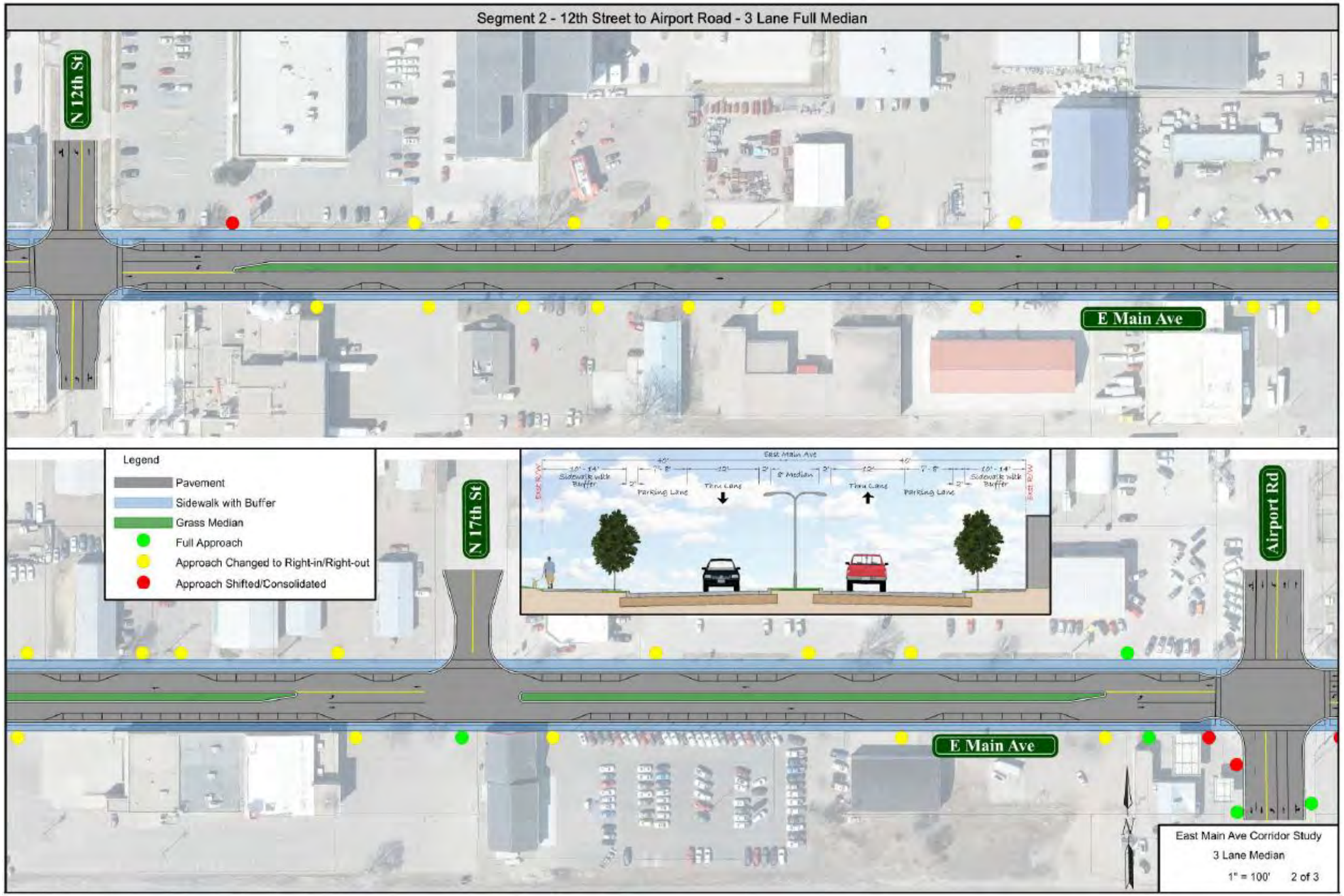
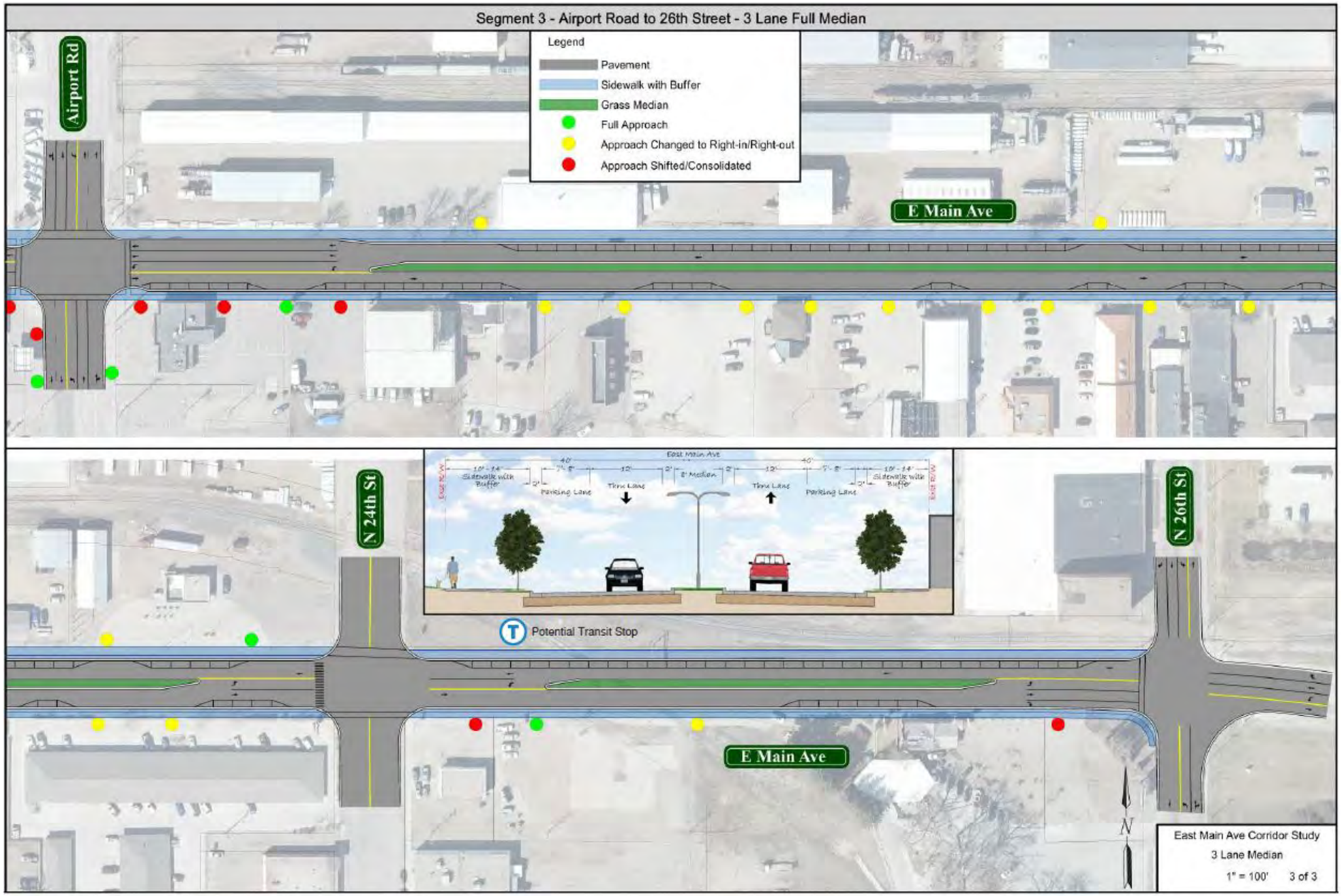


Figure 21: Segment 3, Airport Road to 26th Street: 3 Lane with Median Alternative



Evaluation Criteria

Build alternatives are analyzed against evaluation criteria as summarized below. The no-build alternative is not included in the evaluation criteria.

Vehicular Mobility

The project team reviewed future traffic volumes under each East Main Avenue alternative. Using the BMMPO's Travel Demand Model (TDM), it is estimated that the corridor in the Study area would see diversion of traffic to other parallel corridors if East Main Avenue were reduced to three lanes. The daily diversion from East Main Avenue to other parallel routes, as estimated by the TDM, ranges from approximately 900 to 1,700 vehicles per day (vpd). The TDM estimates diversion due to anticipated minor impacts to travel time and Level of Service, causing some drivers to pursue alternative parallel routes. The parallel routes and estimated traffic diversion include:

- **Broadway Avenue:** + 200 to +400 vpd.
- **Front Avenue:** + 300 vpd.
- **Bismarck Expressway:** +200 to +300 vpd.
- **Other Routes:** Diversion to other routes is expected to be between 500 and 800 vpd. Other routes are not specifically identified and are assumed to be dispersed system-wide.

Based upon current traffic operations and capacity on parallel routes, the traffic diversion associated with the three-lane alternative is expected to have little to no impact on the congestion level or how parallel routes operate on a daily basis.

Vehicular Mobility Evaluation
Five-Lane Alternative
• All intersections operate at a LOS C or better in both the AM and PM peak hour. • Average corridor travel times slightly higher than existing in PM peak hour.
Three-Lane Alternative
• Traffic diversion to parallel routes of approximately 900 to 1,700 vpd. • All intersections operate at a LOS C or better in both the AM and PM peak hour. • Average corridor travel times approximately 15% longer than Five-Lane Alternative.
Three-Lane with Median Alternative
• Diversion to parallel routes of approximately 900 to 1,700 vpd. • All intersections operate at a LOS C or better in both the AM and PM peak hour. • Average corridor travel times approximately 12% longer than Five-Lane Alternative.

A 2045 intersection capacity analysis was also conducted for each alternative. Level of service (LOS) is given for each alternative. The five-lane alternative is estimated to operate at an acceptable LOS C or better during the a.m. and p.m. peak hours with existing traffic controls. Results of the capacity analysis are shown below in Table 9.

Table 10: Alternatives 2045 Operations (Level of Service)

Study Intersection	A.M Peak Hour			P.M Peak Hour		
	5-Lane	3-Lane	3-Lane w/ Median	5-Lane	3-Lane	3-Lane w/ Median
7th Street	B	B	B	B	B	C
9th Street	B	B	B	C	C	C
12th Street	B	B	B	B	B	A
Airport Road	B	C	C	B	C	C
26th Street	B	B	B	B	C	C

Property Access

With 86 private access approaches and seven (7) intersecting streets, a best practices approach is recommended to address access management. Each alternative considered along East Main Avenue recommends shifts, consolidations, and/or right-in/right-out restrictions of private access points along the corridor. These recommendations involve some properties along East Main Avenue. A summary of access recommendations along the East Main Avenue corridor can be found in the Alternative Evaluation Report as found in the Alternatives Analysis Memorandum (Appendix B). Access management recommendations will improve safety along the corridor in the Study area.

Access to the Big Boy drive thru on the south side of East Main Avenue between 24th Street and 26th Street is unique as it enjoys a dedicated lane within the road right of way. Queuing has been noted by stakeholders to, on occasion, impact the 24th Street intersection and beyond (note that study data collection did not document such extensive queues). As a matter of best/better practice, reconfiguration of the Big Boy stacking lane is recommended, where additional queuing can be accommodated outside of the corridor right of way.

Safety

Each alternative considered along East Main Avenue includes recommendations that will result in a reduction of total private access points along the corridor. Access reduction is a proven safety countermeasure, especially for rear-end crashes, the most prevalent crash type along East Main Avenue (see Existing Conditions section). For this reason, many access shifts and consolidations are recommended for both the five-lane and three-lane alternatives. **This critical project element will ultimately require dialogue and agreement with each affected property owner**. This Study only involved cursory-level discussions with some corridor property and business owners about access management.

Another common crash type along the corridor includes angle crashes. Angle crashes will be reduced through signal timing improvements, and in the three-lane alternatives, less lanes to turn across.

Additional alternative improvements such as on-street parking, curb extensions, lane reduction (number and/or width), and raised median are known vertical deflection traffic calming measures[1]. Traffic calming measures are safety countermeasures proven to reduce vehicle speeds, typically installed to support the livability and vitality of residential and commercial areas such as East Main Avenue. New and/or expanded sidewalks and the potential to reduce speeding will also improve pedestrian safety and reduce crash severity in the Study area.

Freight

There are several *wholly freight dependent* properties along East Main Avenue including Prairie Farms, Bismarck Lumber Company, and Ferrellgas. Many other properties along the corridor also rely on freight for their operations, including deliveries. Freight mobility is supported through the Study area and by intersecting roadways identified as truck routes including 7th Street, 9th Street, 12th Street between East Main Avenue and Front Avenue, Airport Road south of East Main Avenue, and 26th Street south of East Main Avenue.

No alternatives would change East Main Avenue's level 2 freight route designation. The three-lane alternative is not expected to impact truck maneuverability; however, the three-lane with a median alternative would have a much greater impact to truck maneuverability.

Safety Evaluation

Five-Lane Alternative

- 32 access approach shifts/consolidations along the corridor reduces conflict points and rear-end crashes.
- 6' sidewalk and 2' stamped concrete buffer on both sides of the street enhances pedestrian safety.
- Curb extensions decrease pedestrian crossing distance, enhance visibility, and provide traffic calming to reduce speeding.
- Signal timing improvements reduce angle crashes.

[1] https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer

Three-Lane Alternative

- 32 access approach shifts/consolidations along the corridor reduces conflict points and rear-end crashes.
- 10’ – 15’ sidewalk buffer on both sides of the street enhances pedestrian safety.
- Curb extensions decrease pedestrian crossing distance, enhance visibility, and provide traffic calming to reduce speeding.
- On-street parking buffers pedestrians from traffic and when utilized, provides traffic calming to reduce speeding.
- Lane reduction decreases pedestrian crossing distance, enhances visibility, and provides traffic calming to reduce speeding.
- Reduces left-turn crossing distance to reduce angle crashes.
- Less queuing reduces crashes.
- Signal timing improvements reduce angle crashes.

Three-Lane with Median Alternative

- 12 access approach shifts/consolidations and 58 right-in/right-out location recommendations along the corridor reduce conflict points and rear-end crashes.
- 10’ – 14’ sidewalk with buffer on both sides of the street enhances pedestrian safety.
- Curb extensions decrease pedestrian crossing distance, enhance visibility, and provide traffic calming to reduce speeding.
- On-street parking buffers pedestrians from traffic and when utilized, provides traffic calming to reduce speeding.
- Lane reduction decreases pedestrian crossing distance, enhances visibility, and provides traffic calming to reduce speeding.
- Median reduces pedestrian crossing distance and enhances visibility in certain locations, and provides traffic calming to reduce speeding.
- Reduces left-turn crossing distance to reduce angle crashes.
- Less queuing reduces crashes.
- Signal timing improvements reduce angle crashes.

Parking

On-street parking was not a critical factor in alternative development, although it does play an indirect role for cross section efficiency, safety, and redevelopment opportunity. Survey input gathered on corridor improvement elements included little interest in on-street parking compared to other elements, such as pedestrian or vehicular mobility. It is important to note that on-street parking can be a critical element of promoting future redevelopment, which is an important consideration for the west side of the corridor.

Parking Evaluation

Five-Lane Alternative

- Limited on-street parallel parking on north side of street between 7th Street and 12th Street.
- No on-street parking between 12th Street and Airport Road.
- No on-street parking between Airport Road and 26th Street.

Three-Lane Alternative

- Abundant on-street parallel parking on both sides of the street throughout the Study area.

Three-Lane with Median Alternative

- Abundant on-street parking on both sides of the street throughout the Study area (slightly fewer spaces than three-lane alternative).

Pedestrian Access & Mobility

For all alternatives, pedestrian improvements exist in the form of new sidewalk on both sides of East Main Avenue, new curb ramps, and ADA accommodation at intersections. Note that all alternatives accommodate a minimum six-foot wide sidewalk, which is the standard required in commercial and industrial areas by the City of Bismarck.

Pedestrian access and mobility are impacted differently for each of the East Main Avenue alternatives and factors associated with the safety evaluation. Each alternative enhances pedestrian access and mobility, with variations in evaluation stemming from pedestrian zone width, the buffer between the sidewalk and the curb, roadway width, reduction in vehicular/pedestrian conflict points, and opportunities for enhanced crossing and visibility.

Environmental Justice

Each alternative provides benefits to identified vulnerable populations in the way of updated infrastructure and associated improvements such as high-quality pavement surface, updated striping, crosswalks, signage, lighting, etc. One of the most critical factors, pedestrian access and mobility, is enhanced by placing a buffer between the curb and the sidewalk, providing crosswalks at critical points along the corridor (such as the 24th Street intersection), and ensuring ADA compliance for curb ramps at intersections.

Bike Access & Mobility

Dedicated bike facilities are not included in any East Main Avenue alternative. However, alternatives for the corridor would likely improve accessibility and mobility for bicyclists. Most of the pedestrian access and mobility evaluation is applicable to bicyclists who bike off-street and on the sidewalk. Bicycling is legally allowed on sidewalks except in Downtown Bismarck or between 7th Street and 12th Street within the Study area, where bicycling on the sidewalk is

illegal per City of Bismarck statute. Wider sidewalks or pedestrian zones may indirectly improve bicycle access and mobility where bicycling on the sidewalk is legal. Wider sidewalks are proposed along East Main Avenue in the three-lane and three-lane with median alternatives, with the five-lane alternative being limited.

Parallel corridors, including Rosser Avenue and Broadway Avenue are likely to provide a more comfortable environment for bicyclists. Rosser Avenue includes a bike lane. A bike lane should also be considered for Broadway Avenue along with any future improvements to that corridor.

Figure 22. Orange Transit Route and Potential Transit Stop

Transit

For all alternatives, space may be available to accommodate a transit shelter near the northeast corner of the intersection of East Main Avenue and 24th Street. This area includes a private property (note that a rail spur is shown in Figure 23, but that spur was removed from within the right of way and to the south in 2022), that may need to be acquired to accommodate the space necessary for a transit shelter. The transit evaluation is closely related to overall multimodal network connectivity and environmental justice evaluations.

Snow Control/Maintenance

All three alternatives consider additional space to accommodate snow storage outside of the sidewalk and are summarized below.

Snow Control/Maintenance Evaluation

Five-Lane Alternative

- Minimal (2' stamped concrete buffer) area along the backside of the curb on each side of the street to accommodate snow storage. This allows 6' sidewalk widths. Note that street trees currently on the outside of the sidewalk will need to be removed.
- Least conflicts with on-street parking—limited on-street parking along corridor (between 7th Street and 9th Street).

Three-Lane Alternative

- Total sidewalk width with buffer area along the backside of the curb ranges from 10'-15' on each side of the street. At a minimum, a 4' wide area for snow storage is allowed that allows for 6' wide sidewalk.
- More conflicts with on-street parking—on-street parking incorporated across corridor.

Three-Lane with Median Alternative

- Similar to the three-lane alternative with capacity for snow storage on the sides of the street however, raised median would decrease the volume of snow needing to be cleared from the roadway.
- Similar to the three-lane alternative for on-street parking conflicts.
- Median presents challenges for plow maneuverability and ease of clearing snow, typically requiring demarcation during winter months.

Corridor Image

East Main Avenue has existing street trees. However, the existing image/aesthetic in the Study area is very industrial/heavy commercial. Existing street trees are located toward the outside edge of the sidewalk. Other streetscaping and aesthetic improvements within the corridor right of way are nonexistent. One exception is a City of Bismarck welcome sign with tree and shrub plantings on the southwest corner of East Main Ave and 26th Street. Each corridor alternative is evaluated below for opportunities to improve the corridor's image, including the capacity to accommodate streetscaping improvements such as street trees, other landscaping, street furniture, and/or decorative lighting.

Corridor Image Evaluation

Five-Lane Alternative

- 2' buffer on the backside of the curb does not allow sufficient room for landscaping improvements (City recommends minimum 4' width for planting area).
- Space likely not sufficient for any street furniture or adjacent retail use of sidewalk space (such as sandwich board signs).
- Adequate room provided for lighting improvements on the backside of the curb.
- Sidewalk and buffer area would not align with Downtown streetscaping standards (applies between 7th Street and 12th Street).

Three-Lane Alternative

- Adequate space for landscaping improvements (meets minimum City width recommendation).
- Potential for some accommodation of street furniture and/or adjacent retail use of sidewalk space.
- Adequate room provided for lighting improvements on the backside of the curb.
- The Downtown Bismarck Subarea Plan specifies 15' recommended sidewalk width from 1st Street to 6th Street. For continuity throughout Downtown, the above recommendation could be accommodated east to 12th Street through lane width reduction.

Three-Lane with Median Alternative

- Similar opportunities as with the three-lane alternative.
- Median presents additional landscaping and lighting opportunity.
- Median landscaping would require irrigation for turf grass establishment and additional maintenance.
- Limited 8' width limits landscaping opportunities (City Forrester recommends 10').

Redevelopment Opportunity

Public infrastructure improvements such as a future East Main Avenue reconstruction project, often generate property investment, including redevelopment. In meetings with impacted businesses and public stakeholders, redevelopment opportunities within the Study area were thoroughly analyzed with respect to the corridor alternatives. The redevelopment analysis, in its entirety, can be found in the Alternative Analysis Memorandum (Appendix B).

Redevelopment potential was only considered for Segment 1 of East Main Avenue (i.e., 7th Street to 12th Street). Redevelopment potential was not analyzed for the remaining segments (12th Street to Airport Road and Airport Road to 26th Street). Segment 1 was provided focus as it was included in the Downtown Bismarck Subarea Plan as a redevelopment opportunity area. Also, interviews with local development stakeholders prioritized interest in the vicinity of Segment 1. However, through engagement with business and property owners along the Study corridor, the project team discussed with a private property/business owner their plans to acquire and redevelop the entire block on the south side of East Main Avenue between 24th Street and 26th Street (excluding the Big Boy property). The redevelopment of the south 2400-2600 block of East Main Avenue is expected to be much different than the downtown redevelopment potential which exists between 7th Street and 12th Street and therefore was excluded from the redevelopment evaluation.

As shown in Figures 20 through 22, redevelopment is possible with each alternative, however, the opportunity for development is assumed to be greater under the three-lane

alternative. The Downtown Bismarck Subarea Plan identified the opportunity for East Main Avenue from 7th Street to 12th Street to be reduced to three lanes, which would help facilitate redevelopment opportunities in this area. In conversations with local development stakeholders (Downtown and other local investors and developers), there was also more support for redevelopment under the three-lane alternative from 7th Street to 12th Street. Two property representatives with parking lots fronting East Main Avenue along this segment recognized the potential for development in the long-term but did not have any near-term plans.

Lane reductions to two or three lanes have been demonstrated to improve walkability, slow vehicular traffic, and help create a sense of place that is attractive to residents and businesses. The National Association of City Transportation Engineers (NACTO) Urban Design Guide states that creating an environment more inviting to pedestrians is key to "activating streets socially and economically" (NACTO – Urban Street Design Guide). This has been demonstrated recently on Main Avenue in Downtown Fargo where development investment quickly followed a major road improvement from four lanes to three lanes. The redeveloped portion of Main Avenue in Fargo was also on the edge of the downtown, as is the case between 7th Street and 12th Street. The primary difference between the two areas is the size of the downtown—Downtown Fargo and adjacent Downtown Moorhead together are notably larger and include higher densities, with more retail and housing units in proximity.

The following redevelopment scenarios were considered from referencing the Downtown Bismarck Subarea Plan, local stakeholder input, and case studies of redevelopment projects in North Dakota. The Alternatives Analysis Memorandum (Appendix B) provides more detailed information, including potential development extent, value, property tax revenue potential, and other economic development impacts.

Existing Condition and Five-Lane Alternative

Both the existing condition and five-lane alternative between 7th Street and 12th Street would result in a similar cross section. The five-lane alternative does include some improvements to the pedestrian environment, but such improvements are unlikely to invite redevelopment of intensity similar to downtown development (e.g. multiple stories and a mix of uses). Redevelopment opportunity is assumed to primarily involve commercial development, such as medical offices, limited to the north side of the corridor. Potential economic development impacts include an increase in local workforce and estimated $8 - $13 million in taxable revenue over 20 years.

Figure 23. Existing Condition

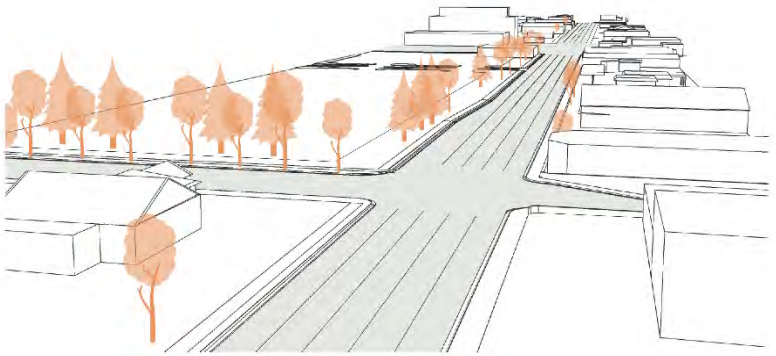
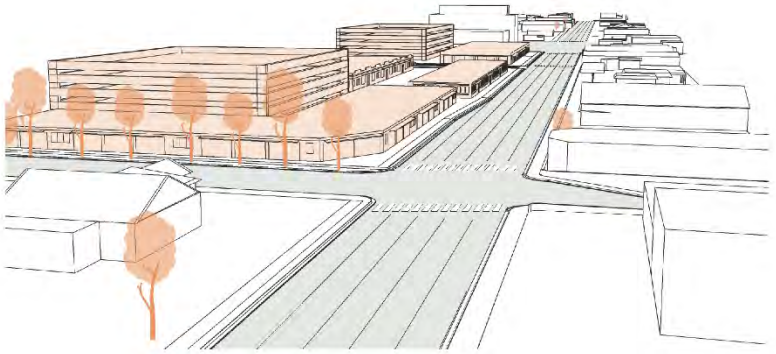


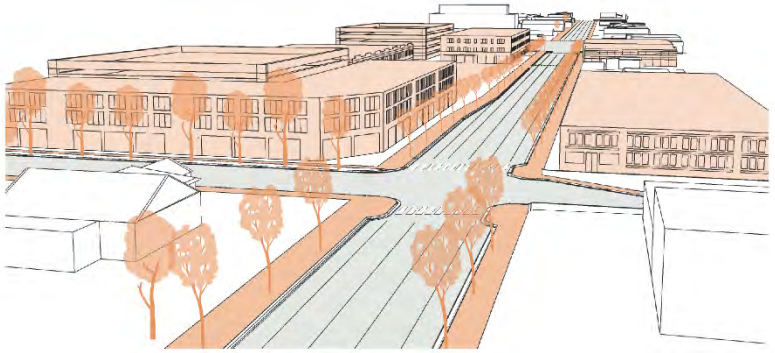
Figure 24. Redevelopment, Five-Lane Alternative



Three-Lane Alternatives

The three lane alternatives involve a significant expansion to the pedestrian space and could involve amenities that make the space attractive and inviting to pedestrians, such as street furniture and landscaping. Between 7th Street and 12th Street, redevelopment opportunities are assumed to include multistory mixed-use buildings on both sides of the corridor, such as commercial (e.g., medical office and retail) and residential. Potential economic development impacts include an increase in local workforce, housing, and estimated $26 to $31 million in taxable revenue over 20 years.

Figure 25. Redevelopment, Three-Lane Alternatives



Evaluation Scoring

East Main Avenue alternatives were evaluated on a qualitative estimate of each alternative's ability to address the specific evaluation factor. The rating system is as follows:

- Good; best meets criteria
- Ok; meets criteria well
- Moderate; close to achieving criteria
- Marginal; does not meet criteria
- Poor; fails to meet criteria

Note that the various criteria was not weighted in this analysis. Certain criteria may have more importance in one segment of the corridor than another. For example, freight could be weighted greater on the east side of the corridor than adjacent to/in the downtown area. Also, criteria may be viewed differently over time as the development context changes along the corridor. For example, on-street parking may be given a lower weight presently between 7th Street and 12th Street, but after redevelopment of parking lots along this segment, parking may need to be weighted much greater.

Table 11. Segment 1 Evaluation Matrix

Evaluation Criteria	Segment 1, 7th Street – 12th Street		
	Five-Lane	Three-Lane	Three-Lane with Median
Vehicular Mobility			
Property Access			
Safety			
Freight			
On-street Parking			
Pedestrian Access & Mobility			
Environmental Justice			
Bike Access & Mobility			
Transit	NA	NA	NA
Snow Control/Maintenance			
Corridor Image			
Redevelopment Opportunity			

Table 12. Segment 2 Evaluation Matrix

Evaluation Criteria	Segment 2, 12th Street – Airport Road		
	Five-Lane	Three-Lane	Three-Lane with Median
Vehicular Mobility			
Property Access			
Safety			
Freight			
On-street Parking			
Pedestrian Access & Mobility			
Environmental Justice			
Bike Access & Mobility			
Transit	NA	NA	NA
Snow Control/Maintenance			
Corridor Image			
Redevelopment Opportunity			

Table 13. Segment 3 Evaluation Matrix

Evaluation Criteria	Segment 3, Airport Road – 26th Street		
	Five-Lane	Three-Lane	Three-Lane with Median
Vehicular Mobility			
Property Access			
Safety			
Freight			
On-street Parking			
Pedestrian Access & Mobility			
Environmental Justice			
Bike Access & Mobility			
Transit			
Snow Control/Maintenance			
Corridor Image			
Redevelopment Opportunity			

Public Engagement Summary

Any successful corridor Study needs to have robust, targeted engagement to solicit feedback from the general public and stakeholders. The public and stakeholder feedback drives the outcome of the Study, ultimately shaping the future of East Main Avenue.

First Round of Public Engagement

As described in the Corridor Study Development Process section, the first round of public engagement was held in mid-July to garner feedback about the issues and opportunities present on East Main Avenue. The feedback summarized is from the open houses, community workshop, property/business owner one-on-one interviews, and the online comment mapping tool.

Property and Business Owner Interviews

Interviewees included:

- Bitty Bean
- Simonson
- Spa's Etc.
- Sanford
- CHI St. Alexius
- Davis Group
- Threefold
- Window & Door Store
- Big Boy
- Ministry on the Margins
- Prairie Farms
- Missouri Valley Coalition for Homeless People – Unmet Needs Committee
- Downtown area development interest group

WikiMap

30 comments were placed on the online mapping tool, WikiMap, including the following categories (number of map responses in parenthesis): driving (16), safety (7), biking (1), accessibility (1), and other (1).

Figure 26: Online Input Mapping Interface (WikiMap)

Key Themes

Key themes from the interviews, WikiMap, and meeting comments are shown below:

- High Vehicular Speeds
- Vehicular Safety
- Pedestrian Conflicts
- Need for Beautification
- Redevelopment Potential
- Importance to Disadvantaged
- Need Operational and Intersection Improvements
- Corridor image
- Queuing (West Side)
- Freight Access
- Snow Maintenance

Second Round of Public Engagement

The second round of public engagement was held in late-November and early-December to garner feedback about the East Main Avenue corridor alternatives and evaluation criteria. The feedback summarized below is from the open houses, community workshop, online community alternatives survey, and tactical engagement with local social service organizations.

Alternatives Survey

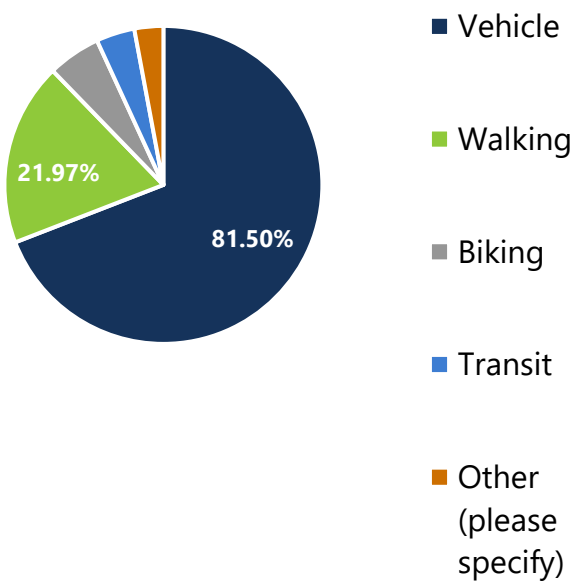
A total of 174 surveys were completed. Several open house and community workshop attendees (approximately ten) completed hard copy versions of the survey. Approximately 100 of the surveys were completed online. 66 surveys hard copy were completed by social service organization clients through tactical engagement efforts.

It is important to understand who completed the survey and how respondents use East Main Avenue. Most (80%) survey respondents live in the City of Bismarck and approximately 20% live in Burleigh or Morton Counties, outside of Bismarck. Approximately 70% of respondents travel the corridor daily or at least several times a week. The two primary reasons respondents use East Main Avenue are for shopping/errands (40%) and to get to work (32%). However, an option for those who use East Main Avenue to access social services was not provided and is likely to include a significant percentage of respondents.

Modes Used on East Main Avenue

The below chart identified the modes of travel survey respondents selected for how they travel on the corridor (some respondents selected multiple modes). Even with responses from social service organization clients who may have limited access to a vehicle, driving was still very prominent. It is recommended that future corridor/project outreach involves additional outreach to modes that may be underrepresented, such as walking or transit.

Survey: Transportation Modes Along East Main Avenue



Input By Group

Three general groups of respondents completed the survey, these include: corridor business (and property) owners and employees, commuters, and social service organization clients. Issues generally prioritized by each group were as follows:

Corridor Business (and Property) Owners and Employees: Vehicular mobility, property access, freight, and snow control.

Commuters: Vehicular mobility and safety (vehicular).

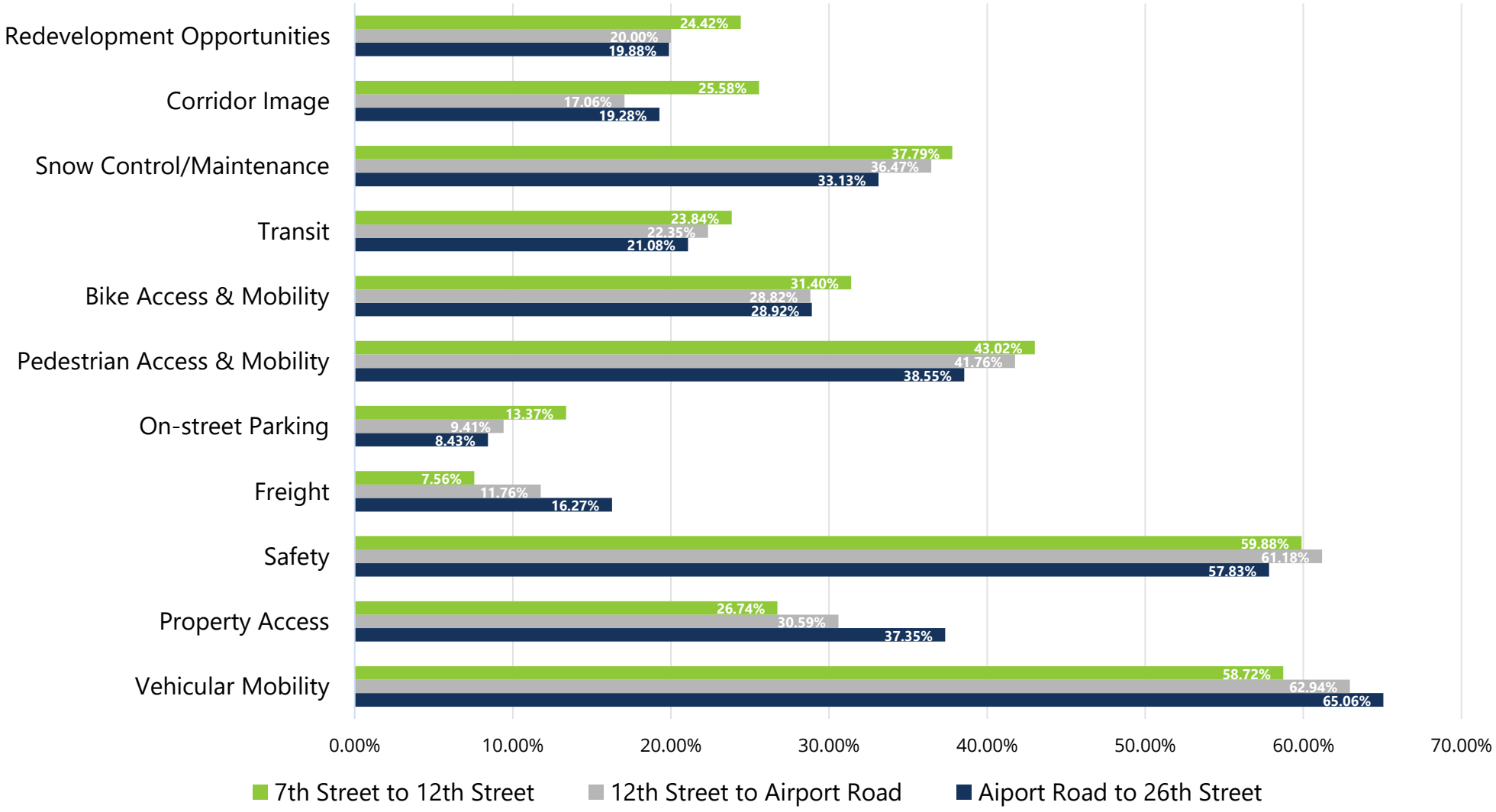
Social Service Organization Clients: Safety (all modes of transportation), pedestrian access and mobility, and bike access and mobility.

Input on Each Corridor Segment

The following chart summarizes survey feedback on how respondents value various elements or criteria of each corridor segment. Each corridor criteria are listed on the left side of the chart (e.g. redevelopment opportunities, corridor image, etc.). Each colored bar represents a different segment. Important takeaways from the chart:

- The two most highly valued criteria include **vehicular mobility** and **safety**. Vehicular mobility is highly valued across the entire corridor but increases in importance going east.
- **Pedestrian access and mobility** is the third-most valued criteria in all three segments, and is most valued from 7th Street to 12th Street. This corresponds with current and anticipated pedestrian volumes from 7th Street to 12th Street.
- Input on **7th Street to 12th Street** includes some noticeable differences from input on the other two segments. These include a higher value given (at least three percentage points) to redevelopment opportunities, corridor image, and on-street parking.
- Other important trends to note include increasing preference for **freight** and **property access** going east.

Criteria Prioritization by Segment



Recommendations

Recommendations of the Study are a direct result of the established purpose and need, alternative development & evaluation process, and feedback from stakeholders.

Locally Feasible Alternative

The three-lane alternative is recommended in Segment 1 (i.e., between 7th Street and 12th Street), and the five-lane alternative is recommended in Segments 2 and 3 (i.e., between 12th Street and 26th Street). This hybrid cross section approach responds to public feedback, balancing preferences for different corridor elements that favor the five-lane alternative versus the three-lane alternative. The locally feasible alternative also balances the alternative evaluation criteria to provide the most responsible future project.

Evaluation criteria are summarized in Table 13. Traffic operations evaluation is summarized in Table 14 and Table 15.

Public Feedback Insight

Segments 2 and 3: Vehicular Mobility and Safety

The number one priority in the survey was vehicular mobility in Segments 2 and 3 (i.e., between 12th Street and 26th Street). Additional open-ended feedback in the survey prioritized a five-lane cross section. Most corridor business and property stakeholders located between 12th Street and 26th Street also prioritized vehicular mobility and a five-lane cross section.

Given great interest in safety through these two segments as shown in the survey and stakeholder interviews, access management improvements and pedestrian improvements as described earlier (addition of buffer along the curb and crossing improvements) are expected to help improve safety for drivers and pedestrians without sacrificing vehicular mobility.

Segment 1: Safety

Public feedback on Segment 1 (7th Street to 12th Street) was more mixed in terms of what corridor elements were the priority. Safety was the number one priority in this segment according to the survey. From reviewing open ended survey comments and from stakeholder interviews, safety is understood to involve concerns related to both vehicular and pedestrian safety. The three-lane cross section would create a much safer environment for pedestrians, with greater sidewalk width and shortened pedestrian crossings. The lane reduction in combination with bulbouts/intersection curb extensions, access management improvements, and on-street parking would also calm traffic, creating a safer environment for both pedestrians and drivers.

Segment 1: Other Elements

Public feedback differed in Segment 1 from the other segments, as for example, pedestrian and snow control needs received higher priority. Redevelopment interest was noted earlier in this report. The three-lane cross section with median is not proposed due to likely complications with maintenance and stakeholder concerns over the loss of a center turn lane that could be used for emergency response to nearby hospitals when through lanes are congested.

Table 14. Feasible Alternative Evaluation Matrix

Evaluation Criteria	Locally Feasible Alternative		
	Segment 1, 7th Street to 12th Street (3-Lane)	Segment 2, 12th Street to Airport Road (5-Lane)	Segment 3, Airport Road to 26th Street (5-Lane
Vehicular Mobility			
Property Access			
Safety			
Freight			
On-street Parking			
Pedestrian Access & Mobility			
Environmental Justice			
Bike Access & Mobility			
Transit	NA	NA	
Snow Control/Maintenance			
Corridor Image			
Redevelopment Opportunity			

Good; best meets criteria
Ok; meets criteria well
Moderate; close to achieving criteria
Marginal; does not meet criteria
Poor; fails to meet criteria

Locally Feasible Alternative Traffic Operations

For commuter traffic, diversion away from the corridor is still expected with the locally feasible alternative. Some of the diverting traffic will be expected to rely on 12th Street to access alternative routes, such as Broadway Avenue or Front Avenue. This is one factor in expected increased delay at 12th Street. However, the level of service at the 12th Street intersection is still expected to be acceptable.

Current and projected 2045 queuing of traffic will increase at 12th Street, where both eastbound and westbound through movements and right turns will experience queuing during the peak hour (2045 average peak hour queuing at 12th Street will range from 45 feet to 51 feet in the morning peak hour and 68 feet to 120 feet in the evening peak hour). Projected 2045 queuing under the locally feasible alternative at 9th Street will be less than queuing under the 2045 no build scenario.

Overall corridor travel time is expected to be, on average, 12 seconds greater in 2045 under the locally feasible alternative when compared to the 2045 no build alternative.

Table 15: Travel Time (Minutes)

	AM Peak Hour			PM Peak Hour		
Alternative	**EB**	**WB**	**Average**	**EB**	**WB**	**Average**
2045 No Build	3.80	4.09	3.90	4.00	4.69	4.30
Year 2045 Feasible Alternative	4.03	4.23	4.10	4.35	4.64	4.50

Table 16: Intersection Operations Level of Service (LOS)

East Main Avenue Intersection	2045 No Build	2045 Locally Rec. Alternative	2045 No Build	2045 Locally Rec. Alternative
	A.M. Peak Hour	A.M. Peak Hour	P.M Peak Hour	P.M. Peak Hour
7th Street	B	B	B	B
9th Street	B	B	C	C
12th Street	B	B	B	**C**
Airport Road	B	B	B	B
26th Street	B	B	C	C

Bold font indicates worse 2045 LOS than Existing LOS

Figure 27. Segment 1, Feasible Alternative

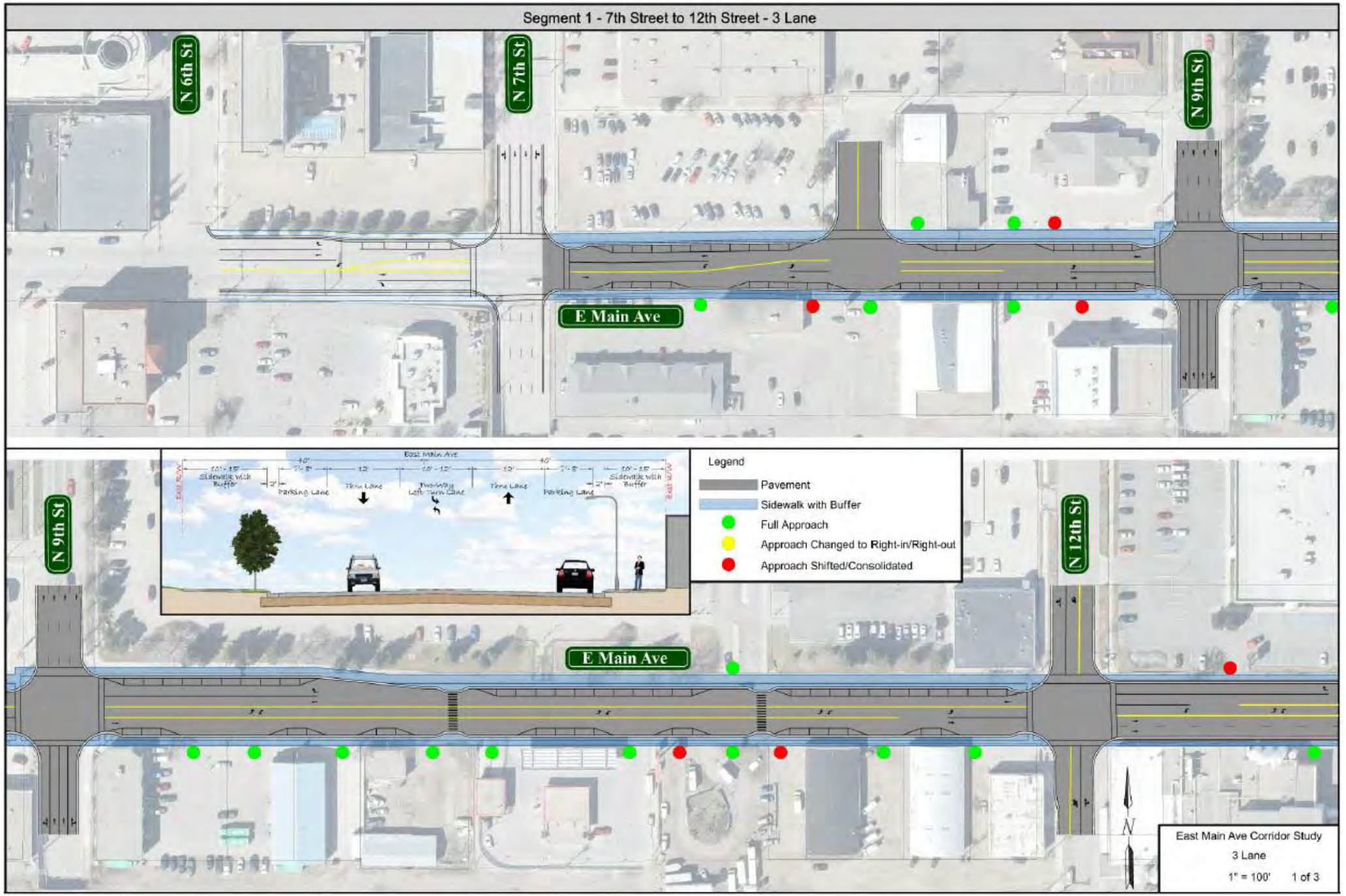


Figure 28. Segment 2, Feasible Alternative

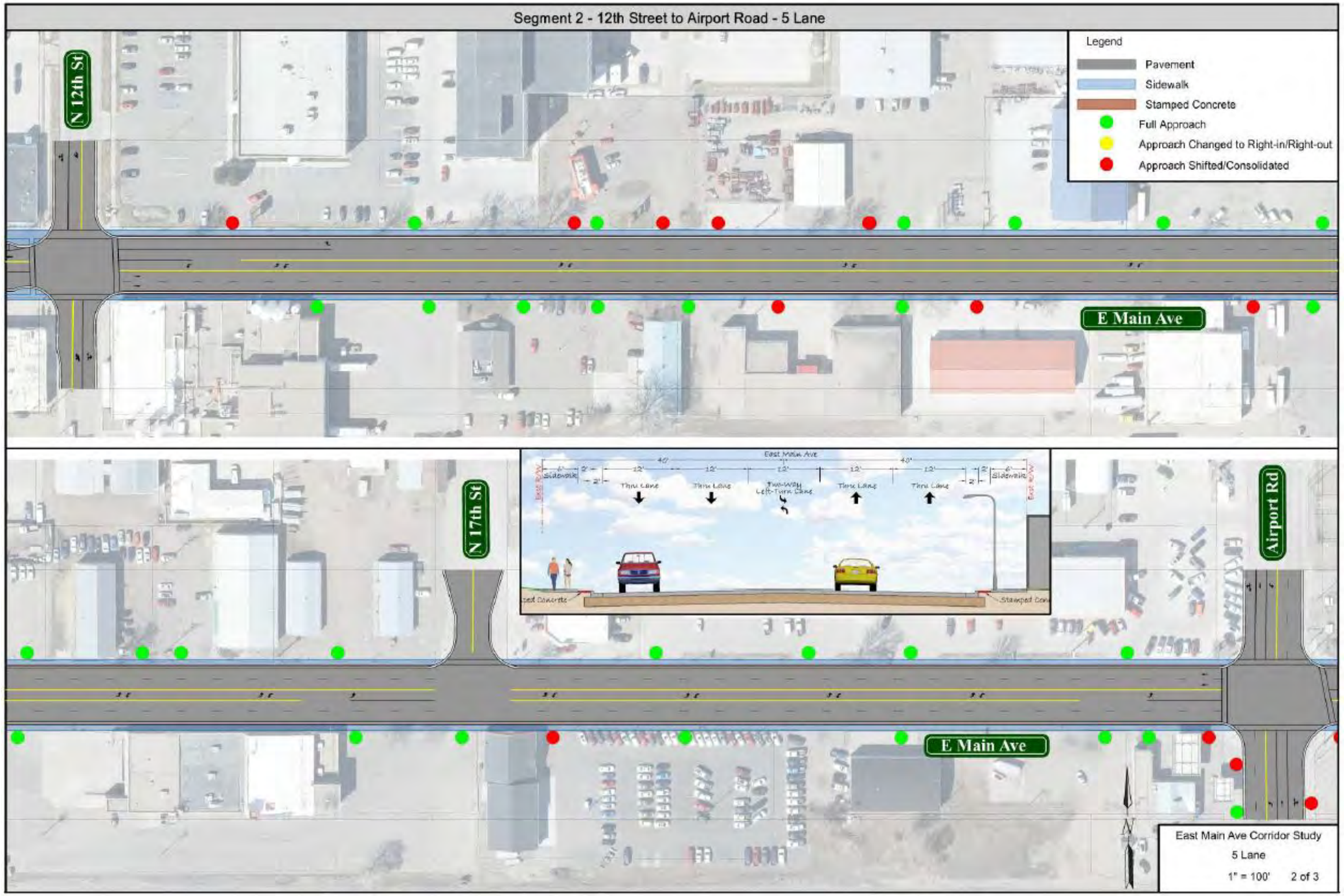
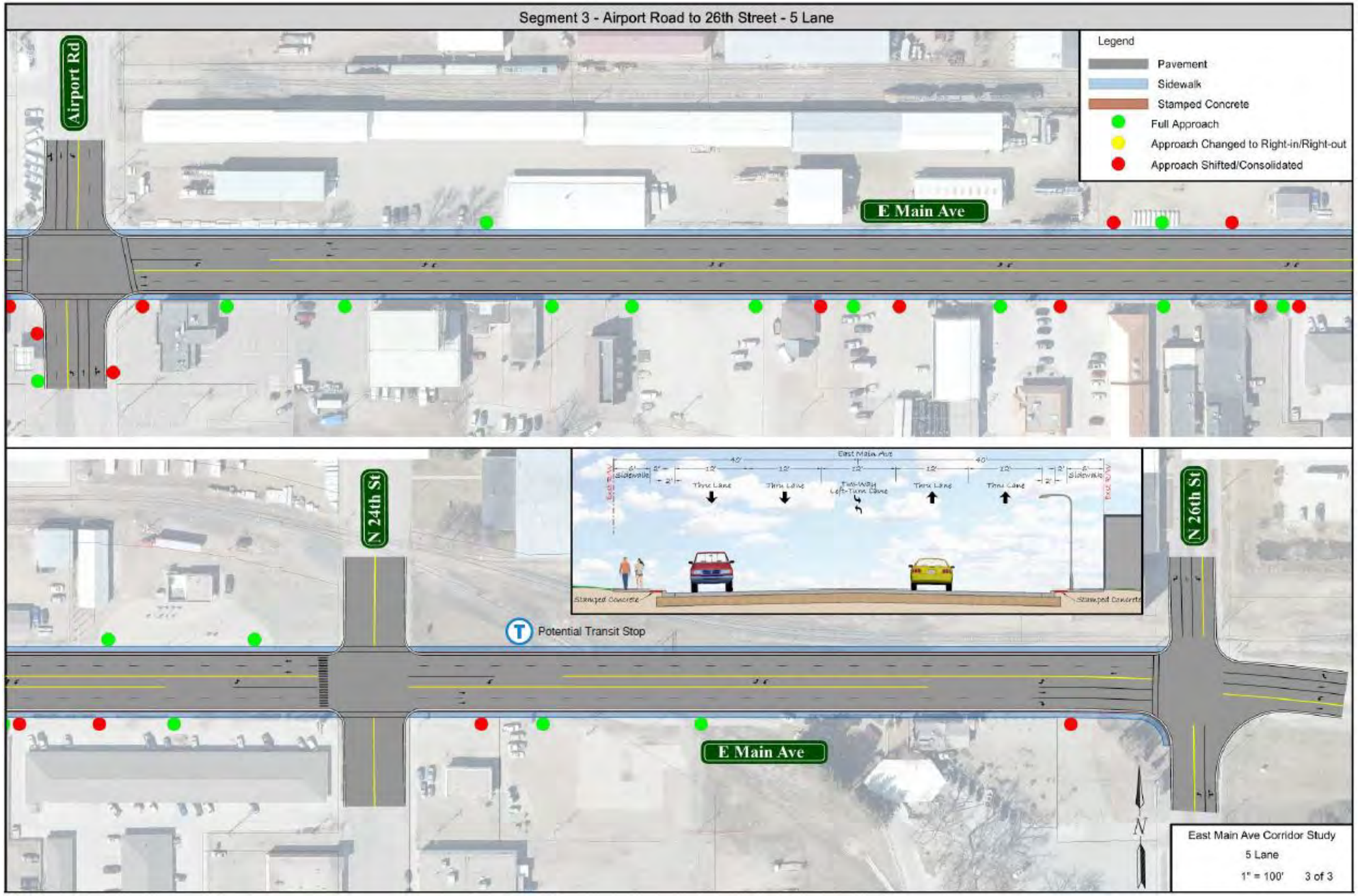


Figure 29. Segment 3, Feasible Alternative



Implementation

This section identifies what comes next for East Main Avenue, phasing ideas, alternative project costs, an overview of funding opportunities, ongoing maintenance, and utility considerations for any roadway improvements.

Corridor Next Steps

The East Main Avenue Corridor Study lays the groundwork for the City of Bismarck and its partners to pursue funding, detailed design, federal environmental review, and ultimately construction of improvements to the corridor. Corridor stakeholder and general community input provides insight into local preferences. Study evaluation of the corridor and alternatives will ease the burden of development of alternatives in the design phase and the understanding of potential environmental impacts.

The section below explains the process required should the project be partially or fully funded with federal dollars. If only local and/or state funding is used for the project, environmental review as explained below may be avoided, which may abbreviate the process timeline.

Project Design and Environmental Review

Prior to any construction project, detailed corridor design will need to the follow this Study. Environmental review would complement this phase as required through the National Environmental Policy Act (NEPA). Additional public involvement would accompany environmental review. This design and environmental phase would result in the selection of one alternative to move forward to a final design phase.

Construction

When design plans are completed, corridor improvements can go out for bid. The Phasing section below explains how corridor construction may take place.

Phasing

The East Main Avenue corridor is conducive to constructing the project in segments, whether in one year or multiple years, as funding becomes available or as the roadway conditions warrant. Breaking the segments at key intersections would be ideal for a multiple year phasing.

Constructing a five-lane or three-lane alternative have their own unique challenges but also share the challenge of maintaining access to adjacent properties along the corridor. Adjacent property owner coordination during the environmental, design, and construction phase is key to education of the construction process and understanding the phasing of access during construction.

Constructing the five-lane alternative is simpler than the three-lane alternative due to the additional pavement width available for shifting traffic. An additional construction phase is sometimes warranted with three-lane construction to overcome the narrower pavement section if two-way traffic is maintained. Closing East Main Avenue during construction is

not a feasible alternative with the multitude of auto-oriented businesses located along the corridor.

Costs

In today's construction industry, price inflation and unpredictability, lack of competition, and supply chain issues have created cost escalation that is unprecedented. Cost estimates which normally have been accurate for the duration of the project development are now only accurate for a short period of time. For the purposes of this Study, similar projects were reviewed from within North Dakota over the past three years and those costs were brought to current dollars with increased inflation over recent years. Those projects were broken down on a per foot of roadway cost to use for the Main Avenue estimates. For "non-pavement" costs such as lighting, similar projects were picked that correlated with what could be needed for these items on East Main Avenue. When the East Main Avenue project is programmed for the design and environmental review, the estimated project costs should be reviewed to ensure their validity.

"No Build" Alternative

The potential for not proceeding with a full reconstruction alternative should be considered. Federal environmental review also requires consideration of the "no build" in the next step. The "no build" description may be somewhat misleading as at a minimum, the corridor's pavement will have to be addressed as the condition continues to deteriorate. If using federal funds, the minimum improvement to the corridor is concrete pavement rehabilitation, which involves concrete panel replacement and curb ramp improvements to meet Americans with Disabilities Act (ADA) requirements. A concrete pavement repair project will *at most* extend the pavement lifespan 10 years on a roadway such as East Main Avenue, as new repair areas will continue appearing. Note that full pavement reconstruction (considered for the build alternatives) would extend pavement lifespan approximately 30 years.

Project Flexibility

The ultimate project or multiple projects that the City of Bismarck decides to move forward with throughout this corridor could vary greatly. The City is not required to follow one build alternative or another throughout the corridor but can select elements from each alternative or decide to focus more improvements on one segment of the corridor than another. Some elements also may be more time sensitive than others, such as curb ramp improvement for ADA compliance or intersection signal and design improvements to improve safety and mobility. As noted earlier, redevelopment opportunities also may also drive the need to implement certain improvements, such as those recommended in the locally feasible alternative from 7th Street to 12th Street.

Cost Estimates

Segment	No Build Alternative	Build/Reconstruction Alternatives*			
	Concrete Pavement Rehabilitation (CPR)	3 Lane	3 Lane Median	5 Lane	Locally Feasible Alternative
7th Street to 12th Street	NA	$5,194,000	$5,506,000	$5,454,000	$5,194,000
12th Street to Airport Street		$7,682,000	$8,143,000	$8,066,000	$8,066,000
Airport Road to 26th Street		$7,654,000	$8,114,000	$8,037,000	$8,037,000
Subtotal	$3,164,000	$20,530,000	$21,763,000	$21,557,000	$21,297,000
Contingency 20%	$633,000	$4,106,000	$4,353,000	$4,311,000	$4,259,000
Subtotal	$3,797,000	$24,636,000	$26,116,000	$25,868,000	$25,556,000
Engineering 20%	$759,000	$4,927,000	$5,223,000	$5,174,000	$5,111,000
Total Cost (2022 Dollars)	**$4,556,000**	**$29,563,000**	**$31,339,000**	**$31,042,000**	**$30,667,000**

*All build/reconstruction alternative costs include stormwater costs.

Funding

Funding could be comprised of many sources depending on the project schedule, segments, and type of facility constructed. Since East Main Avenue is on the NDDOT Urban Roads System, federal funding is an option that is available but programming the project would be critical to fit with other projects Bismarck wants to use federal funds for.

Discretionary Federal Grants

With the passing of the Infrastructure Investment and Jobs Act (IIJA) in 2021, there are numerous discretionary Federal grant opportunities through the US Department of Transportation (USDOT). Most programs have been carried over from the last Highway Bill (FAST Act) and a boost of Federal funding however, there are several new programs as well. The City of Bismarck will need to review the requirements and likelihood of securing such grants to determine if they feel the effort of undertaking the grant application is potentially worth the reward. Many federal grant opportunities are very competitive and successful grant awards have a low probability. In many of USDOT's grants, projects are given greater preference that have a clear equity benefit, or a benefit to disadvantaged populations as identified in this Study's environmental justice review. Based on equity criteria alone, East Main Avenue presents a worthwhile application. Some programs through the IIJA are administered through the Bismarck-Mandan Metropolitan Planning Organization (BMMPO).

BMMPO Federal Funds

The City of Bismarck may also pursue discretionary and formula-based Federal funds administered by the NDDOT through the BMMPO. These Federal programs vary from high to low dollar amounts, which may be pursued for projects along the entire Study area, specific Segments, or more tactically/supplementally (i.e., Highway Safety Improvement Program). The City of Bismarck should continue robust engagement in BMMPO's metropolitan planning processes to identify potential funding sources and designate the regional priority of future projects along East Main Avenue.

State Opportunities

The NDDOT administers USDOT funding through BMMPO but in some cases, the State may administer funding programs in a more creative process, specific to current policy direction. Depending on timing, the North Dakota Urban Grant Program funds might be a potential funding source especially for a three-lane alternative near downtown in the area from 7th Street to 12th Street. Constructing this segment as three-lanes would allow for Urban Grant Program criteria to be met. Urban Grant Program funds are federal dollars passed through NDDOT.

Local Funding Opportunities

Most Federal and State funding programs require local matching funds (e.g., 80 percent Federal & 20 percent local),

but it varies by program. The City of Bismarck has existing and potential funding sources that could be used to cover portions (local match) or the entirety of the project costs.

- Currently, special assessments are used to fund local projects, but a project of this magnitude is not well suited under current policies as the cost per assessed unit would be extremely high without a modification to typical City subsidy rates or inclusion of an area wide assessment.
- The City is considering a street utility fee which would allow the City to use the revenue generated by this fee to maintain and improve roadways. No specific proposal for eligibility of projects that the fee would cover has been approved by the voters of Bismarck or the City Commission at this time.
- While not currently used in Bismarck, tax increment financing (TIF) could potentially be used to contribute to project funding.
- An existing 1% Sales Tax funds the use of snow gates and subsidizes the special assessed costs associated with the maintenance of roadways.
- East Main Avenue within the study limits is not currently eligible for funding through the existing half-cent sales tax used for the construction and reconstruction of arterial roads. Voter approval would be required to allow a project within the study limits to be funded through half-cent sales tax.

Ongoing Maintenance

Whether improvements are made to corridor or not, the concrete pavement must be maintained both for the benefit of vehicular traffic and other modes. The City of Bismarck is currently responsible for maintenance. This includes winter snow and ice control. The lack of snow maintenance along the corridor is noted in the alternatives analysis portion of this report. The City of Bismarck requires property owners to clear the section of sidewalk along the street side of their property. This practice should be reviewed to improve the current inequality between those who drive and walk along the corridor—drivers are given preference as travel lanes are cleared well before sidewalks. **Current sidewalk snow maintenance practices have proven to not be effective from recent observation and community and stakeholder input.**

City Utilities

Sanitary sewer, watermain, and stormwater utilities are present in the East Main Avenue corridor to varying degrees. Depending on the level of construction activity (e.g., full reconstruction or concrete pavement rehabilitation) different extents of city utilities will need to be considered during construction. Below is an identification of the possible extent of city utility improvements along the corridor that could be paired with roadway construction activities.

Sanitary Sewer

The East Main Avenue sanitary sewer from 7th Street to 9th Street is 18" vitrified clay pipe (VCP) and from 9th Street to 26th Street it is 8" and 10" polyvinyl chloride (PVC) pipe. The segment of 18" VCP could be lined independently of roadway work along this corridor. Sanitary manholes that have deteriorated beyond the point of rehabilitation by corrosive gases should be replaced concurrently with roadway work.

Watermain

The watermain along the East Main Avenue corridor is a mix of PVC, Cast Iron (CI), and Ductile Iron (DI).

- 12" PVC – 7th Street to 1300' west of Airport Road
- 12" CI – 1300' west of Airport Road to Airport Road
- 12" DI – Airport Road Intersection
- 8" PVC – Airport Road to 1000' east of Airport Road
- 10" CI – 1000' east of Airport Road to 26th Street

The City of Bismarck typically chooses to replace smaller diameter cast iron pipe at the end of its useful life. The segments of cast iron pipe could be pipe burst independently of roadway work along this corridor. However, if the East Main Avenue corridor is reconstructed, the option to replace the cast iron watermain by open cutting the trench would be feasible. Along other segments of East Main Avenue, minor improvements to the water system would be required with the roadway work. These improvements would include gate valve adjustments, hydrant adjustments, and any service/fire line additions or improvements.

Stormwater

The storm sewer system from 7th Street to 26th Street on the Main Avenue corridor was designed by NDDOT during 1985 and 1986 for a 5-year storm. The estimated rainfall intensities using current National Oceanic and Atmospheric Administration (NOAA) Atlas 14 methodology are higher than the intensities used for the original design. A 5-minute, 5-year storm, for example, is estimated as a 5.65 inches/hour event as per present Atlas 14 methodology, as compared to 5.05 inches/hour as used for the original design, or an increase of up to about 12%. This means that the capacity of some parts of the stormwater system may be slightly undersized for the 5-year storm. The corridor existed as a developed urban corridor when designed and constructed, and land use changes should not have generally affected the runoff characteristics to a significant degree.

A full analysis of the storm drain system will be necessary to determine its adequacy with respect to present design standards for a reconstruction project. For an urban street in Bismarck, the 5-year recurrence interval storm is used for the design event. Modifications to the system could be needed to meet present standards.

Urban street stormwater design allows for spread of flow from the gutter onto the adjacent pavement, particularly within parking lanes or across outer lanes on multi-lane streets. If revisions to lane configuration were to occur, such

as reduction from the existing five lane road section to a three-lane road section with parking, the three-lane road section with parking would allow for a larger spread per the present standards[1].

Three separate storm sewer systems serve the Main Avenue corridor between 7th Street and 26th Street. The first segment is drained easterly from 7th Street to 8th Street, and westerly from 9th Street to 8th Street by storm drains that discharge into a city trunk line that runs south under 8th Street from Rosser Avenue to south of Bismarck Expressway.

From east of 9th Street, a trunk line carries runoff easterly to 14th Street, and from Airport Road to 14th Street, another line conveys the runoff westerly to 14th Street. At 14th Street, these two lines drain into a 36-inch trunk line that runs south then west under Front Avenue. From Front Avenue westerly, and south, these flows eventually are discharged into the 8th Street trunk line as discussed above, which extends to south of the Bismarck Expressway.

From Airport Road to 26th Street, Main Avenue is drained easterly. A trunk line which drains Front Avenue between Airport Road and 22nd Street feeds flows into the Main Avenue storm drain just west of 22nd Street. From 22nd Street east to 26th Street, a second trunk line was included in the 1980's reconstruction project which serves to provide additional capacity, and discharges into a channel approximately 150 feet north of Main Avenue on the east side of 26th Street. A pair of 60" reinforced concrete pipe (RCP) trunk lines that drain. Broadway Avenue and systems from streets north of Broadway Avenue also discharge into this channel at the same location.

[1] Allowable spread encompasses any shoulder or parking lane and one half of the outside through lane regardless if it is three or five lanes.