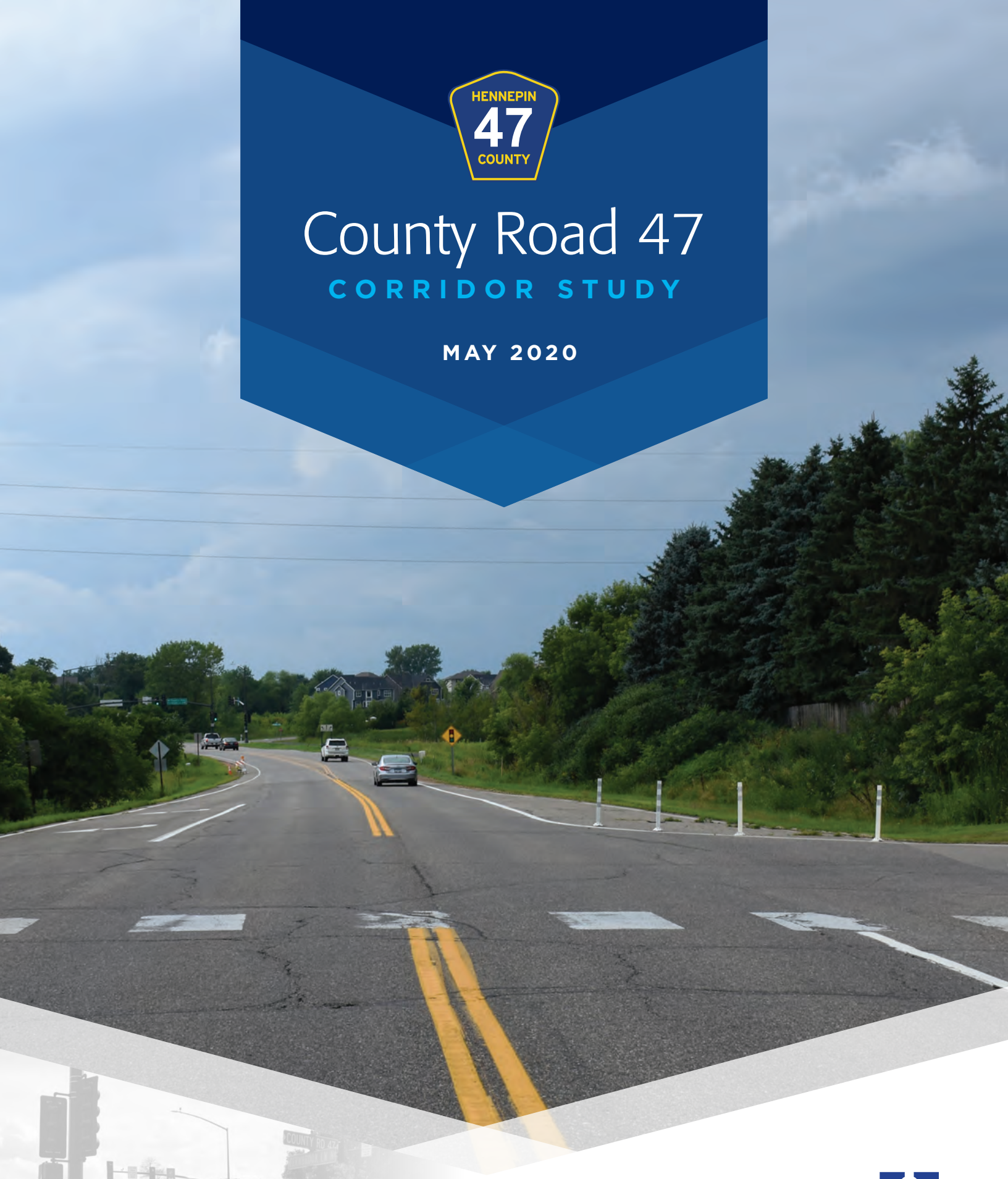
HENNEPIN 47 COUNTY

County Road 47

CORRIDOR STUDY

MAY 2020



City of Plymouth

Hennepin

Acknowledgements

The following individuals contributed to this study:

- Michael Thompson, City of Plymouth
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- Anna Potter, Kimley-Horn

Additionally, Meadow Ridge Elementary School assisted by hosting two open houses, and staff from neighboring communities and agencies were involved throughout the study process.

Note to Readers

The purpose of the County Road 47 Corridor Study is to develop a long-term vision of the corridor and short to mid-term actions using stakeholder feedback, technical engineering judgment, and realistic funding constraints. The information in this study frames the constraints and trade-offs that affect design considerations. Information included in this study will help inform future design decisions and set the foundation for a more detailed engineering and design evaluation. Any efforts related to advancing a full reconstruction of the corridor will require more detailed engineering, investigation, and stakeholder engagement.

This study does not make a recommendation of a preferred concept layout nor does it make any final design decisions regarding the concepts. The Long-Term Vision described in this study outlines at a planning-level the features and type of roadway that County Road 47 is likely to yield if it were to be reconstructed. Final jurisdiction of the roadway will ultimately inform its design. If the road remains a county asset, bituminous rehabilitation would likely be the focus instead of reconstruction as outlined in the Long-Term Vision.

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Chapter 1: Introduction

CORRIDOR LOCATION

County Road 47 in Plymouth, Minnesota comprises a 4-mile roadway segment between County Road 101 on the west and Northwest Boulevard (County Road 61) on the east. The corridor primarily serves land uses in the City of Plymouth, however, it also accommodates travel to and from adjacent communities west and northwest of the corridor. Figure 1 illustrates the location of County Road 47 in Hennepin County (shown in purple) and Figure 2 is a close-up of the corridor extents in Plymouth.

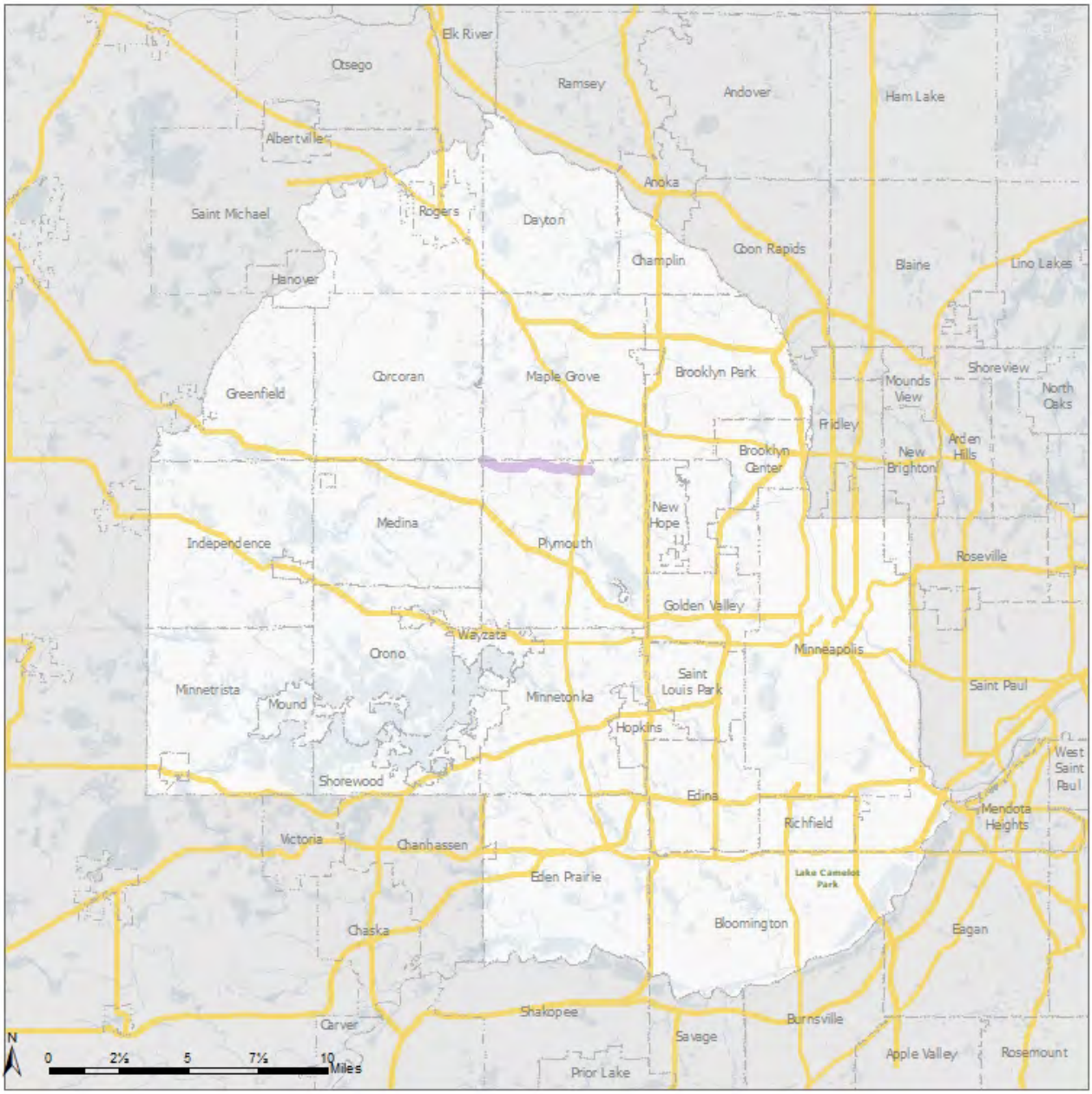


Figure 1: Location of County Road in Hennepin County

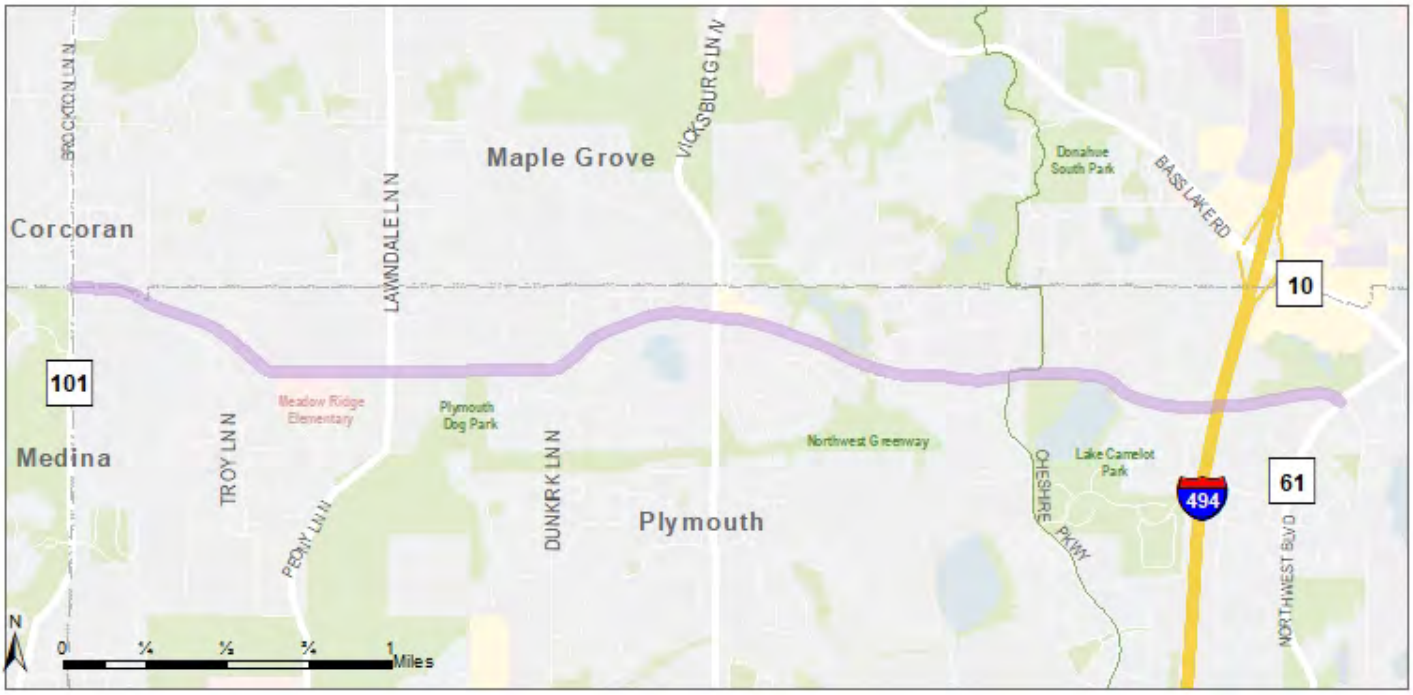


Figure 2: The County Road 47 Corridor Location

HISTORY AS A COUNTY ROAD

County Road 47 has a long history as a component of the Hennepin County roadway system. Portions of today's alignment were first added to the county system in the 1920s. The road had a gravel surface until 1960 when it was extended to connect between State Trunk Highway 101 (now County Road 101) and County State Aid Highway (CSAH) 61. County Road 47 was one of the last of the Hennepin County roads to be paved and improvements have been limited since the road is not eligible for either state or federal funding assistance. These funding challenges, coupled with the fact that the roadway serves a more local versus regional purpose, has resulted in the road having lesser priority in the county roadway system as compared to CSAHs or other county roads that serve regional trips.

Hennepin County is limited to the number of miles of roadway which can be designated as County State Aid Highway (CSAH) to receive state funding assistance. These CSAH roads receive state funding assistance, whereas the remaining county roads are strictly supported by local funding. The basic designations of the county system were made when the state system was originally established in 1929, and later when the 1944 Federal Act provided for certain types of county highways could be eligible for the rural secondary program. With the establishment of the State Aid Division in 1957, guidelines were developed for which roads were to be within the CSAH system. With few exceptions (such as state trunk highway turnbacks), the total CSAH system mileage has remained constant up to today.

Development in this semi-rural portion of the county has accelerated over the last few years. The land uses had primarily been single family homes, however, other uses such as schools, parks and some limited commercial establishments have recently been developed. As this area has changed, so has the function of County Road 47. The road has transitioned from a low-volume rural through route to a road providing primarily local land access. The implementation action plan of Chapter 5 contains more discussion regarding road ownership and the alignment of ownership based on the types of trips the facility provides.

STUDY PURPOSE & STRUCTURE

The purpose of the County Road 47 Corridor Study is to develop a long-term vision of the corridor and short to mid-term actions using stakeholder feedback, technical engineering judgment, and realistic funding constraints.

Travel needs have changed significantly since the corridor's initial construction as a two-lane rural roadway. The area has experienced strong residential growth, has added a new elementary school with direct access to County Road 47, and is now served by popular recreational uses throughout the corridor. Multimodal linkages have been identified as an emerging need in the corridor to create connectivity between the various uses through safer and comfortable facilities for pedestrian and bicyclist travel.

Roadway geometrics and pavement condition are also being reviewed and monitored as the corridor evolves. The horizontal and vertical curvature of the existing roadway has become a concern with increased development and roadway volumes. Residents have mentioned discomfort entering onto County Road 47 due to limited sight distances. Bypass lanes which were originally added to provide better access for left turning traffic to adjacent developments are now observed as contributing to uncertainty and ambiguity as drivers negotiate these areas, resulting in the demand for dedicated turn lanes. The life of the pavement is reaching the threshold where some type of preservation / rehabilitation will be needed within the next few years.

This study was undertaken by the City of Plymouth and Hennepin County to:

1. Develop short to mid-term actions for safety and pavement condition needs
2. Develop a long-term vision for the corridor if and when an opportunity for reconstruction appears
3. Provide a basis for further discussion for a possible jurisdiction transfer from the county to the city

Any suggested improvements need to be coordinated to address both the long-term and near-term needs of the corridor. A plan needs to recognize funding constraints and infrastructure maintenance demands.

A jurisdictional transfer of the road from the county to the city should be given further consideration due to the continued shift in the road's primary function. Within the county roadway network, County Road 47 is relatively low in the hierarchy of critical county road segments, primarily due to its limited continuity and local context. If the road was a city street, it may rank as a more important component to the local street system. The action plan needs to be acceptable to both the city and county, for it will likely contain elements forming the basis of any future agreement for transfer of the road.

This report documents the analysis and efforts completed as a part of this corridor study:

- Chapter 1 reviews the existing conditions in the corridor and the current and future traffic needs
- Chapter 2 documents the public engagement process and key takeaways
- Chapter 3 examines the Short-Term corridor safety and pavement preservation options
- Chapter 4 introduces two Long-Term Visions developed to improve the corridor if and when reconstruction occurs
- Chapter 5 outlines an Action Plan of short to mid-term improvements and a process for a transfer of the roadway to city jurisdiction

Roadway Characteristics

County Road 47 is functionally classified as a B-minor arterial type roadway. Functional classification is guided by several characteristics of the roadway facility that revolve around the context of the road within the network, the type of service it provides (mobility and land access), and how the road is operated. Within the Twin Cities metropolitan area, the Metropolitan Council has been given the authority to administer the functional classification system by the Federal Highway Administration. Appendix A: Hennepin County Functional Classification System Map illustrates the Hennepin County Functional Class Map. Functional classification will be discussed further in Chapter 5 as part of the section on roadway jurisdictional transfer items since this classification is also important to the assignment of proper jurisdiction.

County Road 47 Typical Configuration Today

County Road 47 is currently a rural undivided two-lane roadway. Although there is only one through lane in each direction, the road widens with left and/or right-turn lanes or bypass lanes at many of the local street residential access points and major intersections along the corridor.

As shown in Figure 3, the corridor has:

- Posted speed limits of either 45 or 50 miles per hour (mph)
- Five signalized intersections spaced approximately one mile apart
- Direct access points or intersections approximately every quarter-mile

Figure 3: Existing Traffic Conditions

The posted speed limit for the corridor increases and decreases even though the land uses and roadway geometric conditions are similar. The continued suburbanization of the corridor may be a reason to consider requesting a formal evaluation of appropriate speed postings and discuss this with the Minnesota Department of Transportation (MnDOT). The city and county need to discuss the potential merits of requesting MnDOT to evaluate the posted speed limits.

Speed limits on county roads in Minnesota are set by the Commissioner of MnDOT. Speed limits are based on an engineering and traffic investigation performed by MnDOT staff. The road authority requests the investigation / speed study and MnDOT staff add the request to its list of statewide requests. The results from the investigation includes an updated speed limit authorization. Typically, the results are received about one year after the request is made due to the statewide backlog of requests. This backlog may be somewhat relieved based on recent legislation allowing cities to set their own speed limits under certain conditions. Appendix B: Minnesota Speed Limits Informational Brochure contains additional information from MnDOT concerning speed limits.

Key Destinations

The corridor is primarily residential with a few commercial, institutional and recreational destinations.

- County Road 101 to Vicksburg Lane, the corridor has experienced significant residential growth. The major non-residential destinations with direct access from County Road 47 include:
  - The Plymouth Dog Park just east of Lawndale Lane and Elm Creek
  - Wayzata Meadow Ridge Elementary at the southwest corner of Lawndale Lane and County Road 47

  The western end of the corridor connects to County Road 101, another important north-south roadway. County Road 101 provides linkages southwards to the Medina commercial area near Trunk Highway 55 which is anchored by a Target store, and northwards to the emerging commercial area at County Road 101 / County Road 10 anchored by a HyVee grocery store.

- Vicksburg Lane to I-494, the corridor is fully developed with established residential communities, including a variety of single-family and multifamily homes. This section of the corridor:
  - Provides direct access to Lake Camelot Park (via an uncontrolled marked crossing at Dallas Lane with a pedestrian crossing beacon)
  - Intersects the Medicine Lake Regional Trail (at a signalized intersection crossing of County Road 47 at Cheshire Parkway / Fernbrook Lane)
  - Has access to the Northwest Greenway recreational corridor (which runs parallel south of County Road 47)
  - Has the only commercial activity in the corridor (on the northeast corner of the intersection of Vicksburg Lane and County Road 47)
  - The roadway has no connection to I-494

- East of I-494, the corridor provides access to medium-density townhomes and intersects Northwest Boulevard (County Road 61), an important north-south thoroughfare to the commercial and employment hub at I-494 / Bass Lake Road (County Road 10) northeast of the corridor, and further north to the regional Arbor Lakes commercial / office area in Maple Grove.

Traffic Analysis

A detailed traffic analysis was completed to complement engagement feedback, understand current safety and operational conditions, and to inform the long-term vision for the corridor. The traffic analysis had three parts: a local vs. regional trip analysis, a crash analysis, and an operational analysis.

Local Vs. Regional Trip Analysis

An initial evaluation of the general corridor travel patterns was performed by Hennepin County staff using the StreetLight® software package. This application allows users to analyze large amounts of information gathered from multiple sources like GPS, commercial fleet management systems, and various collectors of mobile phone data, to better understand how people and vehicles move. Data was gathered for trips entering or leaving either end of the County Road 47 corridor at County Road 101 on the west or at County Road 61 on the east. The data utilized mobile and GPS data for 24 hours and 365 days between November 2018 and October 2019.

The investigation of travel patterns in the County Road 47 corridor confirmed that most trips using the roadway are local in nature, meaning they originate or end within the corridor. This contrasts with a typical county road that primarily serves regional traffic, having longer trip lengths of many miles with origins and destinations located beyond the immediate corridor.

Figure 4 illustrates the analysis area for vehicle trips using the corridor. Vehicular trips were classified as local if they used the corridor primarily to reach local destinations and regional if they used County Road 47 as a pass-thru route to serve origins or destinations outside the vicinity of the corridor. The local area of the corridor was defined as being within approximately 1 mile of County Road 47.

The analysis found that:

- Trips that began and ended within the corridor = 9 % of all vehicular trips
- Trips which had origins or destinations within the corridor = 51 % of all vehicular trips
- Trips which used County Road 47 to pass through the corridor without stopping = 40 % of all vehicular trips

The analysis concentrated on the County Road 47 corridor and did not examine other north-south trips that use the local street system that might use a portion of County Road 47 for the trip. In conclusion, it appears that a majority of the vehicle trips served by the County Road 47 corridor are more local than regional in nature.

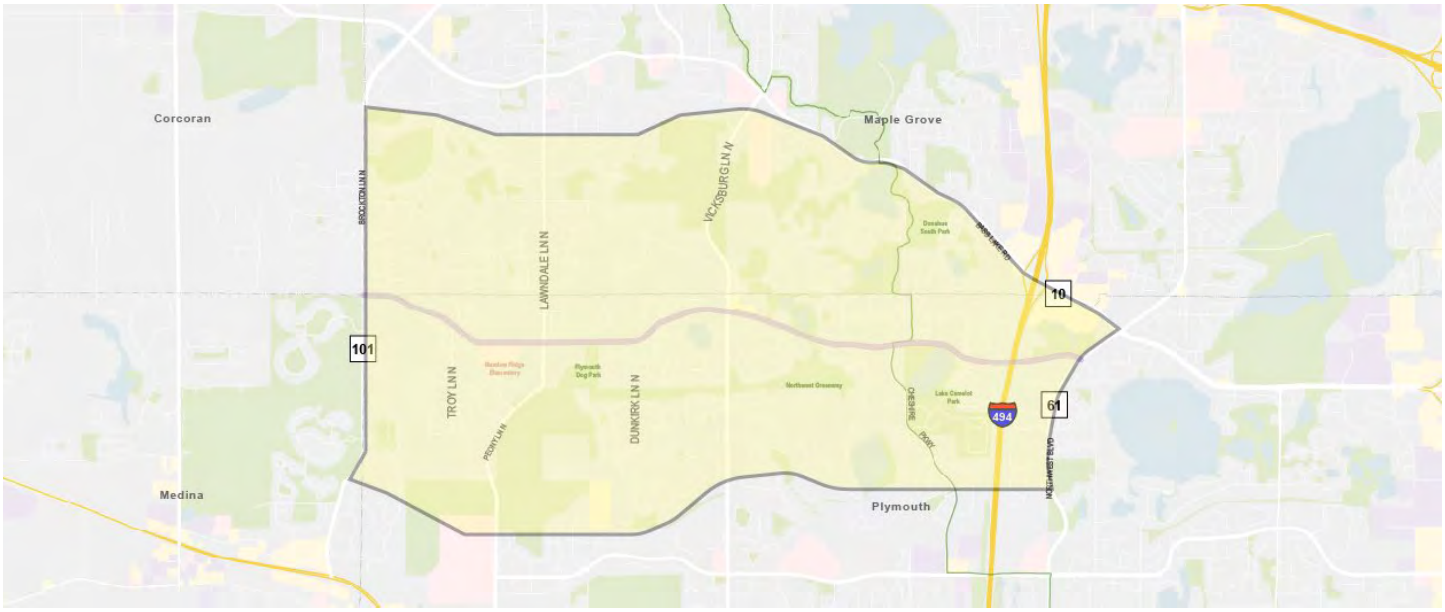


Figure 4: Assumed Area of Local Destined Traffic

Crash Analysis

An analysis of crashes along County Road 47 was completed by Hennepin County staff. From this analysis, there were 61 crashes reported along the corridor between 2017 and 2019. Of those crashes:

- 87% of all crashes were reported at intersections or driveways
  - 84% of the intersection / driveway crashes were at signalized intersections
  - 64% of the intersection / driveway crashes were property damage crashes that did not result in injury.
- The most common crash types were:
  - Angle crashes (turning related crashes or oblique type crashes)
  - Rear end crashes
- Failing to yield the right of way and following too closely were the most common contributing factors.

Figure 5 shows the locations of crashes that occurred along the corridor between 2017 and 2019.

Crash rates were also examined and compared to similar type intersections and county road segments throughout Hennepin County. Based on the data available at the time of the study, **no locations were found with crash rates that exceeded the critical crash rate** (which provides a measure of statistical confidence). However, since the initial analysis was completed*, it appears that the frequency of crashes has increased at some of the signalized intersections. These locations will continue to be monitored.

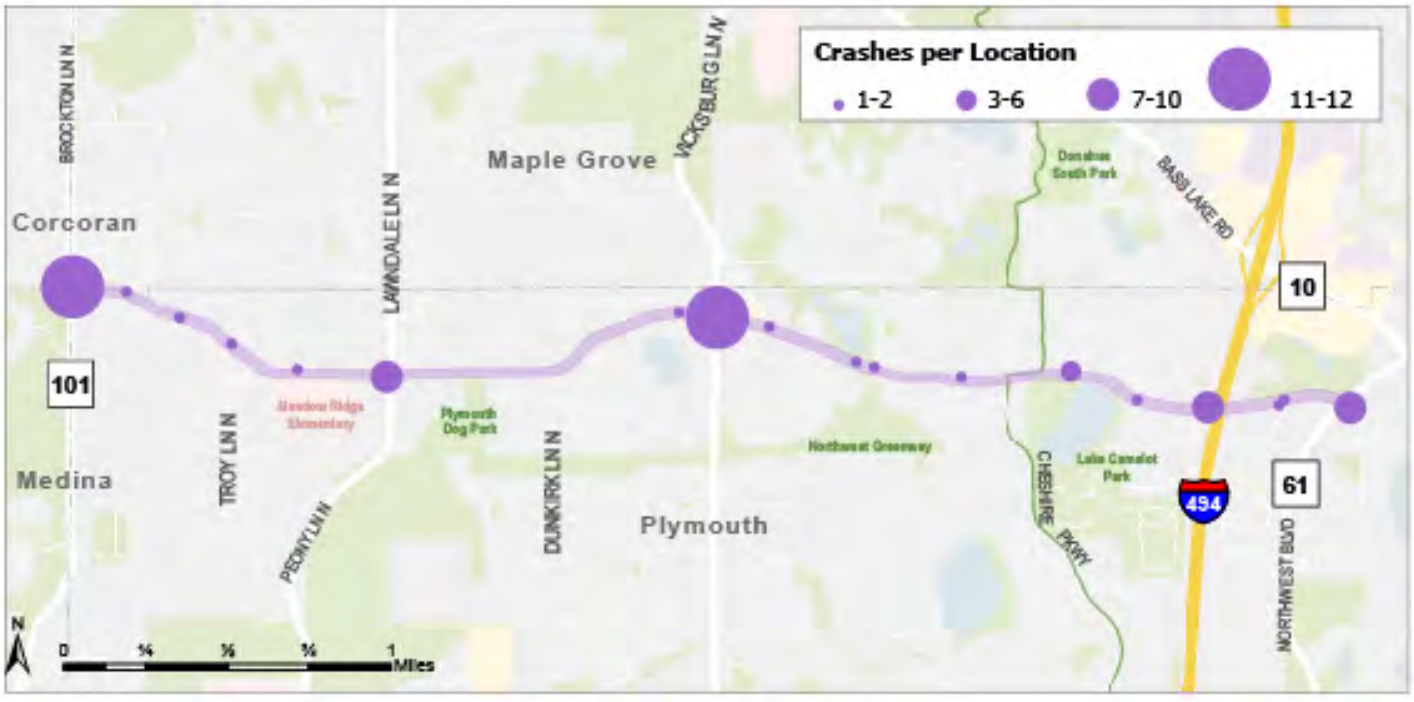


Figure 5: Crash Locations (2017-2019)

*The results of the crash analysis as shown in Appendix C: Traffic Study and Operational Impact Memorandum include crashes from a different time period. The crash analysis summarized above is from more recent data that has only been made is available since completion of the original traffic memo. The trends in the crash locations and types remain consistent in both datasets.

Traffic Operations Analysis (Current & Future)

The traffic analysis included an operational analysis. The summarized results of the analysis are described below, and the specific results and methodology can be found in Appendix C: Traffic Study and Operational Impact Memorandum.

Existing traffic volumes along the corridor vary between 4,000 vehicles per day on the west end to nearly 10,000 vehicles per day on the east end. Based on historical trends and anticipated land use development in the area, an annual growth rate of 1-2 percent per year (See Appendix C for specific growth rates by intersection) was applied to those existing traffic volumes to forecast future transportation needs in the corridor. All five signalized intersections were analyzed for existing (2017) and future (2040) conditions and assigned a grading referred to as Level of Service (LOS) -- that indicates how well traffic flows now and will flow in the future. The highlights from that analysis include:

- Based on the study assumptions, only one through travel lane per direction is needed to serve future (2040) traffic along County Road 47 between intersections.
- Based on the existing (2017) turning movement counts and intersection geometry, all intersections are currently operating at an acceptable LOS during the weekday morning and evening peak hours.
- If traffic continues to increase but no improvements are made, the two signalized intersections on the west end of the corridor would not operate at an acceptable LOS during the weekday morning and afternoon peak hours. To address these conditions, future plans should consider the following improvements (as highlighted in Figure 6):
  - An additional through north-south travel lane on Lawndale Lane at County Road 47
  - Turn lanes and signal phasing on County Road 47 at the County Road 101 intersection

Figure 6: Traffic Analysis Recommendations for the Long-Term Vision

All traffic findings and recommendations for County Road 47 were carried forward and included in development of a Long- Term Vision (Chapter 4). In coordination with the traffic study, a public engagement process was developed and implemented to understand user needs and desires. This engagement process is described in the following chapter.

Chapter 2: Public Engagement

Public feedback was solicited to inform corridor priorities in the development of the Long-Term Vision and to identify near-term improvements.

PROCESS

Over 1,000 comments were received through a diversity of activities and venues:

- FlashVote Survey: A survey was distributed in February 2019 using the city's FlashVote tool. There were 855 participants, many of whom were first time FlashVote survey users. The survey asked for type and priority of improvements.
- Online Feedback Map: An online interactive feedback map was developed for the corridor study. This map was promoted through the FlashVote survey and posted on the city's website in February and March of 2019. The feedback map asked for details on user experience(s) in the corridor by mode and location. Nearly 250 pieces of feedback (such as experiences, likes or dislikes, and identifiation of key destinations) were captured via the Online Feedback Map.
- International Night: The corridor study team heard feedback from users at International Night on March 7th, 2019.
- Open Houses**:** There were two open houses for the corridor study. Over 60 people attended the first Open House on March 13, 2019 and over 100 people attended the second open house on September 18, 2019. Both open houses were held at Meadow Ridge Elementary and were publicized online and via post-card mailings.
- Comment Cards & Emails: 65 comment cards were filled out at the Open Houses, and some comments were emailed to staff after the event.

The Flash Vote survey results, Open House sign-in sheets, comment cards, and email text provided to staff can be found in Appendix D: Open House Comments and Feedback Summaries.

FEEDBACK SUMMARY

Figure 7 illustrates the frequency of the initial comment responses received from the engagement activities leading up to the second open house meeting.

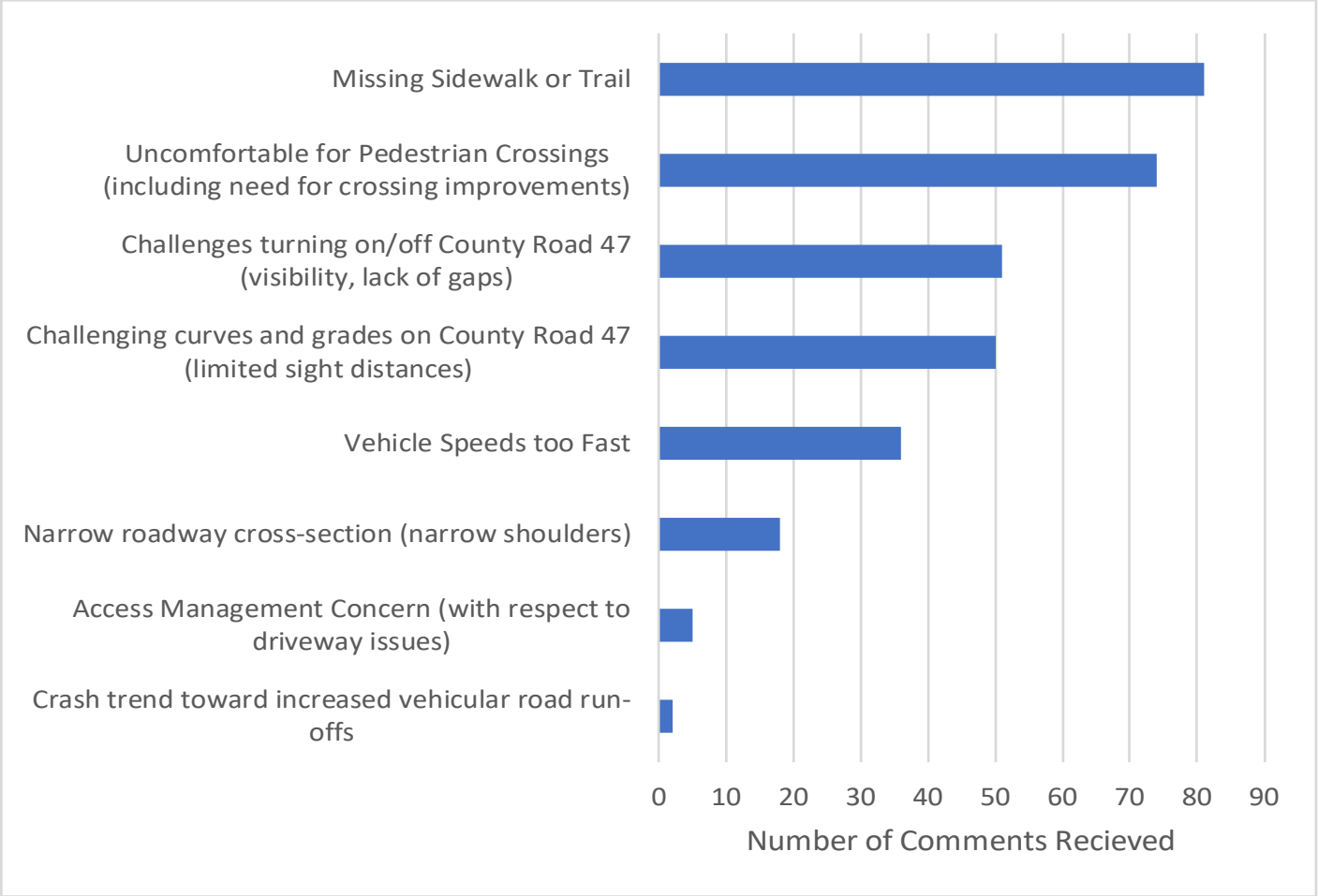


Figure 7: Initial Public Engagement Responses

While most feedback provided was in support of changes to the corridor, a few comments were in opposition to change and/or in support of fiscal responsibility.

In summary, the areas of primary concern expressed by the public included the following:

- Missing sidewalk / trail connections
- Pedestrian crossing concerns
- Difficulties turning on / off County Road 47 due to limited sight lines
- Vehicle conflicts due to the bypass lanes (feedback primarily received in Open House #1 and via the online map. See Appendix D)
- High vehicle speeds
- Storm drainage and ponding concerns (feedback primarily received in Open House #2. See Appendix D)

These concerns helped guide the consideration of options for short-term safety improvements discussed in the following chapter.

Chapter 3: Short-Term Safety & Pavement Condition Considerations

WALKWAY/TRAIL CONNECTIONS AND CROSSINGS

The County Road 47 corridor is currently served by a patchwork of trails and walkways. The Northwest Greenway provides the most comprehensive trail component, connecting Lawndale Lane and Cheshire Parkway south of the corridor. The north-south Medicine Lake Regional Trail crosses the corridor at Cheshire Parkway. Connections are generally poor between isolated areas of residential development and many of the destinations noted previously. The north side of the corridor has trail and walkway continuity challenges due to wetlands, Elm Creek and the configuration of the developments.

Figure 8 illustrates the locations of the key trails and walkways near the corridor and identifies where gaps exist in the trail and walkway system. In addition, the locations of existing and likely future crossing issues are shown as an outcome of where the trail and walkway system intersects County Road 47 at unsignaized intersections.

Figure 8: Key Trails and Walkways in the Vicinity of the County Road 47 Corridor

A prioritization of the trail and walkway system gaps is needed as a first step to determining a plan of improvement for bicyclist and pedestrian travel. Key considerations should include connections to significant destinations such as Meadow Ridge Elementary School, the Plymouth Dog Park, Lake Camelot Park, and the commercial business node at Vicksburg Lane.

City and county staff participating in the study group supported the ultimate provision of trails on both sides of County Road 47 like other cities who have similar policies including Maple Grove, Minnetonka and Eden Prairie. This helps to reduce crossings of busy county roadways and encourages users to cross at signalized intersections or special enhanced crossings. If a walkway or trail is provided on one side in the short or long-term, then consideration should be given to assist people walking or biking to ensure logical facility connections and provisions for safe crossings of County Road 47.

Typically, the county takes an incremental approach to developing crossing improvements at locations which are not under full traffic control (ex: traffic signal or all-way stop). To assist in examining the most appropriate crossing treatments, the county has developed an evaluation process and guidance which is included in Appendix E: Hennepin County Crosswalk Evaluation Guidance.

SIGHT LINES

During the public engagement events, several residents noted discomfort when turning on or off County Road 47. The corridor has several locations where combinations of the horizontal and vertical alignment of County Road 47 limits sight lines.

Some situations exist when an entering driver loses sight of the roadway over a slight hill (as shown at Dunkirk Lane).

Trimming foliage can help in some cases, but significant corrections of the road profile to improve sight lines will likely have to wait for a reconstruction project.

Dunkirk Lane Looking West on County Road 47 (note loss of sight of road in the distance)

VEHICULAR CONFLICTS IN BYPASS LANES

The corridor has several bypass lanes which were installed to facilitate left turning traffic into adjacent developments. Bypass lanes exist at:

- Vagabond Court North
- Dunkirk Lane North
- Archer Lane
- Yuma Lane
- Annapolis Lane North
- Yucca Lane North

Historically, bypass lanes have become less desirable especially along higher speed roadways that are experiencing increases in traffic volumes. The optional thru-left design introduces a level of ambiguity for drivers who may have to make last-minute abrupt maneuvers when the intentions of the lead vehicle are not known. Bypass lanes were originally used since they are more compact in length and could be installed at a lower cost with less impacts to adjacent properties. However, the safety benefits of dedicated turn lane designs have been determined to far outweigh the cost benefits of the bypass lane design.

Most recent intersection and access improvements in the corridor have included dedicated turn lane designs at the following locations:

- Troy Lane North
- Entrance to Meadow Ridge Elementary School
- Shenandoah Lane North
- Quantico Lane North
- Niagara Lane North

When roadway rehabilitation or reconstruction opportunities occur, these remaining bypass lane locations should be considered for upgrading to dedicated turn lane designs.

VEHICLE SPEEDS

Speed limits along county roadways are established by the Minnesota State Commissioner of Transportation as outlined in Minnesota Statute 169.14. Recent state legislation in 2019 authorized Minnesota cities to set speed limits on streets under city jurisdiction under certain circumstances. However, this law does not apply to roadways under county jurisdiction. Any changes to existing speed limits along county roadways are based on the results of an engineering and traffic investigation that is completed by MnDOT. Key factors used by MnDOT in the evaluation include the following:

- Road type and condition
- Location and type of access points (intersections, entrances, etc.)
- Sufficient length of roadway (1/4 mile minimum)
- Existing traffic control devices (signs, signals, etc.)
- Crash history
- Traffic volume
- Sight distances (curve, hill, etc.)
- Test drive results
- Speed study

Drivers receive several cues which determine their levels of comfort driving at certain speeds. Roadway and shoulder widths, design curvature and profile, building and foliage setbacks, sight distances and the presence of people walking and biking are some of these cues. A discussion should be held with the city regarding the potential merits of requesting MnDOT to evaluate the posted speed limits.

DRAINAGE & PONDING CONCERNS

After a particularly wet season, it was not surprising that some residents raised concerns regarding drainage and ponding. Some residents noted that previous dry areas were developing wetland-like characteristics after being wet for a long period. In some situations, plugged or collapsed culverts may be the problem. Possible drainage patterns may have been disrupted by recent land development and grading. In other cases, dry and wet climate cycles may most recently be reverting some areas back to their original wet habitat. These situations should be examined further to determine the best course of action.

PAVEMENT CONDITION CONSIDERATIONS

Pavement condition evaluations are an on-going part of the county's asset management activities. The evaluation of pavement condition relies on three primary measures:

- Pavement Serviceability Rating (PSR)
  PSR is a numerical index between 0 to 5 which is used to indicate the general surface smoothness of a pavement based on how it rides. Observed values below 2.5 are typically considered for resurfacing.

- Pavement Condition Index (PCI)
  PCI is a numerical index between 0 and 100 which is used to indicate general condition of a pavement based on pavement surface distresses. Surface distresses are defects visible on the pavement surface including cracking, potholes, rutting, raveling, and patches. Observed values below 65 are typically considered for resurfacing. PCI scores of less than 40 are often considered for reconstruction.

- Pavement Quality Index (PQI)
  This measure is a combination of the PSR and PCI ratings. The range is from 0 to 100. PQI provides a good indication of the overall condition of the roadway, and can be used to:

  - Prioritize roadway maintenance and rehabilitation needs
  - Optimize roadway treatment options
  - Develop a network preservation maintenance strategy
  - Develop short-term and long-term pavement management budgets

Recent monitoring of resurfacing projects throughout the county has found that some segments of road have not been achieving a 15-year life extension. These roads have required additional early preservation measures with ever shorter effective service lives. Generally, the problems are related to poor supporting soils or other sub-surface issues that are not typically corrected by a simple overlay or mill and overlay repaving project. The trend is also related to the overall aging of the roadway system.

Developed by Hennepin County staff, Appendix F: Pavement Preservation Options contains the existing pavement conditions for County Road 47 based on the above measures. Generally, the most critical segments along the corridor are anticipated to require attention in the next 3-5 years.

The county has begun considering rehabilitation techniques that can extend the life of the roadway short of a full reconstruction effort:

- Cold in-place Recycling (CIR)
  This pavement rehabilitation technique reuses the existing pavement materials which are mixed in-place without the application of heat. It involves grinding off the top 2 to 5 inches of the existing asphalt surface and mixing the crushed asphalt with a recycling agent and then repaving. This process reduces the amount of outside material required to be hauled to the site. Cold in-place recycling can correct deep asphalt defects such as rutting, fatigue (alligator) cracking, and utility cuts that cannot be addressed by a surface treatment or an overlay.

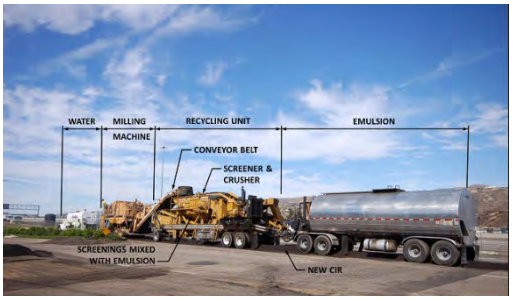
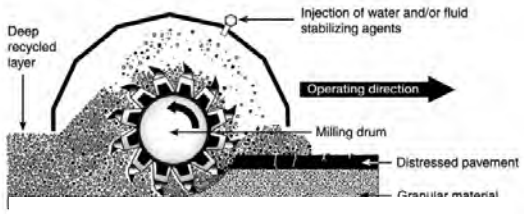


Photo Source: Los Angeles County Public Works

- Full Depth Reclamation (FDR)
  This is a pavement rehabilitation technique is one where the full flexible pavement section and a predetermined portion of the underlying materials are uniformly pulverized and blended together to produce a homogeneous stabilized base course. This process provides a more permanent solution for pavement repair and rehabilitation. With proper engineering and testing protocols, Full Depth Reclamation can provide a design life cycle of up to 30 years. Also, this process is one of the most environmentally friendly methods available.



Source: Asphalt Recycling & Reclaiming Association

Both rehabilitation techniques allow for improved roadway design enhancements such as widening and cross-slope adjustments. In addition, Full Depth Reclamation can allow for profile grade corrections as well. These techniques can extend the pavement life beyond the typical 15-year life for a mill and overlay - to roughly 20-25 years.

Appendix F also lists the proposed pavement treatments based on the evaluation of the existing pavement. Roughly, 70 percent of the County Road 47 corridor appears to have the conditions that would lend itself to one of these types of rehabilitation methods. The appendix also lists planning level cost estimates for rehabilitating the pavement in the corridor. For work including the cold in-place option, the estimated cost is approximately $4.9 million. For the Full Depth Reclamation option, the estimated cost is approximately $6.5 million. These estimates do not include significant roadway / shoulder widening, profile adjustments or any work beyond the existing pavement (such as trail or walkway additions).

Chapter 4: Development of a Long-Term Vision

Two concepts were developed to provide a long-term vision of County Road 47. A full reconstruction project would provide an opportunity to implement the long-term vision and the project would also include substantial work along the corridor to correct geometric, stormwater, and other deficiencies. It should be noted that a reconstruction project would likely be phased as part of any effort to manage limited resources and minimize property impacts during construction activities.

The following information and thoughts will help inform the formal design phase of a future reconstruction project. This formal process generally takes place over the course of several years and is initiated once a project has been programmed in a Capital Improvement Program (CIP). As part of this detailed design process, a formal layout will be developed that illustrates the proposed improvements. Feedback from key stakeholders such as the city and local community will continue to be sought during the layout development and design.

DESIGN CONSIDERATIONS

Geometrics

Based on the traffic analysis, both Long-Term Concepts assume one travel lane will be required in each direction for the foreseeable future. Intersections should have dedicated right and left turn lanes. A boulevard and buffered trail on both sides of the roadway is recommended. To be consistent with City of Plymouth and Hennepin County design standards, an urban design with curb and gutter will likely be needed to accommodate a trail. The actual elements, dimensions, and locations of the various components will be determined during the preliminary and detailed design phases of a project.

Design Speed

The implementation of the Long-Term Vision of County Road 47 will include the development of a formal layout and plans that will detail reconstruction activities. A key factor in determining specific roadway geometry is the Design Speed selected. As noted earlier, the existing authorized speed limit along County Road 47 ranges from 45 mph to 50 mph. It is suggested that a lower Design Speed be considered to balance the needs of people biking, driving, and walking along the corridor. After coordination with city and county staff, the Long-Term Vision concepts and layouts illustrated in Appendix G: Long-Term Conceptual Layouts assumed a design speed of **40 MPH** to balance the needs of vehicular mobility, roadway geometry, and pedestrian and bicycle crossings. This Design Speed assumption will need to be re-evaluated in the final design process. Key factors that support this initial Design Speed assumption include the following:

- Public input: Public feedback indicated a perception that existing vehicle speeds are too fast in the corridor. There is desire for the design to encourage lower vehicle speeds from today.
- Travel modes: Pedestrians and bicyclists use the corridor today, despite the lack of dedicated facilities. Residents indicated an interest in walking or biking if better facilities were provided. As noted elsewhere in this report, the character of the area has changed over time as new development has attracted more people to the area. This known demand for non-motorized facilities suggests a lower design speed may be appropriate to support walking and biking along the corridor.
- Design context: Given the current sight distance challenges and rolling terrain, a lower Design Speed may be appropriate to better fit the alignment within the surrounding environment.
- Minimized property impacts: The reconstruction of County Road 47 will require adequate space for the new cross-section, plus room for crews to perform the work as part of the various construction activities. The Design Speed will affect the amount of right-of-way and temporary construction easements that will be required. Given the proximity of some residences and environmentally sensitive areas, consideration should be given to minimizing property impacts.

Right-of-Way

The right-of-way width along County Road 47 varies greatly between 66'-120' wide. The upper range of this width is suitable for two lanes of travel, turn lanes at intersections, and a boulevard buffered trail on both sides of the corridor – meaning that either Long-Term concept easily fits within existing right-of-way at its upper range. However, several locations in the corridor are closer to the narrower 66' right-of-way width. Further evaluation will take place during the detailed design process to determine the preferred solution in constrained areas. These locations are illustrated in Appendix G: Long-Term Conceptual Layouts.

The following two Long-Term Concepts were developed using these considerations and were reviewed at the 2nd Public Open House held in September 2019.

LONG-TERM CONCEPT #1: WITHOUT SHOULDER

The Long-Term Concept #1 Without Shoulder has two travel lanes adjacent to the curb and gutter. A boulevard on both sides of the roadway separates the multi-use trail from the roadway. Geometric dimensions would be evaluated in the final design process and are subject to change based on jurisdiction.

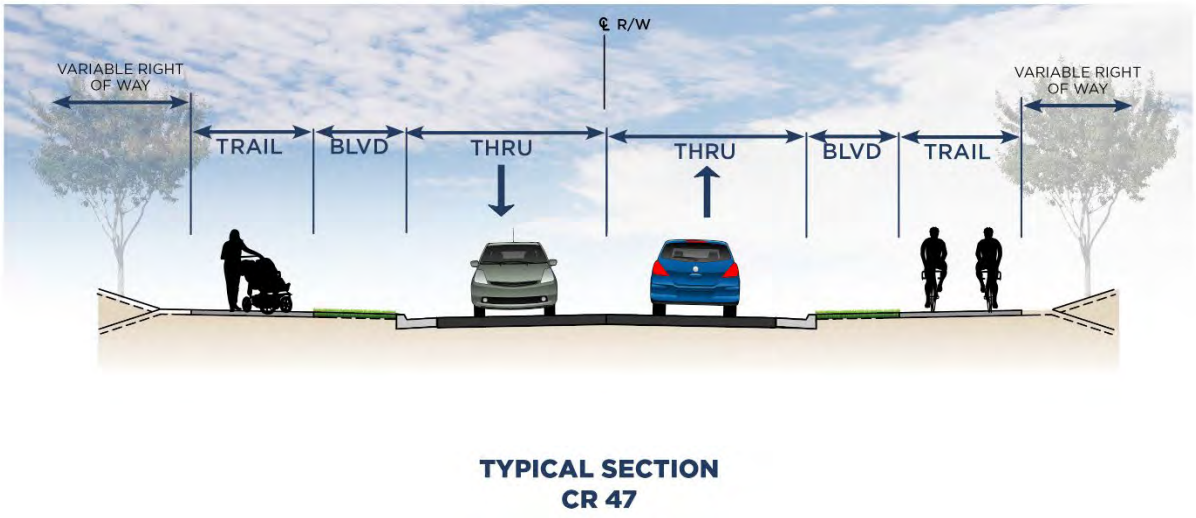


Figure 9: Typical Section of the Long-Term Vision Concept #1 (Without Shoulder, Between Intersections)

Typical dimensions of each of the elements in the cross-section are:

- Two-way Multi-use Trail: 8'-10'
- Boulevard: 6'-8'
- Curb and Gutter: 2'
- Vehicular Travel Lanes: 11-12'

There are tradeoffs to the narrow effective travel lane width:

- Pros of Concept #1: Shorter crossing distances for people walking and biking, improved ability to manage vehicle speeds, and less potential for property impacts.
- Cons of Concept #1: Minimal space available for on-road biking, less ability for people driving to correct for vehicle drifting, limited space for disabled or stopped vehicles and potential impacts to local delivery services (although the corridor currently has limited direct property access).

Capital Cost of Long-Term Concept #1

An engineer's opinion of probable cost for the Long-Term Concept #1 is roughly $27 million. Because the design is at a conceptual level of the engineering, the estimate includes a 15 percent construction contingency and a 30 percent allocation for indirect costs. As detailed in Appendix H: Long-Term Concept Cost Estimates, this capital cost estimate includes:

- Removal of concrete, asphalt, and any existing curb and gutter
- Replacement of concrete, asphalt, and curb and gutter, including an asphalt trail on both sides of the roadway and pedestrian curb ramps at intersections
- Excavation and grading, including an allocation for modular block retaining walls to reduce property impacts
- Removal and replacement of the existing box culvert at Elm Creek
- Signal system revisions and enhanced pedestrian crosswalks
- Storm sewer infrastructure and detention ponds
- Corrects horizontal and vertical alignment issues

LONG-TERM CONCEPT #2: WITH SHOULDER

The Long-Term Concept #2 With Shoulder has two travel lanes and shoulders (including a curb and gutter), which yields a larger effective travel lane width than Concept #1. A boulevard on both sides of the roadway separates the multi-use trail from the roadway. Geometric dimensions would be evaluated in final design process and are subject to change based on jurisdiction.

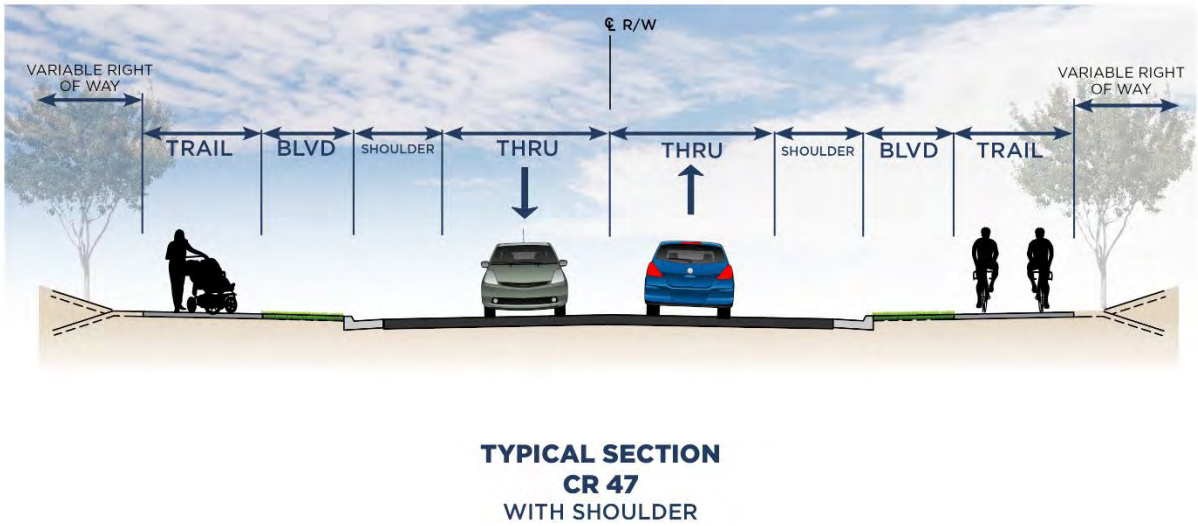


Figure 10: Typical Section of the Long-Term Vision Concept #2 (With Shoulder, Between Intersections)

Typical dimensions of each of the elements in the cross-section are:

- Two-way Multi-use Trail: 8'-10'
- Boulevard: 6'-8'
- Shoulder with Curb and Gutter: 6'-10'
- Vehicular Travel Lanes: 11-12'

There are tradeoffs to the wider effective travel lane width:

- Pros of Concept #2: Space provisions for on-road biking, ability for people driving to correct drifting vehicle paths, and increased space for disabled vehicles and potential delivery services.
- Cons of Concept #2: Longer crossing distances for people walking or biking, less ability to manage vehicle speeds, and higher potential for adjacent property impacts.

Capital Cost of Long-Term Concept #2

An engineer's opinion of probable cost for the Long-Term Concept #2 is roughly $29 Million. Because the design is at a conceptual level of the engineering, the estimate includes a 15 percent construction contingency and a 30 percent allocation for indirect costs. As detailed in Appendix H: Long-Term Concept Cost Estimates, this capital cost estimate includes:

- Removal of concrete, asphalt, and any existing curb and gutter
- Replacement of concrete, asphalt, and curb and gutter, including an asphalt trail on both sides of the roadway and pedestrian curb ramps at intersections
- Excavation and grading, including an allocation for modular block retaining walls to reduce property impacts
- Removal and replacement of the existing box culvert at Elm Creek
- Signal system revisions and enhanced pedestrian crosswalks
- Storm sewer infrastructure and detention ponds
- Corrects horizontal and vertical alignment issues

PUBLIC FEEDBACK ON THE TWO LONG-TERM CONCEPTS

During the 2nd Open House in September 2019, attendees were asked to provide feedback on the two concepts (verbally and/or in written comment form). No formal vote was taken, and there was not a clear quantitative or qualitative preference between the two concepts. However, the following items were commonly noted as important in the long-term design:

- Design features that encourage slower speeds
- Buffer space between pedestrian facilities and the vehicular roadway
- Minimal roadway expansion (retain one travel lane in each direction)
- Add curb and gutter
- Turn lanes that accommodate traffic volumes and speeds

Chapter 5: Implementation Action Plan

Making transportation improvements along County Road 47 will take time and partnerships. Given budget constraints and the diversity of users and stakeholders in the corridor, smaller-scale improvements should be considered as they are more realistically implemented in the short to mid-term while evaluation can continue regarding longer-term pavement preservation options or reconstruction of a Long-Term Vision Concept.

SHORT TO MID-TERM ACTIONS

The following short to mid-term actions were considered based on the outline of key concerns expressed in Chapter 3. Figure 11 illustrates the relative impact and level of effort for these actions.

Trail Connections and Crossings

The missing walkway / trail system gaps shown in Figure 8 should be prioritized and strategies developed to complete the network along the County Road 47 corridor. An example of a similar county-city partnership is the recent development of a trail connection on the east side of County Road 101 from County Road 47 southwards to 54th Avenue North providing connections to the new North Woods Elementary School.

Providing walkway / trail connections to Meadow Ridge Elementary School should be a priority. One means of studying improvements near the school would be to pursue an evaluation through a Safe Routes to School plan. Both MnDOT and the Metropolitan Council offer funding for planning and construction activities related to Safe Routes to School. The Wayzata School District would be a key partner in developing this plan. Likewise, potential crossings of County Road 47 may be evaluated for the potential of adding crossing enhancements. Evaluations should be conducted in accordance with the County Crosswalk Evaluation Guidance.

Sight Lines

As part of the county's routine maintenance program, sight line issues associated with tree and other foliage growth will be reviewed and addressed. Additionally, the corridor has sight line challenges due to existing horizontal and vertical curves. Potential options to explore include reducing vehicle operating speeds or realigning the roadway in the future to increase sight distances. Reducing vehicle speeds could be pursued in conjunction with the speed review described in the "vehicle speeds" near term action or through traffic calming measures. Realigning the roadway would need to be pursued in conjunction with the selected longer-term improvement (either the Long-Term Vision or pavement rehabilitation, depending on final jurisdiction).

Vehicle Conflicts in Bypass Lanes

In the near term, bypass lanes can be refigured via striping. The near-term design and configuration of the intersection and all movements would need to be reviewed on a case by case basis.

For a permanent solution, the conversion of bypass lanes to left turn lanes would need to be completed in conjunction with the selected longer-term improvement (either the Long-Term Vision or pavement rehabilitation, depending on final jurisdiction).

Vehicle Speeds

Hennepin County, with the support of the City of Plymouth, can request that MnDOT perform a speed review of the corridor. Prior to any study, discussions should be held to review the factors that influence speed posting decisions.

Drainage & Ponding Concerns

Culvert and ditch drainage conditions are inspected periodically by Hennepin County. For specific areas of concern, county maintenance crews can visit the site and make the necessary corrections. The County will confer with city staff regarding water drainage and ponding concerns and follow-up on any recent complaints. Roadway paving, rehabilitation or reconstruction projects also provide opportunities for inspection and evaluation of drainage needs.

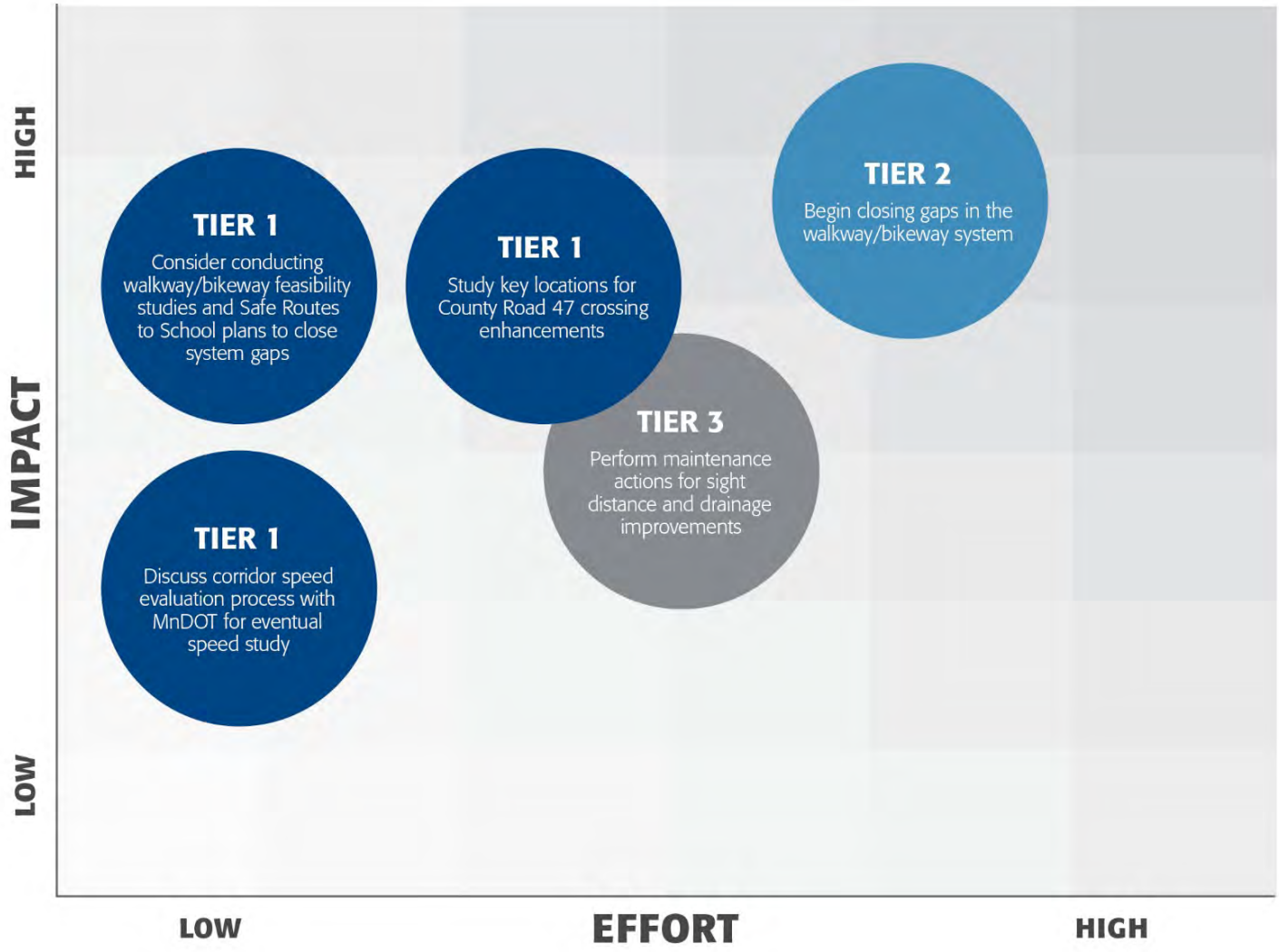


Figure 11: Assessment of Impact vs. Effort for Short to Mid-Term Actions

PAVEMENT CONSIDERATIONS

Figure 12 illustrates proposed pavement treatments for the corridor based on pavement management and asset management considerations. These pavement recommendations were developed by Hennepin County staff and are assumed to be the long-term solution for County Road 47 if reconstruction funding is not available.

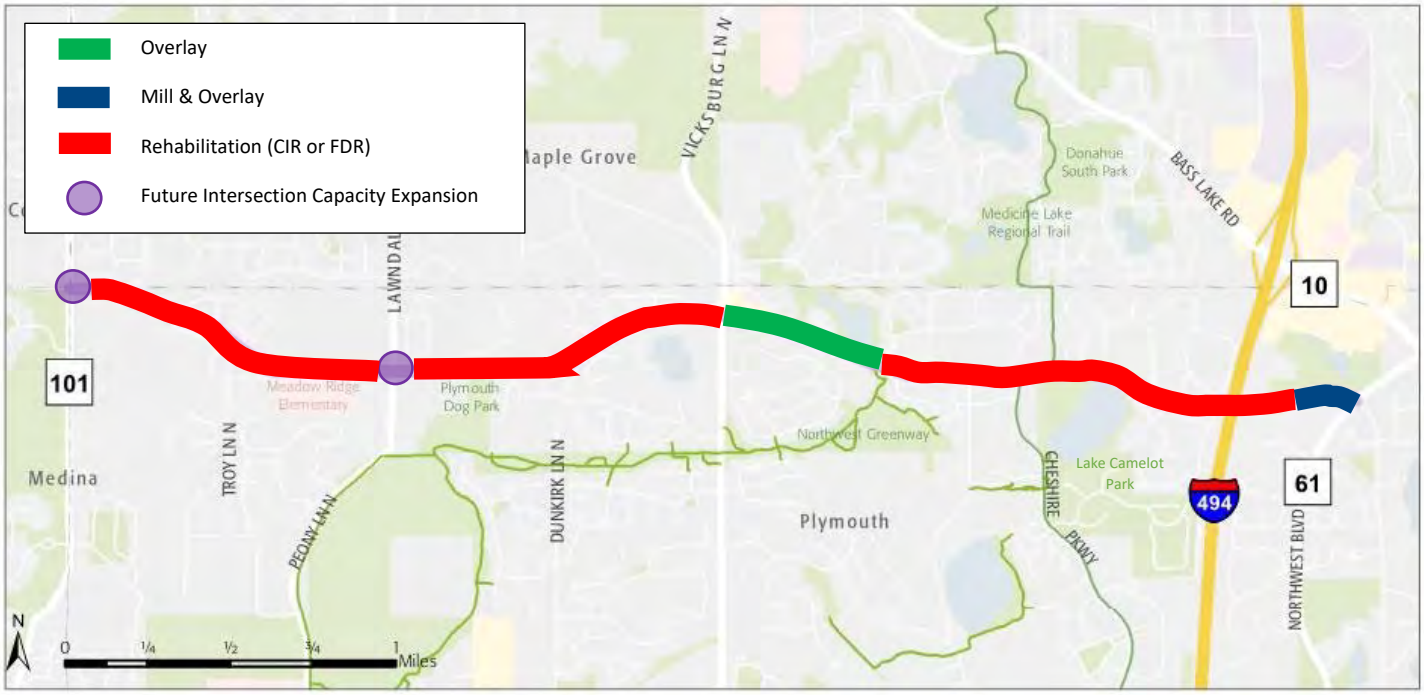


Figure 12: Proposed Pavement Treatments

The areas of poorest pavement condition are located on each end of the corridor; 1) west of Troy Lane and 2) east of Dallas Lane. These segments are anticipated to need attention in the next 3-5 years. Due to soil properties and the older pavement age, these two segments also are recommended for the more extensive rehabilitation efforts mentioned in Chapter 3 (Cold in-place Recycling or Full Depth Reclamation).

The areas recommended for rehabilitation account for about 70% of the corridor lane miles. Less extensive mill and overlay methods are proposed for about 10% of the corridor and the simplest, least expensive pavement overlay would account for the remaining 20% of the corridor.

LONG-TERM VISION RECONSTRUCTION PHASING

Ultimately, some conditions may be best resolved by reconstructing the roadway similar to the concepts in the Long-Term Vision. These existing conditions include narrow travel widths, limited sight-lines, tight horizontal curves, and potential water ponding or drainage issues.

The sections of County Road 47 where these conditions are compounded with other localized access or multi-modal needs should be considered first when selecting priority areas for reconstruction. To that end, the County Road 47 Corridor has been categorized into corridor priority phases based on the presence and frequency of these compounding issues so that if funding becomes available, the sections with the greatest needs will be addressed first.

The corridor phasing priority moves west to east, as shown in Figure 13.

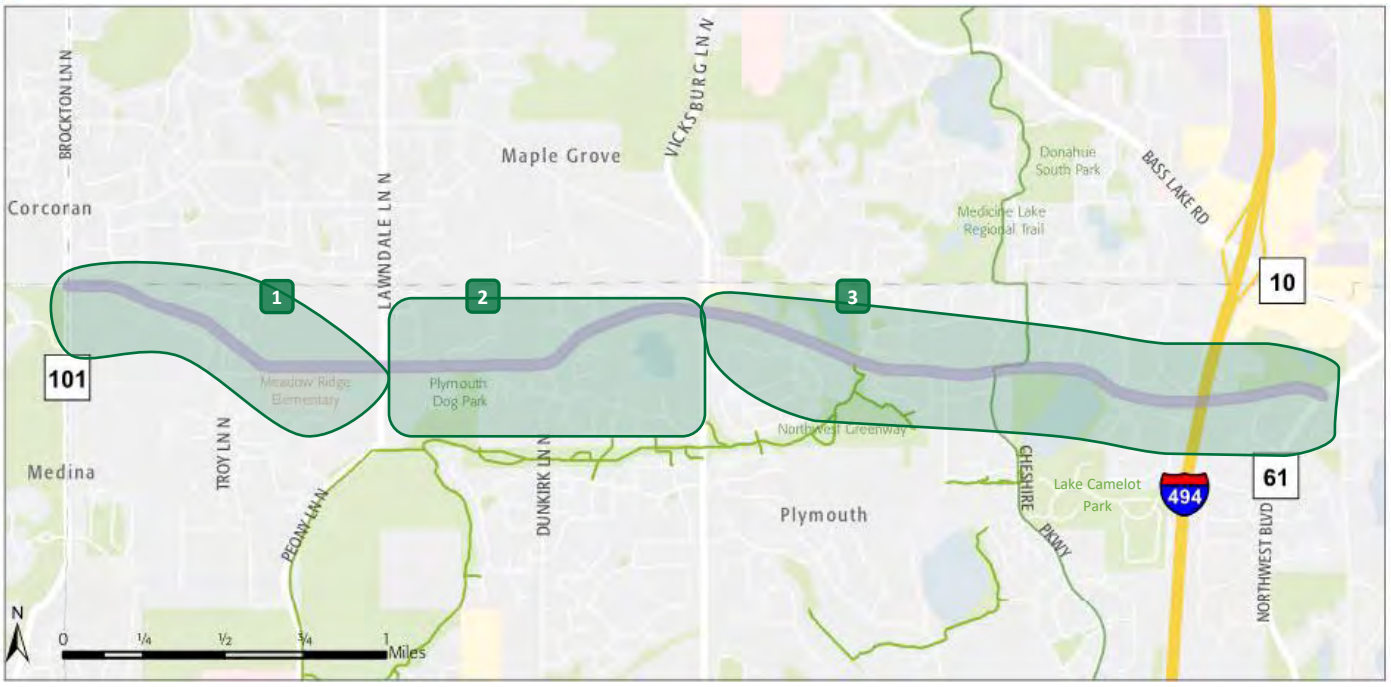


Figure 13: Long-Term Vision Reconstruction Phasing

- Phase 1: County Road 47 between Brockton Lane (County Road 101) & Lawndale Lane
  Reconstructing this section of the corridor will add trail connectivity to Meadow Ridge Elementary, address water ponding and other water retention issues, and improve vehicular access and visibility on the west end of the corridor where new residential developments are anticipated. This section is recommended as the first phase because reconstructing this section is not only opportunistic in that it resolves several compounding issues, but it also has fewer known risks that may impact engineering or funding.
- Phase 2: County Road 47 between Lawndale Lane and Vicksburg Lane
  Reconstructing this section of the corridor will add trail connectivity to subdivisions that currently have no multi-modal access (north of County Road 47) and would create multi-modal access to the Plymouth Dog Park. Additionally, reconstructing this section of the corridor will improve the roadway alignment near Dunkirk Lane and address visibility challenges noted in public engagement. Reconstructing this section will be more costly than the first Phase given that it includes modifications at the crossing of Elm Creek.
- Phase 3: County Road 47 between Vicksburg Lane and Northwest Boulevard (County Road 61)
  This section is feasible for a final reconstruction phase because it may include several short-term improvements while funding for the long-term construction is identified.

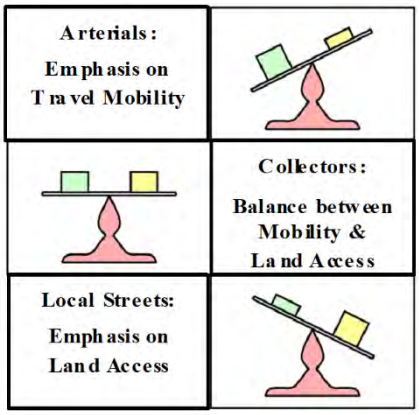
ROADWAY JURISDICTIONAL TRANSFER ITEMS

Jurisdictional changes are sometimes necessary when the function of a roadway changes or other transitions occur over time. Factors such as increased urbanization or significant changes in the roadway system can lead to a need for jurisdictional adjustments. System realignments and adjustments are sometimes prompted by new land development or redevelopment. Jurisdictional transfers within the county system have infrequently occurred over the last 10 years.

Roadway functional classification is a system that assigns the relative importance of a road within the network. It defines how a road functions within the overall system of metropolitan roads and local streets. Roadways and streets are grouped into classes according to the type of service the facility provides (or is intended to provide). The classification process recognizes that regional highways, county

roads and local streets are interdependent. The network needs the proper proportion of these roadway types in order to successfully handle community and neighborhood transportation needs.

The purpose of roadway classification is to ensure that a system of roadways and streets provides a balanced relationship between travel mobility and land access. Mobility may be defined as the ability to efficiently travel along the roadway, while land access may be defined as the ease of being able to connect to a parcel of land. This concept applies to all modes of travel.



The classes that roads and streets are typically categorized into are:

- Principal Arterials (Freeways, Trunk Highways)
- Minor Arterials (County roads and some major local streets)
- Collector Streets (Key local streets and a few minor county roads)
- Local Streets (Typical subdivision streets)

Within the Twin Cities metropolitan area, the Metropolitan Council has been given the authority to administer the functional classification system by the Federal Highway Administration. Appendix A: Hennepin County Functional Classification System Map shows which roadways in Hennepin County fall into each of these categories per the Metropolitan Council. Historically, County Road 47 was functionally classified as a collector street up until 2009 when the city and county requested and received approval for a change in the classification to a B-minor arterial status. The Twin Cities region is unique in that it has sub-classified minor arterials into A and B types. This was done to focus federal funding assistance to the most important arterials in the metropolitan area (i.e. the A-type minor arterials). Appendix I: Metropolitan Council Roadway Functional Classification Guidelines includes the regional guidance for functional classification. This appendix is taken directly from the 2040 Transportation Policy Plan, Appendix D.

For many years, County Road 47 has been considered for possible transfer to the City of Plymouth since it generally has the characteristics more as a city street than as a county roadway. Within the county roadway network, it is a minor component whereas in the local city street system it would be an important part of that system. Although preliminary discussions with the city were held most recently in 2005-2006 to consider a transfer, no mutually agreeable terms could be reached at that time. Figure 14 shows the identification of County Road 47 as a candidate for the transfer of jurisdictional responsibilities to local cities in both the 2030 Hennepin County Transportation Systems Plan (HC-TSP) and the 2040 Mobility Plan.

In July 2018, the county updated its jurisdictional transfer policy (Appendix J: Hennepin County Jurisdictional Transfer Policy). The policy recognizes that it is important that a roadway's function be ideally aligned with the appropriate jurisdiction. The policy notes that misclassifications can lead to inefficiencies within the roadway system as well as funding eligibility restrictions and limitations for roadway improvements and preservation. A jurisdictional transfer may be necessary to optimize system connectivity, eliminate system redundancy, and achieve greater consistency in design guidelines and standards. All these items help to fulfill the county's broader transportation vision and goals.

Map E from 2030 HC-TSP (2011)

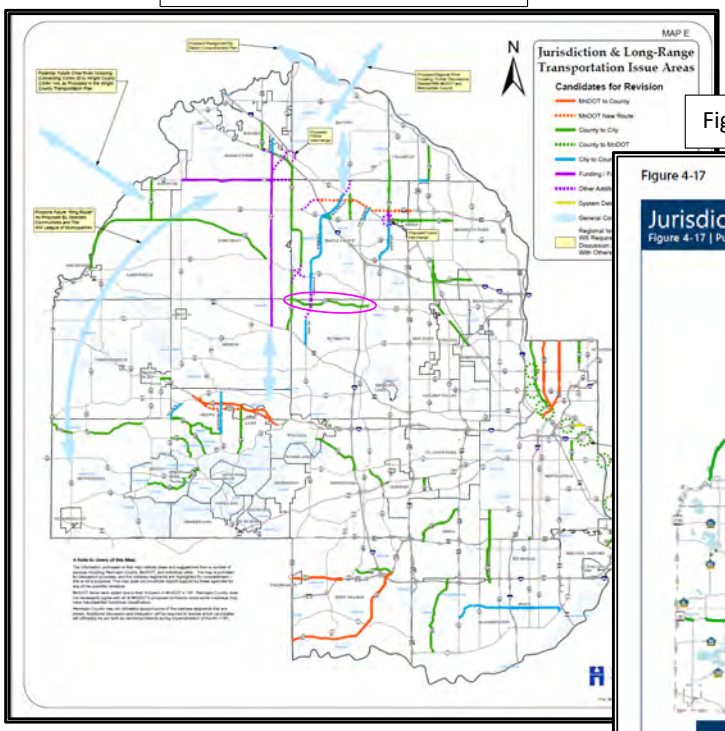


Figure 4-17 from 2040 Mobility Plan (2018)

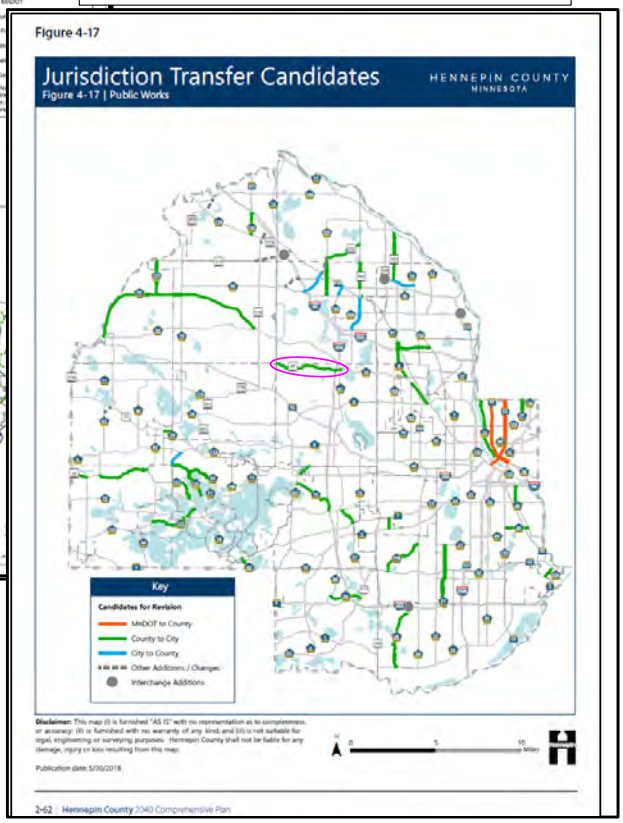


Figure 14: County Road 47 Transfer Identified in Previous Long-Range County Plans

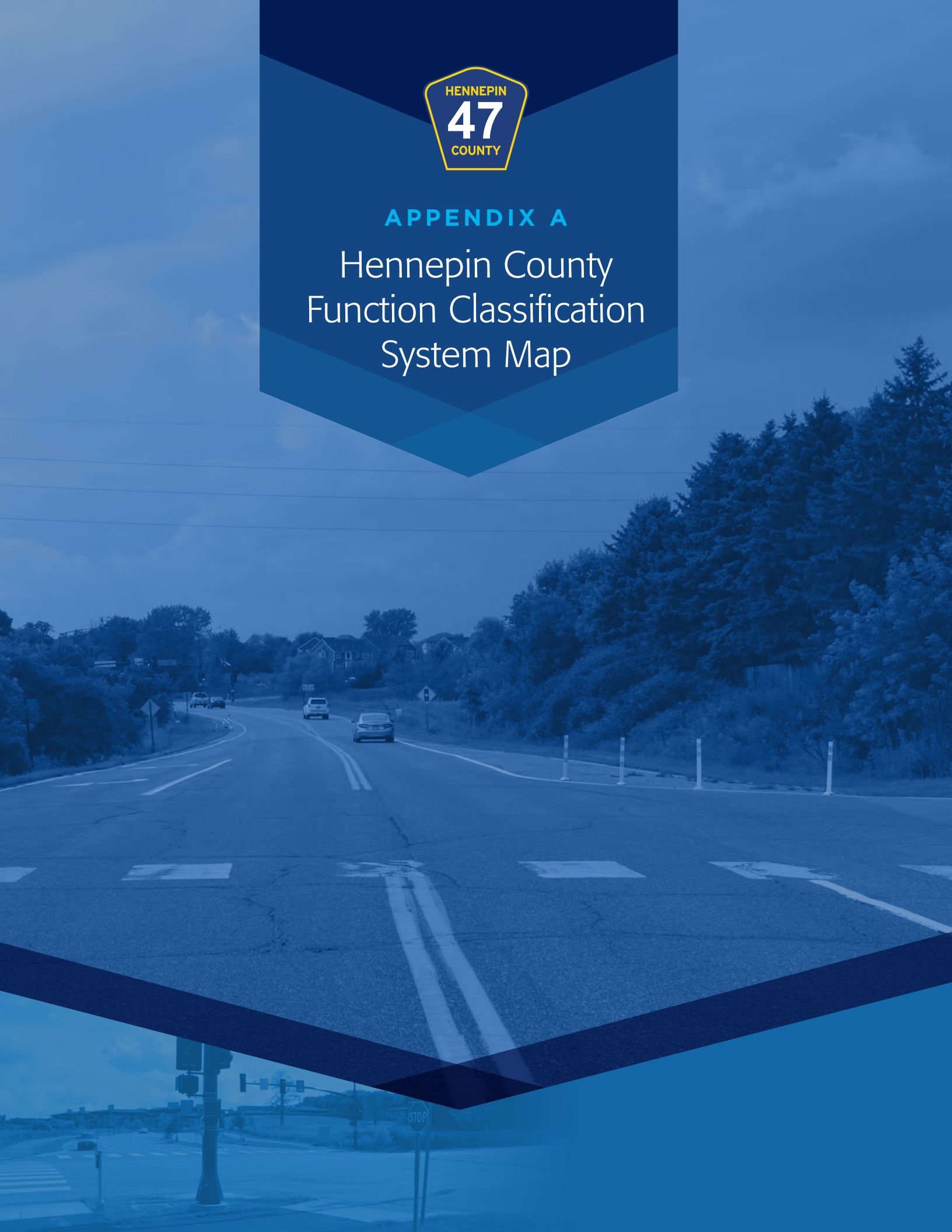
The Hennepin County Jurisdictional Transfer Policy states that roadways transferred from the county to a city need to meet Municipal State Aid (MSA) street requirements and may also need to meet several of the following requirements:

- The road functions as a collector street or a non-regional minor arterial
- The road has experienced significant change in character over time (adjacent land development patterns, traffic volumes, access spacing, changed system connections, etc.)
- The road system continuity or spacing of roads has changed where newly constructed or reconstructed roads have diverted traffic away from the county road
- The road serves to connect municipal land uses such as parks, parkways, or recreational areas
- Development density along the road has increased substantially

Since County Road 47 meets most of these requirements, a jurisdictional transfer should be considered since the city may be in a better position to own and maintain this roadway.

NEXT STEPS

The County Road 47 Corridor is in transition and will continue to be improved. Several near-term improvements can occur first as shown in Figure 11 while funding, design details, and ownership and maintenance of County Road 47 is identified.



APPENDIX A

Hennepin County Function Classification System Map

Figure 4-16


Functional Classification
Figure 4-16 | Public Works
HENNEPIN COUNTY
MINNESOTA
Key
Functional Class
Principal Arterial
A Minor Augmentor
A Minor Reliever
A Minor Expander
A Minor Connector
B Minor
Major Collector
Minor Collector
Status
Existing
Planned
County System
Disclaimer: This map (i) is furnished "AS IS" with no representation as to completeness or accuracy; (ii) is furnished with no warranty of any kind; and (iii) is not suitable for legal, engineering or surveying purposes. Hennepin County shall not be liable for any damage, injury or loss resulting from this map.
Publication date: 5/9/2018
Data Sources: Metropolitan Council
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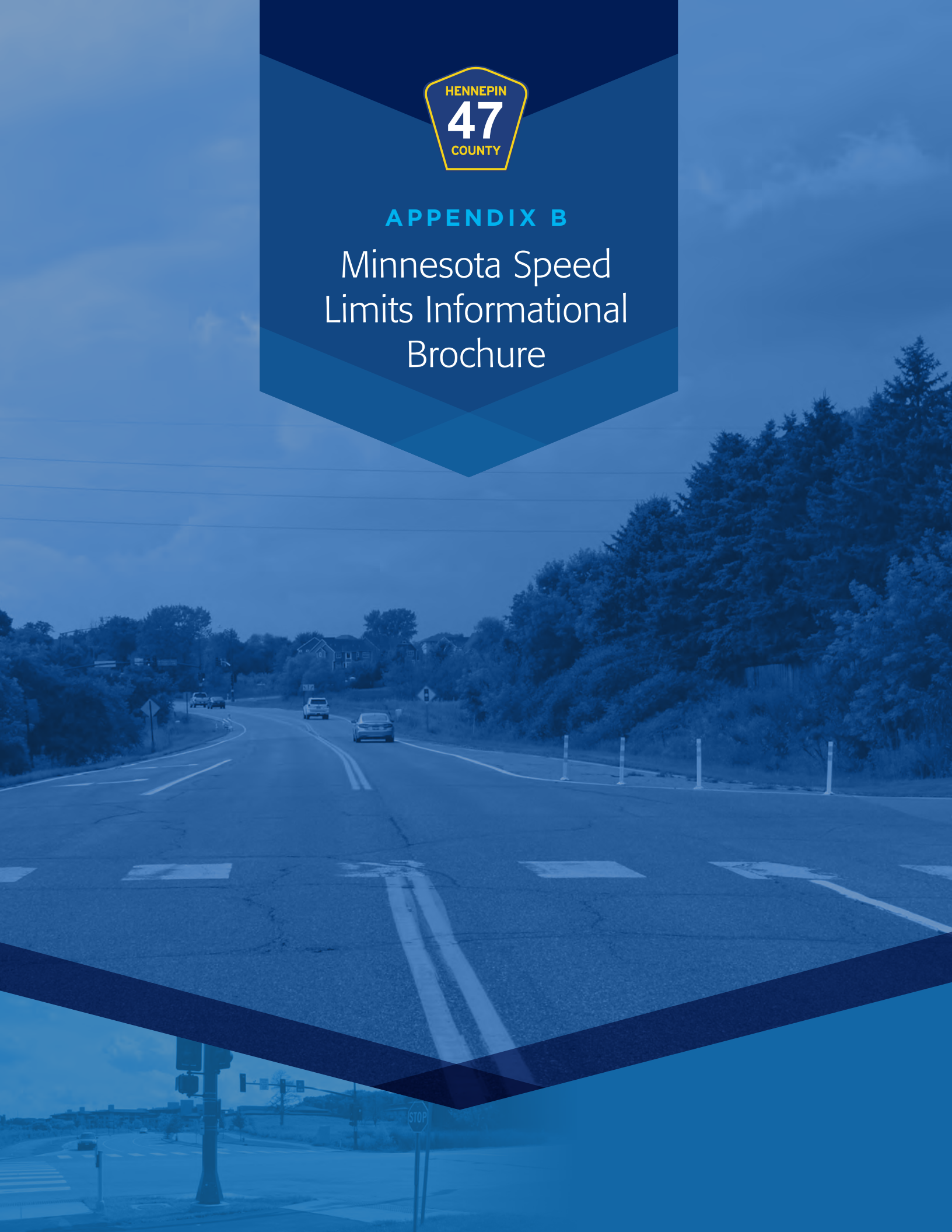


APPENDIX B

Minnesota Speed Limits Informational Brochure

Q&A

Will lowering the speed limit reduce speeds?

No. Studies show there is little change in the speed pattern after the posting of a speed limit. The driver is much more influenced by the roadway conditions.

Will lowering the speed limit reduce crash frequency?

No. Although lowering the speed limit is often seen as a cure-all in preventing crashes, this is not the case. Crashes are most often the result of driver inattention and driver error. However, if a posted speed limit is unrealistically low, it creates a greater speed variance (i.e. some drivers follow the speed limit while most drive the reasonable speed). This speed variance can contribute to crashes.

Why do we even have speed limits?

A uniform speed of vehicles in a traffic flow results in the safest operation. The posted speed limits can keep the traffic flowing smoothly provided the majority of drivers find the speed limits reasonable. To best do this, the limits must be consistent throughout the state. The speed limits also give the motorist an idea of a reasonable speed to drive in an unfamiliar location. The speed limits are used by police officials to identify excessive speeds and curb unreasonable behavior.

Who do I contact?

If you believe that there is a safety concern or an inappropriate speed limit posted, the person to contact depends on the type of road.

Interstates, federal and state highways

For regulatory and advisory speed limits on the trunk highway system, contact the district traffic engineer at your MnDOT district office.

The trunk highway system includes:

- Interstate Highways
- U.S. Highways and
- Minnesota State Highways

Local streets and highways

For these roadways, you may contact your local road authority (county, city, or township).

If you are unable to find the right phone number, call the MnDOT Information center:

Greater Minnesota: 1-800-657-3774
Twin Cities Metro: 651-296-3000

MnDOT Office of Traffic Safety and Technology

For more information, visit: www.mndot.gov/speed/

We all have a stake in A+B

Minnesota *Speed Limits*

What are the legal speed limits?

State law says every road should have a speed limit, whether posted or not. Speed limits are set according to Minnesota State Statute 169.14. The Minnesota Department of Transportation carries out state laws through the development and enforcement of regulations.

Speed limits are set to improve traffic flow and reduce crashes, injuries and fatalities and the costs associated with them. Speed limits are also intended to supplement motorists' judgment in determining speeds. To effectively enforce a law, motorists must believe that the law is reasonable.

Minnesota's speed regulations are based on the same basic speed law that is used in all 50 states: "No person shall drive a vehicle on a highway at a speed greater than is reasonable and prudent under the conditions."

Speed limits are based on the concept that highways can operate safely at set maximum speeds under ideal conditions. In poor weather conditions, at curves or hills and when there are potential hazards such as pedestrians, drivers are required to reduce speeds below the speed limits, whether they are posted or not.

Drivers must also reduce speed when approaching or passing emergency vehicles with emergency lights flashing.

The most common speeds regulated by state law are:

- 10 mph in alleys
- 30 mph on streets in urban districts
- 70 mph on rural interstate highways
- 65 mph on urban interstate highways
- 65 mph on expressways
- 55 mph on other roads

When these speed limits are not the correct value for a specific highway, speed limits may be changed.



Interstates are high design multi-lane divided highways that have controlled access interchanges such as cloverleaf or diamond shaped interchanges. Through traffic on the interstate never has to stop or yield. Examples: I-94 or I-35

Expressways are multi-lane divided highways but they have entries and intersections, sometimes controlled by traffic signals. Some interchanges may exist but they are not the rule. Examples: Highways 10 or Highway 52

What are the types of speed limits?

REGULATORY SPEED LIMIT SIGN

This black and white sign shows the maximum speed that motorist may travel under ideal conditions. It can be a value based on state statute or it must be authorized by the commissioner of transportation.

ADVISORY SPEED SIGN

This black and yellow speed sign is used to advise motorists of a comfortable speed to navigate certain situations. It is used with a warning sign. For example, when traveling on a winding road, the curve warning sign would be used with an advisory speed sign. This sign may be posted by the local road authority on local roads.

SPEED LIMITS IN SCHOOL ZONES

Local authorities may establish school speed limits on local streets, within a school zone, based on the engineering and traffic investigation as directed by the commissioner of transportation. This speed limit is in effect whenever children are present, such as before and after school or during recess. The school sign is black and yellow and the other signs are black and white. Optional fluorescent yellow green may be used for the school sign.


How does MnDOT determine the speed limit?

These factors are considered:

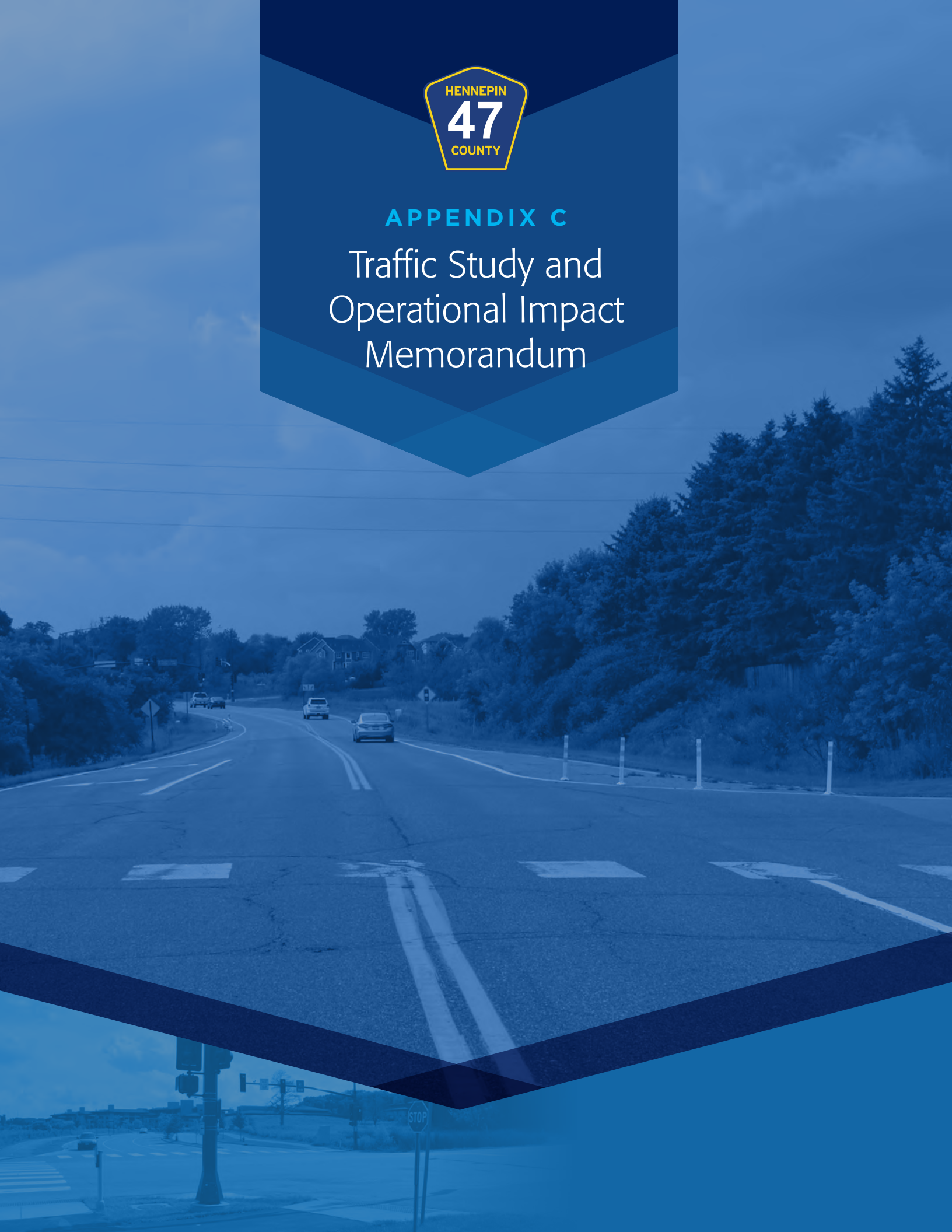
- Road type and condition
- Location and type of access points (intersections, entrances, etc.)
- Sufficient length of roadway (1/4 mile minimum)
- Existing traffic control devices (signs, signals, etc.)
- Crash history
- Traffic volume
- Sight distances (curve, hill, etc.)
- Test drive results
- Speed study

The speed study is the most important part of the traffic investigation. Drivers take many roadway environment factors into consideration when choosing a speed. The speed that the majority of people consider reasonable is an important value. Data is collected by performing radar checks at selected locations on the roadway under ideal driving conditions.

An analysis is done on the results to determine the 85th percentile, which is the value indicating the speed at which most (85%) drivers are traveling. The posted speed limit near the 85th percentile is the maximum safe and reasonable speed. Studies show that traveling faster or slower than this value can increase the chances of being in a crash.

Engineering judgment is the most important tool. The traffic investigator must use knowledge of nationally accepted principles combined with experience to assign the safe speed.





APPENDIX C

Traffic Study and Operational Impact Memorandum

Memorandum

To: Michael Thompson, P.E. - City of Plymouth
Bob Byers, P.E. - Hennepin County

From: Brandon Bourdon, P.E. - Kimley-Horn and Associates, Inc.

Date: October 8, 2019

Re: County Road 47 Corridor Study – Traffic Safety and Operations Memo

BACKGROUND INFORMATION

Kimley-Horn has been selected by the City of Plymouth and Hennepin County to complete a corridor study along County Road 47 (CR 47) to address safety issues, assess multimodal improvements along the corridor, and evaluate solutions to provide capacity for future traffic growth. The extents of the CR 47 corridor considered in this study are from CSAH 101 (Brockton Lane N) on the west end to CSAH 61 (Northwest Boulevard) on the east end.

The traffic analysis will aid in determining what improvements could be implemented to resolve potential existing and future operational challenges. While it has been acknowledged that immediate funding is not currently available to reconstruct the corridor, short-term and long-term improvements for the CR 47 corridor can be determined for when the funding becomes available.

The traffic analysis is being performed at the signalized intersections along the corridor to evaluate any existing issues as well as determine potential issues that could arise in the future due to traffic growth. The analysis will document recommended intersection control and geometry to accommodate the anticipated growth along the corridor. This memorandum provides a summary of the existing conditions along the corridor, a crash analysis based on historic crash data, future traffic volume forecasting, future operating no-action conditions, potential mitigations along the corridor, and future operations with the recommended mitigations.

EXISTING (2017) CONDITIONS

CR 47 is an east-west roadway that connects CSAH 101 (Brockton Lane N) with CSAH 61 (Northwest Boulevard) between CSAH 10 (Bass Lake Road - to the north) and Schmidt Lake Road (to the south). CR 47 is currently an undivided two-lane roadway that is classified as a B Minor Roadway according to the Hennepin County Functional Class Map. At many of the residential access points along the corridor, CR 47 widens to accommodate either left and/or right-turn lanes or bypass lanes.

The study corridor is approximately 4 miles long and has posted speed limits of either 45 or 50 mph. The existing Average Daily Traffic (ADT) along CR 47 is 4,150 vehicles per day (vpd) between CSAH 101 and Vicksburg Lane, 8,100 vpd between Vicksburg Lane and Yucca Lane, and 9,100 vpd between Yucca Lane and CSAH 61.

Along the corridor, five (5) study intersections were considered in the traffic analysis. All five of the study intersections are signalized and are listed below.

- CR 47 & CSAH 101 (Brockton Lane N)
- CR 47 & Lawndale Lane
- CR 47 & Vicksburg Lane
- CR 47 & Cheshire Parkway/Fernbrook Lane N
- CR 47 & CSAH 61 (Northwest Boulevard)

Exhibit 1 in **Appendix 1** provides the existing lane geometry and intersection control for the study intersections listed above.

Traffic Counts

Turning movement counts from Hennepin County's Multi Modal Counts Map were used to complete the traffic operations analysis for the corridor. Turning movement counts were collected at each of the study intersections between April 2017 and July 2017. The 2017 turning movement counts were assumed to represent the existing conditions for the traffic analysis. Based on the turning movement counts, an AM & PM peak hour and peak hour factor (PHF) were determined for the entire CR 47 network. The AM peak hour was determined to be 7:15AM to 8:15AM with a PHF of 0.91. The PM peak hour was determined to be 4:45PM to 5:45PM with a PHF of 0.96.

Exhibit 2 in Appendix 1 provides a summary of the turning movement volumes during the weekday AM and PM peak hours for Existing (2017) Conditions.

Existing Traffic Operations

An intersection capacity analysis was performed at the study intersections using the weekday AM and PM peak hour turning movement volumes. The capacity analysis was performed using Synchro/SimTraffic software to determine the current Level of Service (LOS) for the study intersections. The LOS boundaries, as documented in the *Highway Capacity Manual* for signalized and unsignalized intersections, are provided in **Table 1**. For the purposes of this study, LOS A through LOS D are considered acceptable service levels for both signalized and unsignalized intersections.

Table 1: Level of Service Boundaries

Level of Service	Average Control Delay per Vehicle (sec/veh)		Description
	Signalized	Unsignalized	
A	≤ 10	≤ 10	Minimal control delay; traffic operates at primarily free-flow conditions; unimpeded movement within traffic stream.
B	> 10 and ≤ 20	> 10 and ≤ 15	Minor control delay at signalized intersections; traffic operates at a fairly unimpeded level with slightly restricted movement within traffic stream.
C	> 20 and ≤ 35	> 15 and ≤ 25	Moderate delays at intersections with satisfactory to good traffic flow. Light congestion; infrequent backups on critical approaches.
D	> 35 and ≤ 55	> 25 and ≤ 35	Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No long-standing lines formed.
E	> 55 and ≤ 80	> 35 and ≤ 50	Heavy traffic flow condition. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow.
F	> 80	> 50	Unstable traffic flow. Heavy congestion. Traffic moves in forced flow condition. Average delays greater than one minute highly probable. Total breakdown.

Based on the Existing (2017) Conditions capacity analysis, all intersections are currently operating at an acceptable LOS during the weekday AM and PM peak hours. All individual movements are operating at LOS D or better for both the AM and PM peak hours except for the following movements:

- **CR 47 & Cheshire Parkway/Fernbrook Lane N –** In the PM peak hour, the southbound through movement operates at LOS E. However, this movement serves less than five vehicles. The overall intersection operates at LOS A in both the AM and PM peak hours.
- **CR 47 & CSAH 61 –** The westbound through movement operates at LOS E in the PM peak hour. Additionally, the westbound through movement operates at LOS E in the AM peak hour and the westbound left-turn movement operates at LOS E in the PM peak hour, but these two movements only serve approximately ten vehicles each. The intersection operates at LOS C in both peak hours.

For Existing (2017) Conditions, the overall LOS for each study intersection as well as the LOS for the individual movements that are currently operating at an undesirable LOS (LOS E or LOS F) are shown in **Exhibit 3** in Appendix 1. The SimTraffic reports are included in **Appendix 2**.

CRASH ANALYSIS

Historical crash data was obtained for a five (5) year period – 2014 to 2018. Crash data from 2014 and 2015 was acquired through MnDOT's Crash Mapping Analysis Tool (MnCMAT) and crash data from 2016 to 2018 was provided by the City of Plymouth. There was a total of 86 crashes along the corridor between 2014 and 2018 – 51 of which occurred at the study intersections. Of the total 86 crashes, there were 0 fatalities, 3 incapacitating injuries, 11 non-incapacitating injuries, 11 possible injuries, and 61 property damage only crashes.

Crash rates provide an indication of the number of crashes that can be expected per entering vehicle over a given analysis period. Using MnDOT's *2015 Intersection Green Sheets*, intersection crash rates were calculated for the intersections along the corridor and compared to statewide average values to develop a critical index. When the critical index is greater than 1.0, the intersection is operating outside of the expected, normal range. Intersection crash rates, critical rates, and critical indices for total crashes at the study intersections are included in **Table 2**.

The total crash critical index at all five study intersections is below 1.00 which is within the expected, normal range.

Table 2: Study Intersection Crash Summary

Intersection on CR 47	Total Crashes	Crash Type					Daily Entering Volume	Total Crash Rate		
		PD	C	B	A	K		Observed	Critical Rate	Critical Index
CSAH 101	4	3	1	0	0	0	11,175	0.20	0.78	0.26
Lawndale Lane	12	10	1	1	0	0	10,625	0.62	0.96	0.65
Vicksburg Lane	15	12	0	2	1	0	14,475	0.57	0.73	0.78
Cheshire Parkway/ Fernbrook Lane N	1	1	0	0	0	0	11,275	0.05	0.78	0.06
CSAH 61	19	14	2	2	1	0	20,375	0.51	0.83	0.61

In addition to the crashes at the study intersections, crashes have also occurred throughout the CR 47 corridor at other locations for the 2014 to 2018 analysis period. In particular, there are four main concentrations of crashes at non-signalized locations as discussed below.

- **East of Troy Lane:** At this location, approximately 25% of the crashes are ran off road crashes and 75% of the crashes are right angle crashes.
- **Dunkirk Lane:** For the crashes at this location, 33% are rear-end, 33% are right angle, and 33% are sideswipe.
- **Quantico Lane N:** For the crashes at this location, 33% are head-on, 33% are right angle, and 33% are rear-end.

- **East of Cheshire Parkway/Fernwood Lane N:** For the stretch of CR 47 east of Cheshire Parkway, approximately 50% of the crashes are right angle crashes and 50% of the crashes are rear-end crashes.

All crashes along the CR 47 corridor during the analysis period (2014-2018) are detailed in **Exhibit 4** in Appendix 1 and are classified as either a property damage only crash, a possible injury crash, a minor injury crash, or a serious injury crash.

Non-signalized intersection crashes are split between angle crashes, rear-ends, and front-to-front, sideswipe, and ran off road crashes. These locations will be evaluated further using public feedback and geometry consideration.

The majority of crashes on CR 47 did not result in injuries – over the last five years, seven out of every ten crashes on CR 47 were property damage only. The most common type of crashes in the corridor were turning-related, followed by rear-end crashes. The leading cause of crashes was failure to yield the right of way followed by distracted driving. Additionally, over half of the crashes in the corridor occurred at the study intersections, but crashes that occurred between the study intersections were more severe crashes.

FUTURE (2040) CONDITIONS

A Future (2040) Conditions analysis was performed to determine future conditions at the study intersections based on forecasted traffic growth. This will help develop potential future improvements at the study intersections.

Future (2040) Conditions Volume Forecast

To forecast future growth along the CR 47 corridor, both forecasted ADTs (2040) and recent ADTs (2015) were used to determine appropriate growth rates. **Table 2** shows the 2015 ADTs and forecasted 2040 ADTs from the City of Plymouth 2040 Comprehensive Plan as well as the corresponding growth rate.

Table 2: Recent and Forecasted ADTs

#	Count Location	Count Year (ADT)		Growth Rate
		2015	2040	
1	CSAH 101 (South of CR 47)	6,800	9,300	1.4%
2	CR 47 (East of CSAH 101)	3,900	5,300	1.3%
3	Lawndale Lane (North of CR 47)	5,100	8,000	2.0%
4	Vicksburg Lane (North of CR 47)	7,200	8,100	0.5%
5	Vicksburg Lane (South of CR 47)	11,200	12,100	0.3%
6	CR 47 (East of Cheshire Parkway/Fernbrook Lane N)	6,200	7,800	1.0%
7	CR 47 (West of CSAH 61)	7,200	14,900	3.2%

Due to the varying ADTs along the CR 47 corridor, a different growth rate was used at each of the five study intersections. The growth rates were chosen based on knowledge of the corridor area and the recent and forecasted traffic volumes in the 2040 Comprehensive Plan. **Table 3** shows the growth rates for the study intersections.

Table 3: Intersection Growth Rates

Study Intersection	Intersection Growth Rate
CR 47 & CSAH 101	1.5%
CR 47 & Lawndale Lane	2.0%
CR 47 & Vicksburg Lane	1.0%
CR 47 & Cheshire Parkway/Fernbrook Lane N	1.0%
CR 47 & CSAH 61	1.5%

Exhibit 5 in Appendix 1 provides Future (2040) Conditions forecasted turning movement volumes, which are based on the 2017 existing turning movement counts grown to 2040 using the growth rates in Table 3.

Future (2040) No-Action Conditions Capacity Analysis

To determine baseline future conditions, a Future (2040) No-Action Conditions capacity analysis was performed. The analysis was performed using Synchro/SimTraffic and assumes existing intersection geometry with forecasted Future (2040) Conditions traffic volumes (as shown in Exhibit 5 in Appendix 1) and accordingly adjusted signal timings.

Based on the analysis, one intersection is anticipated to operate at LOS F during the AM peak hour, and several movements are expected to operate at LOS E or F during the AM and PM peak hours as described below.

- **CR 47 & CSAH 101 –** In both the AM and PM peak hour, the westbound left-turn movement is anticipated to operate at LOS E. The overall intersection is anticipated to operate at LOS C in the AM peak hour and the PM peak hour.
- **CR 47 & Lawndale Lane –** In the AM peak hour, the eastbound left-turn and right-turn movements are expected to operate at LOS E, and the eastbound through movement is expected to operate at LOS F. Additionally, the westbound left-turn and the southbound left-turn, through, and right-turn movements are anticipated to operate at LOS F during the AM peak hour. The intersection is anticipated to operate at LOS F in the AM peak hour and LOS D in the PM peak hour.
- **CR 47 & CSAH 61 –** The westbound through movement is anticipated to operate at LOS E in both peak hours. In the AM peak hour, the westbound left-turn movement is also expected to operate at LOS E. However, the westbound movement is anticipated to have a relatively low traffic volume. The intersection is expected to operate at LOS C in the AM peak hour and LOS D in the PM peak hour.

Exhibit 6 in Appendix 1 provides a summary of the overall intersection LOS for the Future (2040) No-Action Conditions capacity analysis. Individual intersection movements with an undesirable LOS (LOS E or F) are also shown.

Future (2040) Conditions Proposed Roadway and Intersection Improvements

Based on the results of the Future (2040) No-Action Conditions Capacity Analysis, several roadway and intersection improvements were analyzed to mitigate potential traffic issues. The following improvements were analyzed in the Future (2040) Mitigated Conditions and are recommended along the corridor at the study intersections.

- **CR 47 & CSAH 101 –** Addition of dedicated left and right-turn lanes for the east and west approaches with storage lengths of approximately 250 feet. This will improve the safety of the intersection by reducing the risk of rear end crashes and will improve the flow of traffic by removing left-turning vehicles that block through vehicles. The signal timing at the intersection was modified to allow for permissive/protected left-turns for the eastbound and westbound approaches from the left turn lanes.
- **CR 47 & Lawndale Lane –** Addition of one through lane in both the north and south directions. The additional through lanes should be extended at least one quarter mile in each direction from

the intersection, otherwise the northbound and southbound through lanes will not be utilized equally resulting in underutilization of the lane being added to mitigate the undesirable LOS.

- **CR 47 & Vicksburg Lane –** Signal timing optimized.
- **CR 47 & Cheshire Parkway/Fernbrook Lane N –** Signal timing optimized.
- **CR 47 & CSAH 61 –** Signal timing optimized.

Exhibit 7 in Appendix 1 shows the proposed roadway and intersection improvements for the CR 47 corridor at the study intersections. The SimTraffic reports are included in Appendix 2.

Additionally, queue lengths for Future (2040) Conditions were analyzed for both through movements and turning movements to determine if the projected traffic growth would impact the capacity of any of the existing turn lanes. Several of the projected 95th percentile queue lengths for turning movements at the study intersections are anticipated to extend beyond the existing storage lengths. It is recommended that the storage length of the following existing turn lanes be extended to accommodate the projected future traffic growth:

- **CR 47 & Lawndale Lane –** The westbound left-turn storage length should be extended from 210 feet to approximately 300 feet.
- **CR 47 & Vicksburg Lane –** The eastbound left-turn and right-turn storage lengths should be extended from approximately 110 feet and 130 feet respectively to approximately 250 feet.
- **CR 47 & CSAH 61 –** The eastbound left-turn lane storage length should be extended from 280 feet to 450 feet, and the eastbound right-turn lane should be extended from 200 feet to 300 feet.

Future (2040) Mitigated Conditions Capacity Analysis

A capacity analysis for both peak hours was performed using Synchro/SimTraffic software to determine the operating conditions at the study intersections for Future (2040) Mitigated Conditions. The analysis was based on the proposed roadway and intersection improvements shown in Exhibit 7 in Appendix 1 and the Future (2040) Conditions forecasted traffic volumes as shown in Exhibit 5 in Appendix 1.

It is anticipated that all the study intersections will operate at an overall LOS D or better in both the AM and PM peak hour with the proposed improvements. The SimTraffic reports are included in Appendix 2. One of the study intersections experienced individual movement delay that exceeded the desirable LOS D threshold:

- **CR 47 & CSAH 61 –** In the AM peak hour, the westbound through movement is expected to operate at LOS E, however this movement serves approximately 15 vehicles in the AM peak hour. In the PM peak hour, the westbound left-turn and through movements are also expected to operate at LOS E. However, the westbound left-turn movement serves approximately 15 vehicles in the PM peak hour. In both the AM and PM peak hours, the overall intersection is anticipated to operate at LOS C.

Exhibit 8 in Appendix 1 provides a summary of LOS for the Future (2040) Mitigated Conditions capacity analysis. In addition to the overall intersection LOS, the individual intersection movements with an undesirable LOS (E or F) are also shown.

CONCLUSION

A traffic operations analysis was performed for the CR 47 study corridor from CSAH 101 on the west to CSAH 61 on the east. The preceding memorandum provided an analysis of the operations for Existing (2017) Conditions, an analysis of crash data from the previous five years, and an assessment of operations for Future (2040) No-Action Conditions and Future (2040) Mitigated Conditions.

The Existing (2017) Conditions intersection capacity analysis showed that all five study intersections are operating at an acceptable LOS (LOS D or better). Based on the Future (2040) No-Action Conditions analysis, one of the intersections and multiple intersection movements are anticipated to operate at LOS E or LOS F and show the need for intersection improvements.

Following is a list of intersection geometrics recommendations to ensure the study intersections will operate at an acceptable LOS into the future:

- **CR 47 & CSAH 101** – It is recommended to provide dedicated left and right-turn lanes with approximately 250 feet of storage length for both the eastbound and westbound approaches on CR 47. Additionally, permissive/protected phasing should be implemented for the eastbound and westbound left-turns.
- **CR 47 & Lawndale Lane –** It is recommended to provide an additional through lane in both the north and the south direction for approximately one quarter mile upstream and downstream of the intersection. Additionally, the westbound left-turn storage length should be extended to approximately 300 feet.
- **CR 47 & Vicksburg Lane –** The eastbound left-turn and right-turn storage lengths should be extended to approximately 250 feet.
- **CR 47 & Cheshire Parkway/Fernbrook Lane N –** There are no proposed changes at this intersection.
- **CR 47 & CSAH 61 –** The storage length of the eastbound left-turn lane should be extended to a length of 450 feet, and the eastbound right-turn lane should be extended to 300 feet. Signal timing should also be monitored and evaluated in the future to ensure optimal throughput at the intersection due to the unique split phasing.

After implementation of the recommended improvements, the study intersections are anticipated to operate at an acceptable LOS of D or better in both the AM and PM peak hours for Future (2040) Mitigated Conditions.

Traffic Memo Appendices

Appendix A1. Exhibits

Appendix A2. SimTraffic Reports

Appendix A1: Traffic Exhibits

1. Existing (2017) Conditions Geometry and Intersection Control
2. Existing (2017) Conditions Peak Hour Traffic Volumes
3. Existing (2017) Conditions LOS Summary
4. Corridor Crash Map
5. Future (2040) Conditions Peak Hour Traffic Volumes
6. Future (2040) No-Action Conditions LOS Summary
7. Proposed Roadway and Intersection Improvements
8. Future (2040) Mitigated Conditions LOS Summary

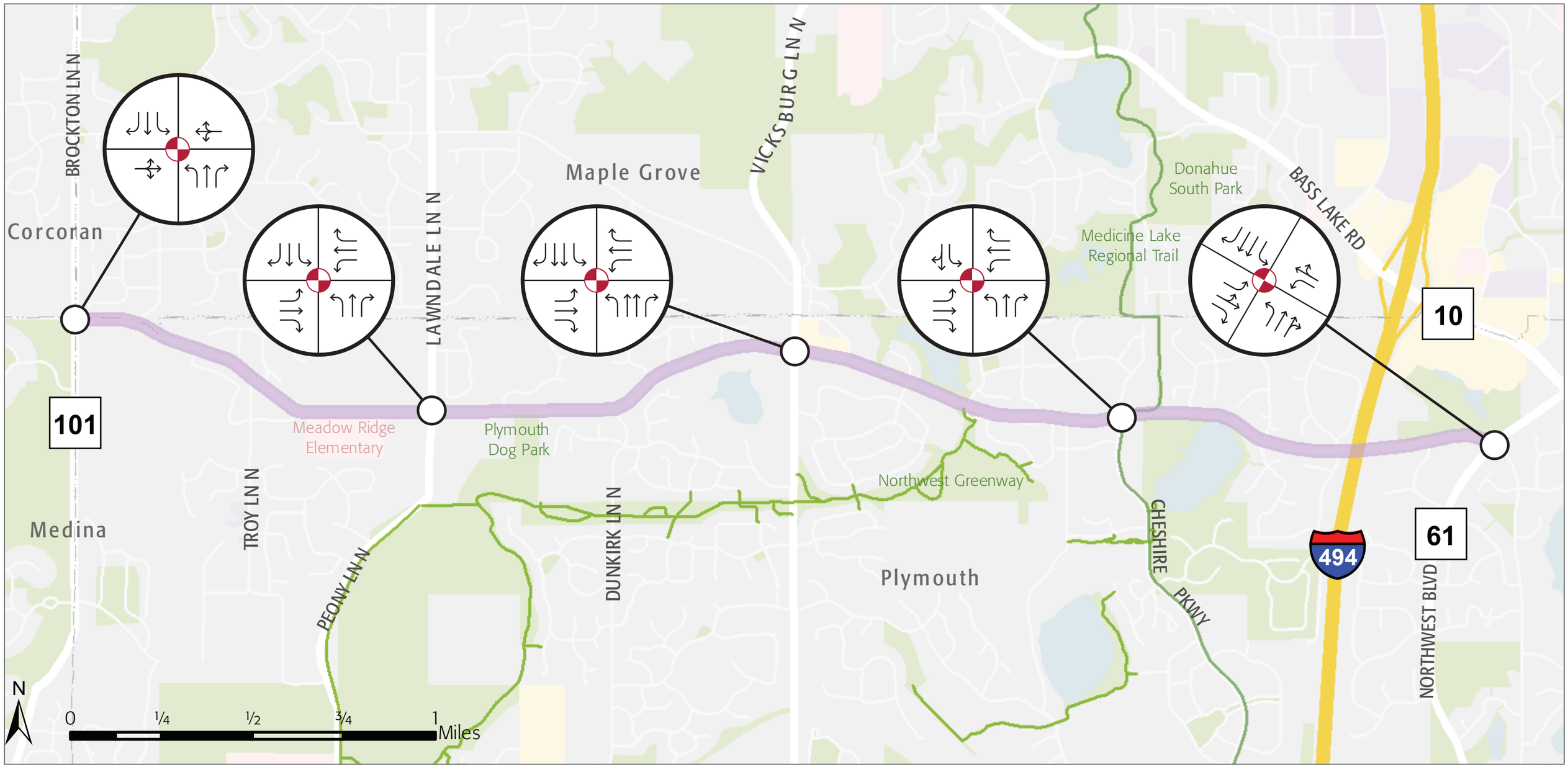


EXHIBIT 1

EXISTING (2017) CONDITIONS GEOMETRY AND INTERSECTION CONTROL

Kimley»Horn

LEGEND

- Study Corridor
- Study Intersection
- Existing Signal Control

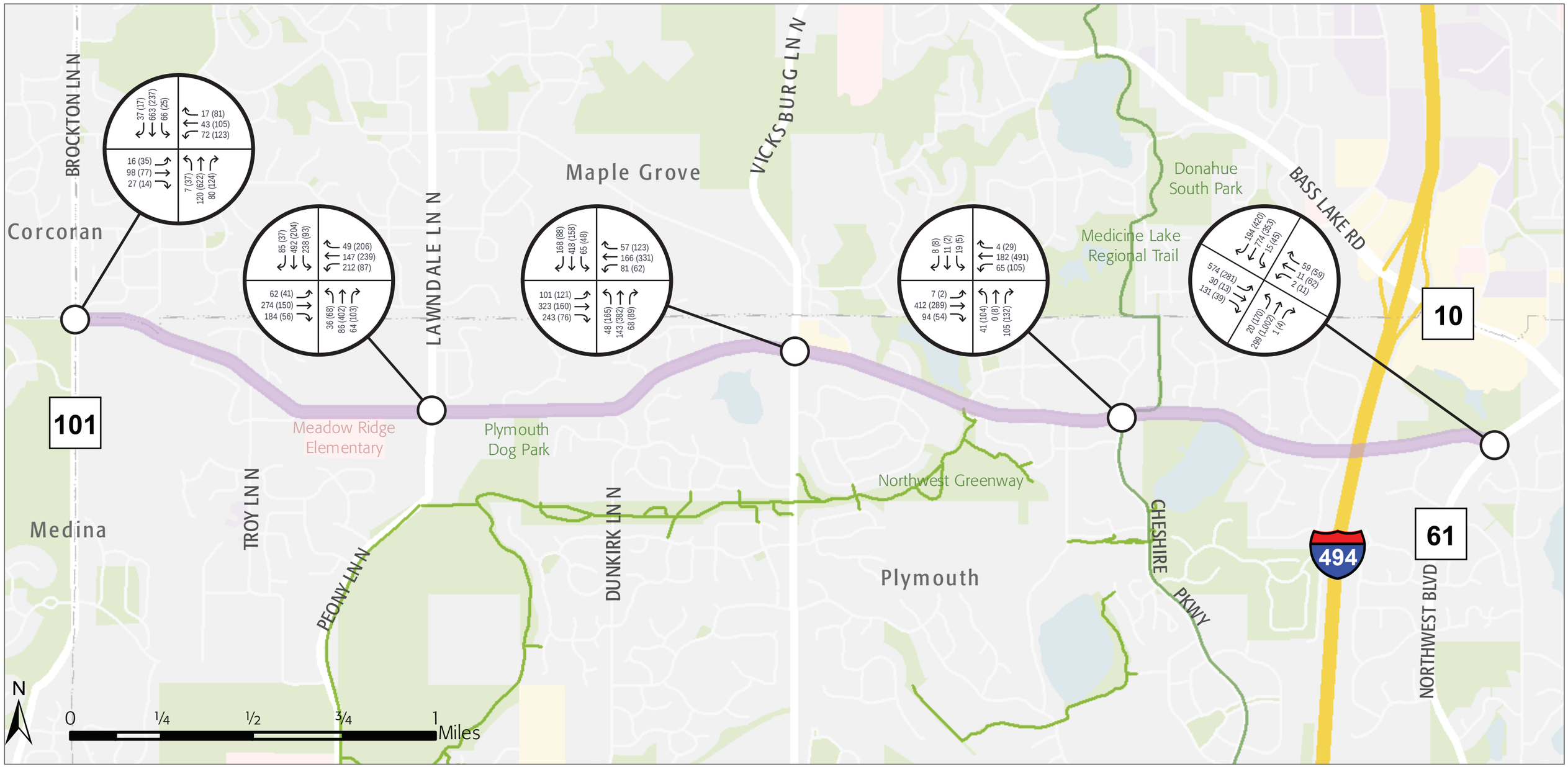


EXHIBIT 2

EXISTING (2017) CONDITIONS PEAK HOUR TRAFFIC VOLUMES

Kimley»Horn

LEGEND

- Study Corridor
- Study Intersection
- XX (XX) AM (PM) Peak Hour Volumes

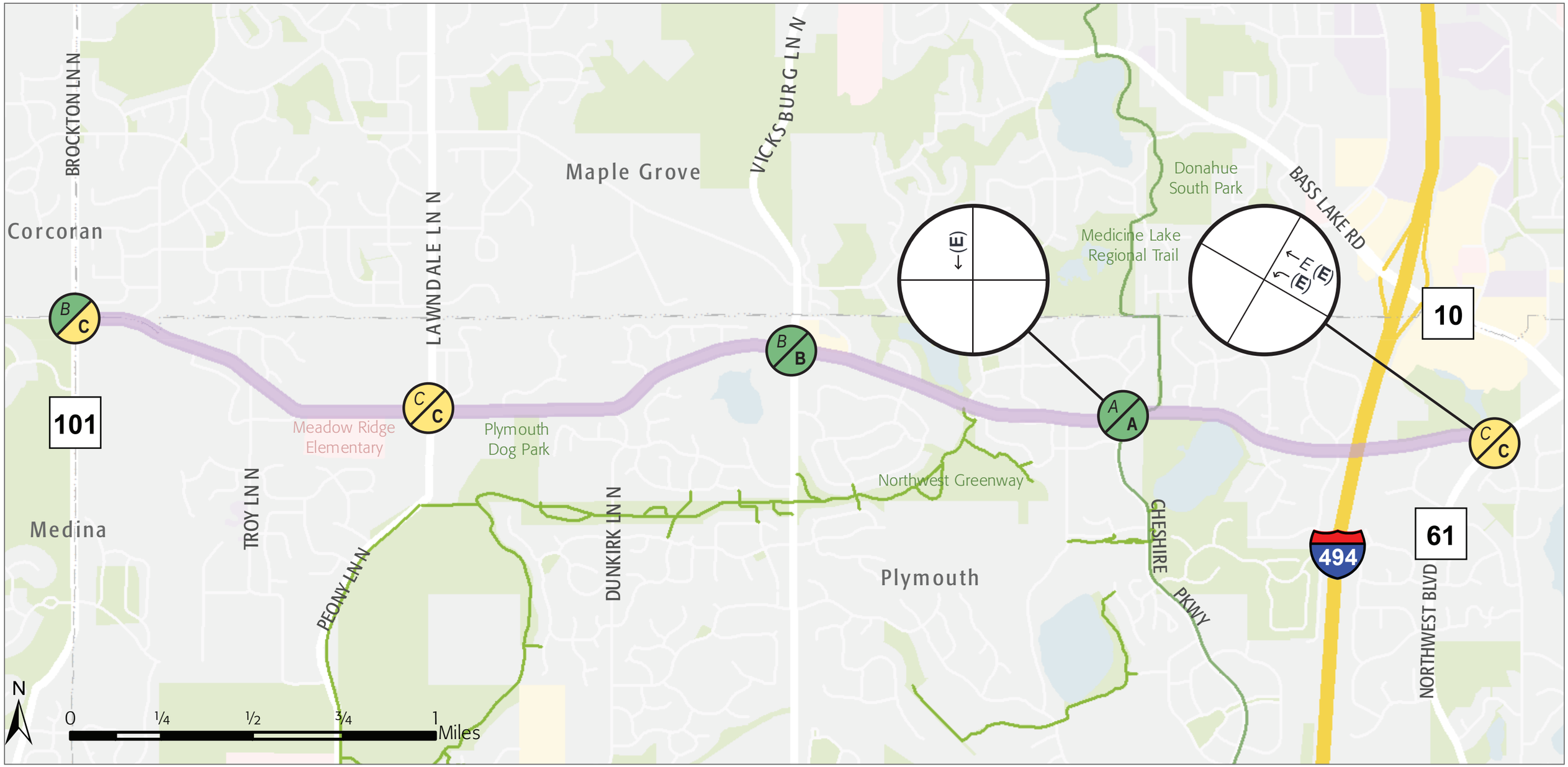


EXHIBIT 3

EXISTING (2017) CONDITIONS LOS SUMMARY

Kimley»Horn

LEGEND

- Study Corridor
- A / A — Study Intersection AM / PM Peak Hour LOS
- *XX* (**XX**) AM (PM) Peak Hour Movement LOS (only E or F shown)

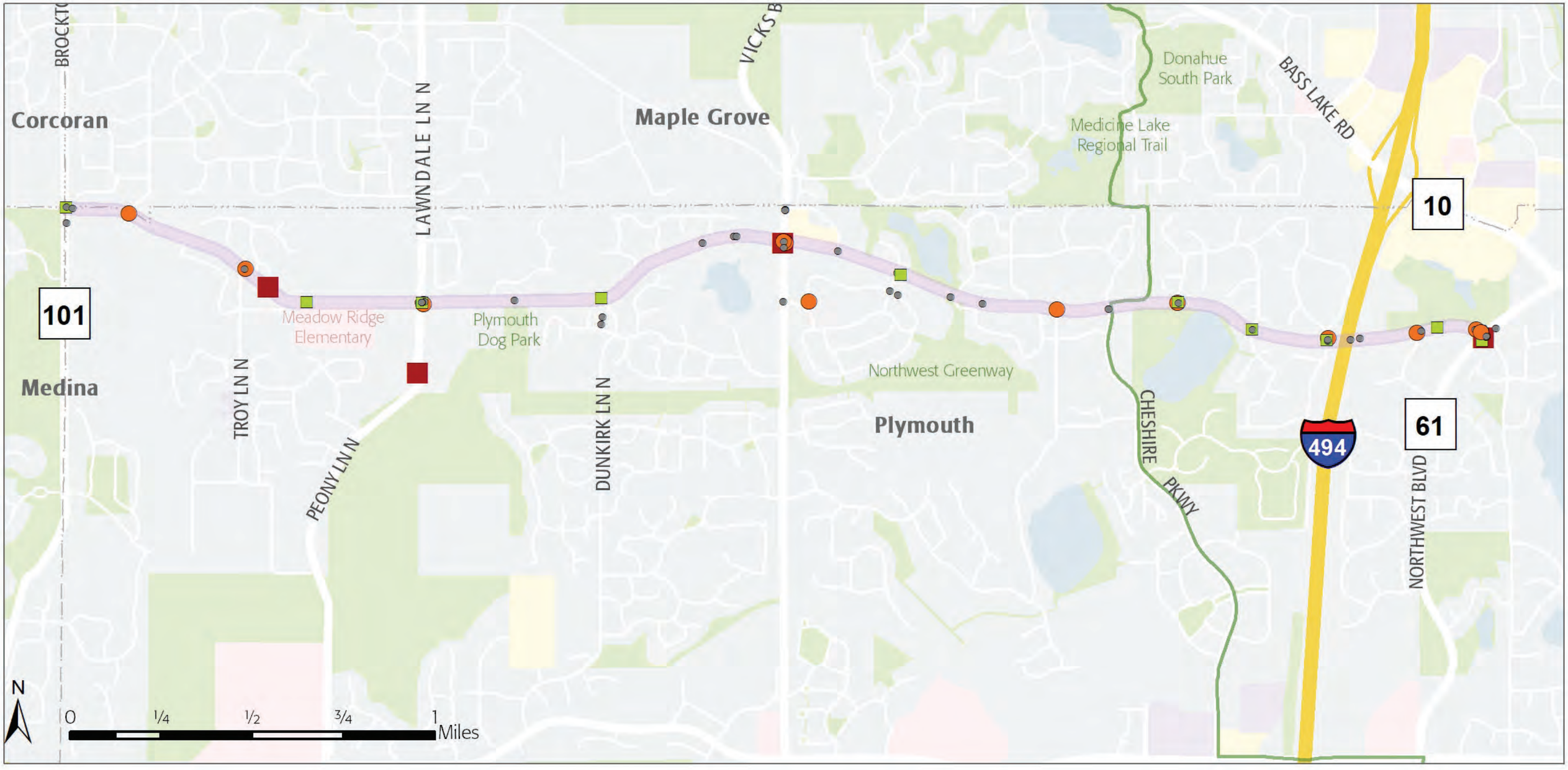


EXHIBIT 4
CORRIDOR CRASH MAP

LEGEND

- Study Corridor
- Property Damage Only Crash
- Possible Injury Crash
- Minor Injury Crash
- Serious Injury Crash

Kimley»Horn

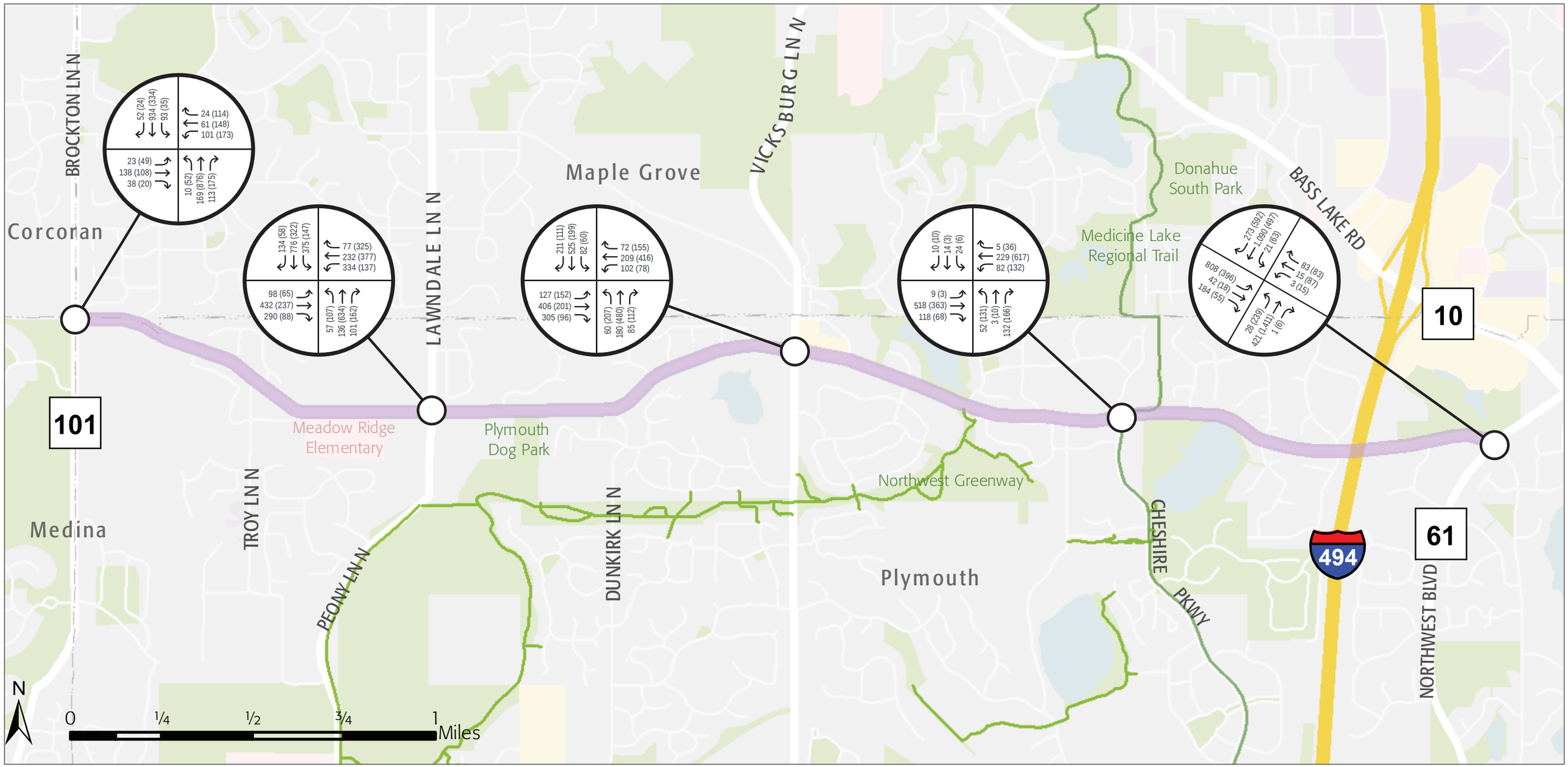


EXHIBIT 5

FUTURE (2040) CONDITIONS PEAK HOUR TRAFFIC VOLUMES

Kimley»Horn

LEGEND

- Study Corridor
- Study Intersection
- XX (XX) AM (PM) Peak Hour Volumes

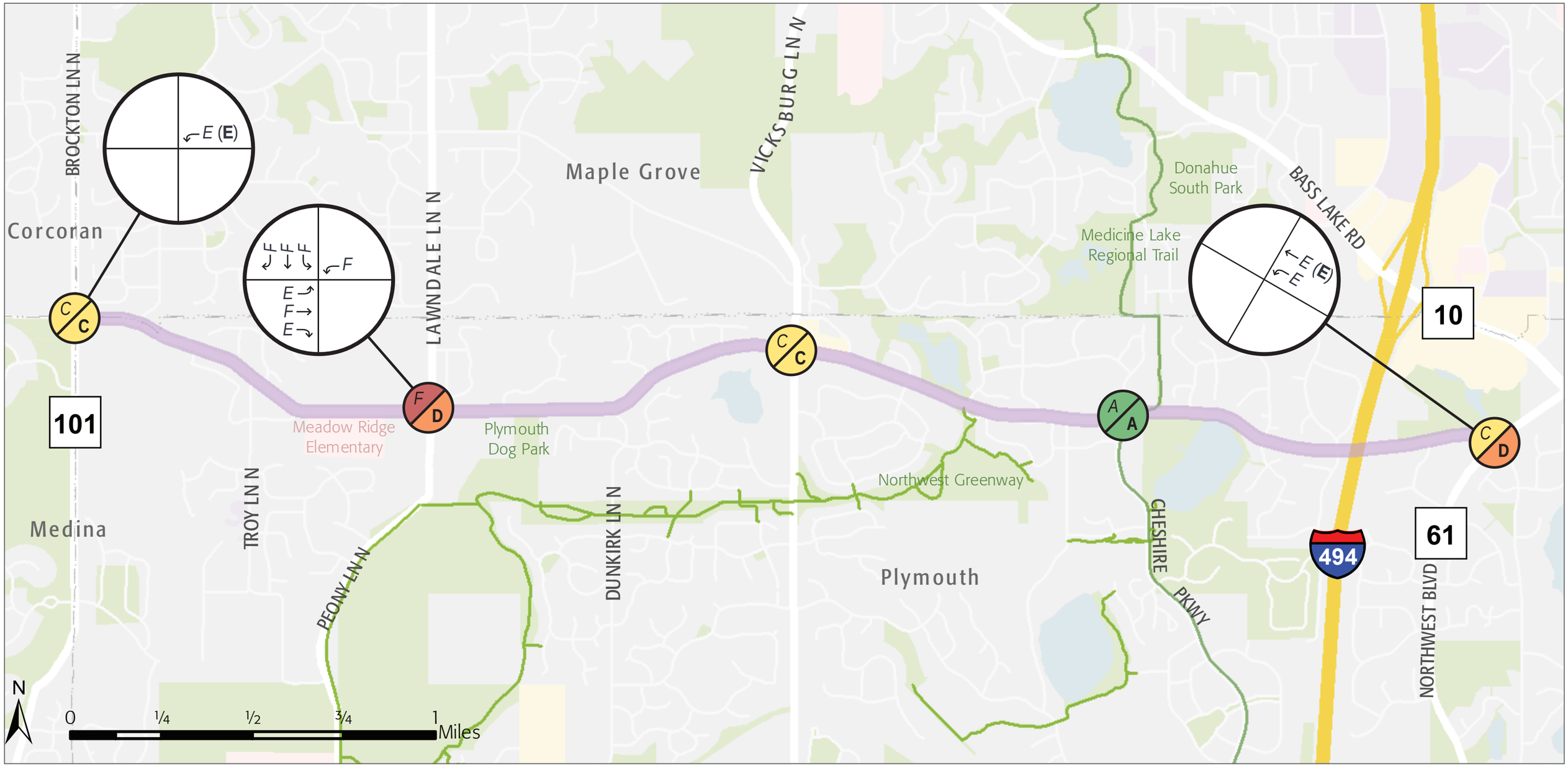


EXHIBIT 6
FUTURE (2040) NO-ACTION CONDITIONS LOS SUMMARY

Kimley»Horn

LEGEND

- Study Corridor
- A / A — Study Intersection AM / PM Peak Hour LOS
- *XX* (**XX**) AM (PM) Peak Hour Movement LOS (only E or F shown)

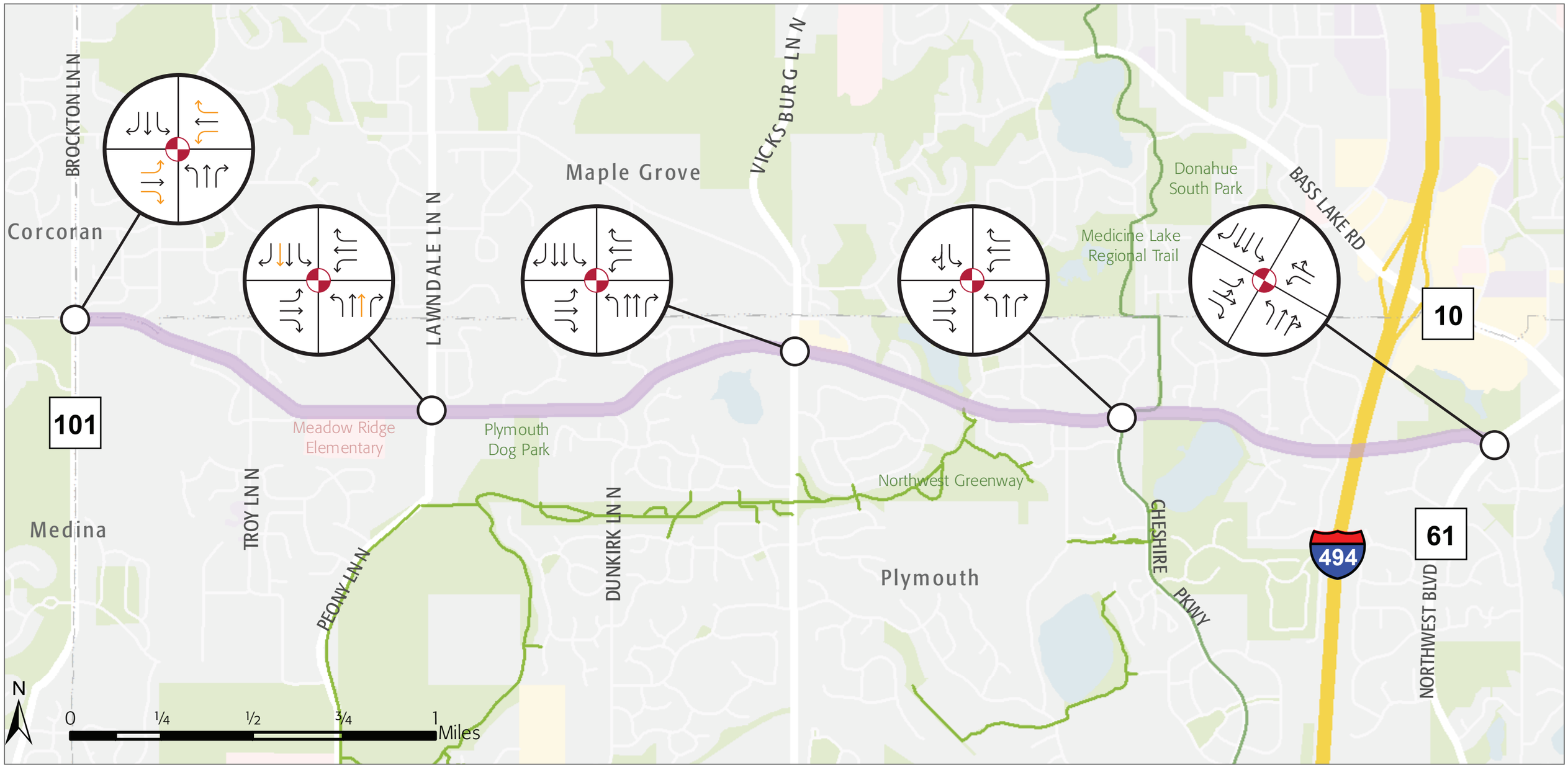


EXHIBIT 7

PROPOSED ROADWAY AND INTERSECTION IMPROVEMENTS

Kimley»Horn

LEGEND

- Study Corridor
- Study Intersection
- Existing Signal Control
- Proposed Improvement

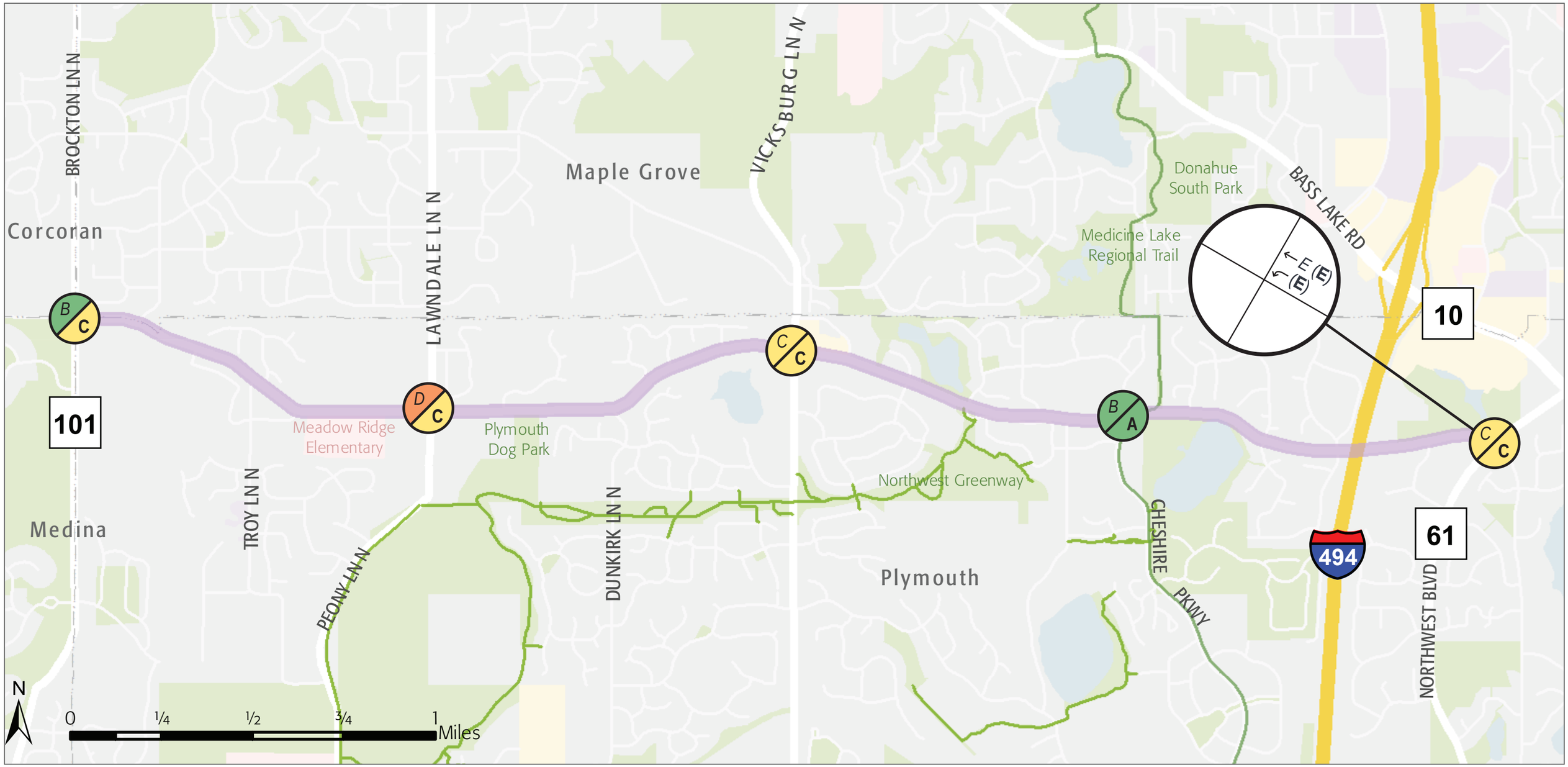


EXHIBIT 8
FUTURE (2040) MITIGATED CONDITIONS LOS SUMMARY

Kimley»Horn

LEGEND

- Study Corridor
- A / A — Study Intersection AM / PM Peak Hour LOS
- *XX* (**XX**) — AM (PM) Peak Hour Movement LOS (only E or F shown)

Appendix A2: SimTraffic Reports

- Existing (2017) Conditions SimTraffic Reports
- Future (2040) No-Action Conditions SimTraffic Reports
- Future (2040) Mitigated Conditions SimTraffic Reports

1: Brockton Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.0
Denied Del/Veh (s)	0.3	0.2	3.5	0.0	0.0	0.0	3.8	0.3	3.8	3.1	0.9	2.9
Total Delay (hr)	0.2	1.1	0.1	0.9	0.6	0.0	0.0	0.3	0.0	0.1	1.8	0.0
Total Del/Veh (s)	42.4	40.9	11.1	43.3	13.5	4.3	12.5	7.8	1.8	8.0	9.9	2.0
Vehicles Entered	18	95	30	71	173	19	7	124	77	63	644	36
Vehicles Exited	19	97	29	72	173	19	7	124	77	63	644	35
Hourly Exit Rate	19	97	29	72	173	19	7	124	77	63	644	35
Input Volume	16	98	27	72	179	17	7	120	80	66	663	37
% of Volume	121	99	107	100	97	113	97	103	97	95	97	94

1: Brockton Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.4
Denied Del/Veh (s)	1.0
Total Delay (hr)	5.2
Total Del/Veh (s)	13.8
Vehicles Entered	1357
Vehicles Exited	1359
Hourly Exit Rate	1359
Input Volume	1382
% of Volume	98

2: Lawndale Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1
Denied Del/Veh (s)	2.3	0.5	2.1	0.3	0.0	0.3	3.9	0.4	3.8	3.2	1.3	3.3
Total Delay (hr)	0.3	2.3	0.8	1.4	0.8	0.1	0.3	0.9	0.1	2.3	6.0	0.6
Total Del/Veh (s)	17.6	29.5	15.3	24.1	20.8	5.0	33.6	40.7	7.3	33.8	44.3	29.2
Vehicles Entered	63	276	176	204	145	52	35	82	66	237	483	78
Vehicles Exited	63	278	176	203	144	51	36	82	65	240	484	79
Hourly Exit Rate	63	278	176	203	144	51	36	82	65	240	484	79
Input Volume	62	274	184	212	147	49	36	86	64	238	492	85
% of Volume	102	101	96	96	98	105	99	95	102	101	98	93

2: Lawndale Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.8
Denied Del/Veh (s)	1.5
Total Delay (hr)	16.1
Total Del/Veh (s)	30.0
Vehicles Entered	1897
Vehicles Exited	1901
Hourly Exit Rate	1901
Input Volume	1929
% of Volume	99

3: Vicksburg Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1
Denied Del/Veh (s)	0.7	0.2	0.6	1.1	0.1	1.0	3.6	0.1	3.8	3.0	0.2	3.1
Total Delay (hr)	0.5	2.0	0.5	0.3	0.9	0.0	0.3	1.2	0.1	0.5	3.4	0.3
Total Del/Veh (s)	18.3	21.3	7.3	15.5	19.6	3.0	26.9	29.8	5.5	26.2	28.9	5.9
Vehicles Entered	104	324	246	75	162	55	43	143	66	67	418	167
Vehicles Exited	103	326	247	75	162	55	43	144	66	66	418	168
Hourly Exit Rate	103	326	247	75	162	55	43	144	66	66	418	168
Input Volume	101	323	243	81	166	57	48	143	68	65	418	168
% of Volume	102	101	102	93	97	96	90	101	97	102	100	100

3: Vicksburg Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.5
Denied Del/Veh (s)	0.9
Total Delay (hr)	10.0
Total Del/Veh (s)	19.1
Vehicles Entered	1870
Vehicles Exited	1873
Hourly Exit Rate	1873
Input Volume	1880
% of Volume	100

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	0.3	0.1	0.5	0.5	0.0	0.4	3.9	3.9	4.2	0.1	0.1	0.8
Total Delay (hr)	0.0	0.8	0.1	0.1	0.2	0.0	0.3	0.2	0.1	0.2	0.0	2.0
Total Del/Veh (s)	3.7	6.8	2.1	7.3	3.5	2.0	29.1	6.7	34.1	42.5	7.8	7.6
Vehicles Entered	6	419	97	55	176	4	40	113	14	14	7	945
Vehicles Exited	7	419	97	55	175	4	40	112	14	14	7	944
Hourly Exit Rate	7	419	97	55	175	4	40	112	14	14	7	944
Input Volume	7	412	94	65	182	4	41	105	19	11	8	949
% of Volume	97	102	103	85	96	100	97	106	75	124	85	99

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Denied Del/Veh (s)	0.3	0.3	1.4	3.7	0.1	0.2	3.3	0.1	0.1	3.0	0.3	2.6
Total Delay (hr)	7.7	0.5	0.4	0.0	0.2	0.3	0.1	1.1	0.0	0.0	3.9	0.1
Total Del/Veh (s)	45.5	53.3	11.9	52.0	68.4	16.6	19.3	13.4	8.8	10.2	17.8	2.8
Vehicles Entered	596	30	134	2	10	58	23	290	2	12	784	177
Vehicles Exited	599	31	133	2	10	58	23	289	2	12	786	177
Hourly Exit Rate	599	31	133	2	10	58	23	289	2	12	786	177
Input Volume	574	30	131	2	11	59	20	299	1	15	774	194
% of Volume	104	103	101	100	89	98	116	97	200	79	102	91

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.6
Total Delay (hr)	14.4
Total Del/Veh (s)	24.3
Vehicles Entered	2118
Vehicles Exited	2122
Hourly Exit Rate	2122
Input Volume	2110
% of Volume	101

Total Network Performance

Denied Delay (hr)	2.2
Denied Del/Veh (s)	1.5
Total Delay (hr)	54.4
Total Del/Veh (s)	35.9
Vehicles Entered	5288
Vehicles Exited	5313
Hourly Exit Rate	5313
Input Volume	19797
% of Volume	27

Intersection: 1: Brockton Ln & CR 47

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	165	98	152	56	23	98	40	65	260	21
Average Queue (ft)	70	15	78	9	5	22	10	20	105	3
95th Queue (ft)	135	51	143	34	19	62	28	50	209	14
Link Distance (ft)	1494		874			745			819	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		40		40	320		290	260		275
Storage Blk Time (%)	33	1	38	0					0	
Queuing Penalty (veh)	9	1	6	0					0	

Intersection: 2: Lawndale Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	85	301	164	155	156	53	68	125	53	369	505	240
Average Queue (ft)	27	122	57	87	59	13	24	50	17	146	268	46
95th Queue (ft)	62	224	120	147	122	36	57	101	40	299	432	140
Link Distance (ft)		1387			2581			849			724	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	275		275	210		200	310		330	260		340
Storage Blk Time (%)		0			0					0	11	
Queuing Penalty (veh)		1			0					2	37	

Intersection: 3: Vicksburg Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	169	214	116	97	172	37	66	137	96	56	108	222
Average Queue (ft)	54	112	44	33	62	12	30	62	22	25	42	132
95th Queue (ft)	123	204	88	72	131	29	59	116	69	49	87	199
Link Distance (ft)		1407			2485			816	816			678
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	110		130	280		270	300			300	210	
Storage Blk Time (%)	0	10	0									0
Queuing Penalty (veh)	2	34	0									0

Intersection: 3: Vicksburg Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	172	90
Average Queue (ft)	84	41
95th Queue (ft)	161	70
Link Distance (ft)	678	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		210
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Cheshire Pkwy/Fernbrook Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	R	L	TR
Maximum Queue (ft)	17	166	50	56	65	11	64	73	42	47
Average Queue (ft)	1	51	11	18	17	0	22	21	9	10
95th Queue (ft)	8	128	35	46	51	5	53	54	32	32
Link Distance (ft)		905			2147					627
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250		260	375		200	210	170	100	
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 5: Northwest Blvd & CR 47/Pineview Ln

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	L	TR	L	T	TR	L	T	T	R
Maximum Queue (ft)	335	378	300	22	122	48	148	110	29	276	246	52
Average Queue (ft)	198	229	67	2	40	14	64	25	4	159	113	15
95th Queue (ft)	294	331	196	11	85	36	127	76	18	259	228	39
Link Distance (ft)		892			553		707	707		832	832	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	280		200	140		350			280			325
Storage Blk Time (%)	1	17			0					0		
Queuing Penalty (veh)	4	71			0					0		

Network Summary

Network wide Queuing Penalty: 169

1: Brockton Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.3	3.5	0.0	0.0	0.0	3.1	1.0	3.2	3.8	0.3	3.7
Total Delay (hr)	0.4	0.9	0.0	1.9	1.9	0.5	0.1	2.2	0.1	0.1	0.6	0.0
Total Del/Veh (s)	43.0	43.0	6.6	51.1	43.5	20.6	10.3	13.3	2.7	13.8	9.1	1.9
Vehicles Entered	36	77	17	127	151	83	34	593	123	26	247	18
Vehicles Exited	37	78	17	129	152	83	34	593	124	26	247	18
Hourly Exit Rate	37	78	17	129	152	83	34	593	124	26	247	18
Input Volume	35	77	14	123	140	81	37	622	124	25	237	17
% of Volume	105	101	119	105	108	102	93	95	100	103	104	104

1: Brockton Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.4
Denied Del/Veh (s)	0.9
Total Delay (hr)	8.7
Total Del/Veh (s)	20.3
Vehicles Entered	1532
Vehicles Exited	1538
Hourly Exit Rate	1538
Input Volume	1532
% of Volume	100

2: Lawndale Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0
Denied Del/Veh (s)	0.3	0.0	0.3	0.0	0.0	0.0	3.3	0.9	3.2	3.6	0.6	3.6
Total Delay (hr)	0.2	0.9	0.1	0.5	1.7	0.8	0.5	4.6	0.1	0.7	1.6	0.2
Total Del/Veh (s)	18.3	20.9	3.9	19.9	19.5	13.1	25.4	39.9	5.2	29.1	28.6	25.1
Vehicles Entered	41	158	46	89	300	209	74	413	101	90	202	34
Vehicles Exited	40	157	46	88	301	209	75	413	100	92	202	35
Hourly Exit Rate	40	157	46	88	301	209	75	413	100	92	202	35
Input Volume	41	150	56	87	291	206	68	402	103	93	204	37
% of Volume	98	104	83	101	103	101	110	103	97	99	99	95

2: Lawndale Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.4
Denied Del/Veh (s)	0.9
Total Delay (hr)	12.0
Total Del/Veh (s)	24.3
Vehicles Entered	1757
Vehicles Exited	1758
Hourly Exit Rate	1758
Input Volume	1738
% of Volume	101

3: Vicksburg Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.1	0.0	0.1	0.0	0.0	0.0	3.1	0.2	3.1	3.7	0.1	3.7
Total Delay (hr)	0.5	0.7	0.1	0.3	2.2	0.2	1.2	2.9	0.1	0.4	1.5	0.2
Total Del/Veh (s)	16.7	17.0	3.5	16.4	18.2	6.9	27.2	28.5	5.1	30.1	34.5	7.4
Vehicles Entered	117	156	84	64	425	118	163	363	93	48	159	97
Vehicles Exited	116	156	84	64	423	118	163	364	92	48	157	97
Hourly Exit Rate	116	156	84	64	423	118	163	364	92	48	157	97
Input Volume	121	160	76	62	418	123	165	382	89	48	158	88
% of Volume	96	97	111	103	101	96	99	95	103	101	99	110

3: Vicksburg Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.4
Denied Del/Veh (s)	0.8
Total Delay (hr)	10.5
Total Del/Veh (s)	19.9
Vehicles Entered	1887
Vehicles Exited	1882
Hourly Exit Rate	1882
Input Volume	1891
% of Volume	100

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	0.8	0.1	0.5	0.0	0.0	0.0	3.8	0.7	3.8	3.9	0.1	0.1
Total Delay (hr)	0.0	0.6	0.0	0.3	0.9	0.0	0.9	0.1	0.2	0.1	0.0	0.0
Total Del/Veh (s)	7.7	6.9	1.9	8.7	6.3	3.6	31.1	23.7	5.0	41.8	67.0	7.3
Vehicles Entered	1	287	55	111	524	29	100	8	133	5	2	9
Vehicles Exited	1	289	55	112	525	29	100	8	132	5	2	9
Hourly Exit Rate	1	289	55	112	525	29	100	8	132	5	2	9
Input Volume	2	289	54	105	518	29	104	8	132	5	2	8
% of Volume	50	100	102	106	101	99	96	100	100	100	100	112

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.8
Total Delay (hr)	3.0
Total Del/Veh (s)	8.5
Vehicles Entered	1264
Vehicles Exited	1267
Hourly Exit Rate	1267
Input Volume	1257
% of Volume	101

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.4
Denied Del/Veh (s)	0.0	0.0	0.0	3.8	0.2	0.3	2.6	0.3	0.6	2.9	0.3	3.1
Total Delay (hr)	4.3	0.2	0.1	0.2	1.3	0.6	1.0	4.7	0.0	0.2	2.0	0.8
Total Del/Veh (s)	54.1	8.3	6.4	67.2	67.4	38.2	21.6	16.6	14.8	18.4	19.5	7.1
Vehicles Entered	283	104	37	13	66	61	168	1002	5	39	364	429
Vehicles Exited	275	105	37	13	65	59	171	1016	5	39	368	429
Hourly Exit Rate	275	105	37	13	65	59	171	1016	5	39	368	429
Input Volume	281	106	39	11	62	59	170	1002	4	45	353	420
% of Volume	98	99	95	118	105	100	100	101	125	87	104	102

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	All
Denied Delay (hr)	0.7
Denied Del/Veh (s)	0.9
Total Delay (hr)	15.5
Total Del/Veh (s)	21.5
Vehicles Entered	2571
Vehicles Exited	2582
Hourly Exit Rate	2582
Input Volume	2552
% of Volume	101

Total Network Performance

Denied Delay (hr)	2.1
Denied Del/Veh (s)	1.4
Total Delay (hr)	56.9
Total Del/Veh (s)	36.1
Vehicles Entered	5487
Vehicles Exited	5508
Hourly Exit Rate	5508
Input Volume	21694
% of Volume	25

Intersection: 1: Brockton Ln & CR 47

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	179	52	360	160	52	313	50	39	146	18
Average Queue (ft)	76	8	175	73	14	140	16	12	50	2
95th Queue (ft)	148	34	314	179	39	259	39	35	109	12
Link Distance (ft)	1494		874			745			819	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		40		40	320		290	260		275
Storage Blk Time (%)	32	0	59	6		0				
Queuing Penalty (veh)	5	0	48	14		1				

Intersection: 2: Lawndale Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	74	150	49	107	200	130	107	380	45	111	178	67
Average Queue (ft)	22	63	11	39	96	56	38	209	18	50	89	14
95th Queue (ft)	54	122	31	76	181	114	80	339	36	89	159	43
Link Distance (ft)		1387			2581			849			724	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	275		275	210		200	310		330	260		340
Storage Blk Time (%)					0			2				
Queuing Penalty (veh)					1			3				

Intersection: 3: Vicksburg Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	123	149	51	77	272	65	163	188	181	68	80	144
Average Queue (ft)	47	55	17	27	122	27	84	108	77	29	33	73
95th Queue (ft)	91	114	41	61	223	53	142	175	147	55	67	125
Link Distance (ft)		1407			2485			816	816			678
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	110		130	280		270	300			300	210	
Storage Blk Time (%)	0	1			0							
Queuing Penalty (veh)	0	2			1							

Intersection: 3: Vicksburg Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	67	69
Average Queue (ft)	21	33
95th Queue (ft)	55	59
Link Distance (ft)	678	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		210
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Cheshire Pkwy/Fernbrook Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	7	135	43	70	160	24	119	18	72	22	21
Average Queue (ft)	0	46	11	30	55	3	53	2	21	4	6
95th Queue (ft)	3	105	35	61	127	16	102	12	54	17	19
Link Distance (ft)		905			2147			660			627
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	250		260	375		200	210		170	100	
Storage Blk Time (%)					0						
Queuing Penalty (veh)					0						

Intersection: 5: Northwest Blvd & CR 47/Pineview Ln

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	L	TR	L	T	TR	L	T	T	R
Maximum Queue (ft)	205	223	50	41	194	167	365	318	70	187	153	156
Average Queue (ft)	109	124	18	11	95	74	186	150	18	95	40	57
95th Queue (ft)	177	192	46	34	169	144	306	274	45	167	118	125
Link Distance (ft)		892			553		707	707		832	832	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	280		200	140		350			280			325
Storage Blk Time (%)	0	1			5		0					
Queuing Penalty (veh)	0	2			1		0					

Network Summary

Network wide Queuing Penalty: 78

1: Brockton Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.5	0.0
Denied Del/Veh (s)	0.3	0.3	3.4	0.0	0.0	0.0	4.0	0.5	3.6	3.6	2.1	3.5
Total Delay (hr)	0.3	1.7	0.3	1.8	1.2	0.1	0.1	0.5	0.1	0.4	5.4	0.1
Total Del/Veh (s)	47.0	44.4	28.4	61.7	14.9	10.8	22.6	9.7	2.7	14.3	20.2	6.4
Vehicles Entered	21	139	43	102	286	22	9	171	111	89	954	47
Vehicles Exited	21	135	43	99	286	23	10	172	112	91	955	47
Hourly Exit Rate	21	135	43	99	286	23	10	172	112	91	955	47
Input Volume	23	138	38	101	298	24	10	169	113	93	934	52
% of Volume	92	98	112	98	96	97	98	102	99	98	102	91

1: Brockton Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.9
Denied Del/Veh (s)	1.6
Total Delay (hr)	11.8
Total Del/Veh (s)	21.2
Vehicles Entered	1994
Vehicles Exited	1994
Hourly Exit Rate	1994
Input Volume	1992
% of Volume	100

2: Lawndale Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.5	1.5	1.0	0.1	0.0	0.0	0.0	0.0	0.1	16.9	36.0	6.9
Denied Del/Veh (s)	17.8	12.8	13.2	1.0	0.2	1.1	3.6	0.5	3.7	162.8	167.1	176.3
Total Delay (hr)	1.7	14.2	5.6	7.7	2.8	0.3	0.7	1.7	0.4	11.1	23.2	3.6
Total Del/Veh (s)	64.1	118.3	70.8	84.2	42.6	13.0	49.1	43.0	15.1	110.1	113.9	97.0
Vehicles Entered	92	417	283	317	233	79	49	138	99	348	707	128
Vehicles Exited	92	413	279	317	231	80	50	140	100	351	706	129
Hourly Exit Rate	92	413	279	317	231	80	50	140	100	351	706	129
Input Volume	98	432	290	334	232	77	57	136	101	375	776	134
% of Volume	94	96	96	95	100	104	88	103	99	94	91	96

2: Lawndale Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	63.1
Denied Del/Veh (s)	75.5
Total Delay (hr)	73.1
Total Del/Veh (s)	88.1
Vehicles Entered	2890
Vehicles Exited	2888
Hourly Exit Rate	2888
Input Volume	3042
% of Volume	95

3: Vicksburg Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	1.2	0.2	0.9	3.5	0.1	3.5	2.8	0.3	2.9
Total Delay (hr)	0.6	2.5	0.8	0.5	1.2	0.1	0.5	1.7	0.2	0.7	6.0	0.5
Total Del/Veh (s)	18.6	19.8	10.1	17.6	20.1	3.9	32.8	35.9	7.0	31.9	40.6	8.6
Vehicles Entered	120	455	289	101	216	74	59	170	87	83	516	206
Vehicles Exited	120	454	288	99	217	75	58	172	87	82	522	204
Hourly Exit Rate	120	454	288	99	217	75	58	172	87	82	522	204
Input Volume	127	476	305	102	209	72	60	180	85	82	525	211
% of Volume	94	95	94	97	104	104	97	96	103	100	99	97

3: Vicksburg Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.5
Denied Del/Veh (s)	0.7
Total Delay (hr)	15.4
Total Del/Veh (s)	23.0
Vehicles Entered	2376
Vehicles Exited	2378
Hourly Exit Rate	2378
Input Volume	2435
% of Volume	98

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	0.3	0.1	0.7	0.0	0.0	0.0	3.9	0.4	3.8	4.1	0.2	0.2
Total Delay (hr)	0.0	1.1	0.1	0.3	0.3	0.0	0.5	0.0	0.3	0.3	0.2	0.0
Total Del/Veh (s)	6.4	8.2	2.7	11.0	4.4	1.5	35.9	40.0	8.1	42.3	47.4	8.0
Vehicles Entered	10	494	114	82	242	7	46	3	139	22	13	10
Vehicles Exited	10	494	114	82	244	7	46	3	140	22	13	10
Hourly Exit Rate	10	494	114	82	244	7	46	3	140	22	13	10
Input Volume	9	518	118	82	230	5	52	3	132	24	14	10
% of Volume	108	95	97	100	106	140	89	100	106	93	91	98

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.8
Total Delay (hr)	3.1
Total Del/Veh (s)	9.2
Vehicles Entered	1182
Vehicles Exited	1185
Hourly Exit Rate	1185
Input Volume	1197
% of Volume	99

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.4	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Denied Del/Veh (s)	1.8	2.7	3.5	4.1	0.2	0.2	3.4	0.1	0.3	2.3	0.4	2.4
Total Delay (hr)	9.0	0.6	1.0	0.1	0.4	0.6	0.3	3.2	0.0	0.2	11.2	0.4
Total Del/Veh (s)	39.8	48.8	18.8	67.3	72.4	26.2	34.1	27.1	15.6	28.4	38.5	5.4
Vehicles Entered	794	41	189	3	18	84	32	425	1	21	1042	281
Vehicles Exited	796	40	185	3	18	84	32	427	1	21	1037	282
Hourly Exit Rate	796	40	185	3	18	84	32	427	1	21	1037	282
Input Volume	808	42	184	3	15	83	28	421	1	21	1090	273
% of Volume	99	95	101	100	118	102	114	101	100	101	95	103

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	All
Denied Delay (hr)	1.0
Denied Del/Veh (s)	1.2
Total Delay (hr)	26.9
Total Del/Veh (s)	32.7
Vehicles Entered	2931
Vehicles Exited	2926
Hourly Exit Rate	2926
Input Volume	2969
% of Volume	99

Total Network Performance

Denied Delay (hr)	65.7
Denied Del/Veh (s)	31.3
Total Delay (hr)	141.9
Total Del/Veh (s)	66.0
Vehicles Entered	7443
Vehicles Exited	7421
Hourly Exit Rate	7421
Input Volume	27738
% of Volume	27

Intersection: 1: Brockton Ln & CR 47

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	221	138	284	155	30	115	53	275	645	192
Average Queue (ft)	105	29	128	16	7	39	17	44	271	18
95th Queue (ft)	179	92	233	76	25	89	42	163	550	131
Link Distance (ft)	1494		874			745			819	
Upstream Blk Time (%)									1	
Queuing Penalty (veh)									0	
Storage Bay Dist (ft)		40		40	320		290	260		275
Storage Blk Time (%)	44	8	57	0					7	
Queuing Penalty (veh)	17	13	13	0					11	

Intersection: 2: Lawndale Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	455	860	455	310	678	213	102	185	104	370	1323	450
Average Queue (ft)	159	554	328	246	264	31	37	85	33	330	1222	215
95th Queue (ft)	444	906	573	356	605	134	79	160	74	461	1531	520
Link Distance (ft)		1387			2581			1300			1274	
Upstream Blk Time (%)											38	
Queuing Penalty (veh)											0	
Storage Bay Dist (ft)	275		275	210		200	310		330	260		340
Storage Blk Time (%)	0	49	3	32	1					8	44	
Queuing Penalty (veh)	0	190	16	98	6					73	226	

Intersection: 3: Vicksburg Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	169	328	226	104	186	68	91	142	116	79	133	288
Average Queue (ft)	67	145	60	43	77	18	41	77	29	29	52	194
95th Queue (ft)	155	277	144	82	156	45	79	130	77	59	106	272
Link Distance (ft)		1407			2485			816	816			678
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	110		130	280		270	300			300	210	
Storage Blk Time (%)	1	15	1									5
Queuing Penalty (veh)	5	65	3									4

Intersection: 3: Vicksburg Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	255	117
Average Queue (ft)	150	54
95th Queue (ft)	241	98
Link Distance (ft)	678	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		210
Storage Blk Time (%)	1	
Queuing Penalty (veh)	1	

Intersection: 4: Cheshire Pkwy/Fernbrook Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	18	255	64	79	89	19	91	14	84	42	48
Average Queue (ft)	2	71	17	30	26	1	28	1	29	15	11
95th Queue (ft)	11	166	46	63	68	5	66	8	63	38	32
Link Distance (ft)		905			2147			660			627
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	250		260	375		200	210		170	100	
Storage Blk Time (%)		0									
Queuing Penalty (veh)		0									

Intersection: 5: Northwest Blvd & CR 47/Pineview Ln

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	L	TR	L	T	TR	L	T	T	R
Maximum Queue (ft)	410	632	300	30	150	70	238	197	129	511	477	169
Average Queue (ft)	246	301	139	2	62	23	134	84	15	309	264	33
95th Queue (ft)	386	501	328	17	131	56	221	184	80	470	434	106
Link Distance (ft)		892			553		707	707		832	832	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	280		200	140		350			280			325
Storage Blk Time (%)	4	24			1					15	3	
Queuing Penalty (veh)	28	142			0					3	8	

Network Summary

Network wide Queuing Penalty: 925

1: Brockton Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.2	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.2	3.5	0.0	0.0	0.0	4.1	2.5	3.9	3.5	0.4	3.5
Total Delay (hr)	0.6	1.4	0.1	3.3	3.3	1.7	0.3	7.4	0.3	0.3	1.5	0.0
Total Del/Veh (s)	44.6	45.9	8.5	68.0	44.8	52.4	18.2	29.7	6.9	31.0	15.6	3.1
Vehicles Entered	48	107	22	169	262	115	57	890	169	36	346	22
Vehicles Exited	48	107	22	167	258	116	57	891	169	37	347	22
Hourly Exit Rate	48	107	22	167	258	116	57	891	169	37	347	22
Input Volume	49	108	20	173	255	114	52	876	175	35	334	24
% of Volume	98	99	109	96	101	102	110	102	96	105	104	91

1: Brockton Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	1.0
Denied Del/Veh (s)	1.6
Total Delay (hr)	20.2
Total Del/Veh (s)	32.0
Vehicles Entered	2243
Vehicles Exited	2241
Hourly Exit Rate	2241
Input Volume	2216
% of Volume	101

2: Lawndale Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Denied Del/Veh (s)	0.7	0.1	0.8	0.7	0.2	0.6	3.1	1.3	3.1	3.3	0.8	3.4
Total Delay (hr)	0.7	2.4	0.2	1.5	4.8	2.9	0.9	8.9	0.4	2.3	2.6	0.3
Total Del/Veh (s)	40.0	37.2	8.0	39.8	44.9	30.7	30.3	48.4	9.3	52.4	28.0	21.8
Vehicles Entered	66	229	85	138	375	329	110	642	170	153	329	55
Vehicles Exited	66	227	85	136	375	328	110	651	170	152	331	55
Hourly Exit Rate	66	227	85	136	375	328	110	651	170	152	331	55
Input Volume	65	237	88	137	377	325	107	634	162	147	322	58
% of Volume	102	96	96	99	99	101	103	103	105	103	103	95

2: Lawndale Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.9
Denied Del/Veh (s)	1.2
Total Delay (hr)	28.0
Total Del/Veh (s)	36.8
Vehicles Entered	2681
Vehicles Exited	2686
Hourly Exit Rate	2686
Input Volume	2660
% of Volume	101

3: Vicksburg Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.3	2.9	3.6	0.2	3.4
Total Delay (hr)	0.9	1.2	0.1	0.4	3.2	0.4	2.1	5.1	0.2	0.6	2.7	0.3
Total Del/Veh (s)	21.8	13.7	4.6	19.2	21.1	9.0	37.1	37.8	6.4	36.8	46.2	11.2
Vehicles Entered	155	306	90	78	541	164	204	481	109	58	205	112
Vehicles Exited	154	305	91	77	541	161	205	485	110	59	204	112
Hourly Exit Rate	154	305	91	77	541	161	205	485	110	59	204	112
Input Volume	152	298	96	78	524	155	207	480	112	60	199	111
% of Volume	101	102	95	99	103	104	99	101	98	98	103	101

3: Vicksburg Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.5
Denied Del/Veh (s)	0.7
Total Delay (hr)	17.4
Total Del/Veh (s)	24.6
Vehicles Entered	2503
Vehicles Exited	2504
Hourly Exit Rate	2504
Input Volume	2472
% of Volume	101

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0
Denied Del/Veh (s)	1.6	0.1	0.6	0.0	0.0	0.0	3.7	0.6	3.7	4.3	0.2	0.2
Total Delay (hr)	0.0	0.8	0.0	0.4	1.3	0.0	1.7	0.1	0.3	0.0	0.1	0.0
Total Del/Veh (s)	6.6	7.5	2.4	10.2	6.2	3.4	44.6	38.3	6.5	29.9	43.2	7.1
Vehicles Entered	1	365	67	128	770	37	136	10	158	5	5	11
Vehicles Exited	2	365	67	127	774	38	135	10	159	5	4	11
Hourly Exit Rate	2	365	67	127	774	38	135	10	159	5	4	11
Input Volume	3	363	68	132	750	36	131	10	166	6	3	10
% of Volume	67	101	99	96	103	104	103	100	96	83	133	110

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.7
Total Delay (hr)	4.8
Total Del/Veh (s)	10.0
Vehicles Entered	1693
Vehicles Exited	1697
Hourly Exit Rate	1697
Input Volume	1679
% of Volume	101

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.1	0.5
Denied Del/Veh (s)	0.0	0.0	0.0	3.7	0.3	0.3	2.5	0.7	0.4	2.8	0.6	2.8
Total Delay (hr)	5.7	0.3	0.1	0.3	1.5	0.9	3.4	15.8	0.1	0.7	4.6	3.8
Total Del/Veh (s)	52.7	13.0	7.5	54.4	63.5	41.0	46.8	40.1	36.3	38.4	33.4	22.3
Vehicles Entered	389	83	52	17	86	77	251	1398	7	63	487	598
Vehicles Exited	381	83	52	17	85	75	255	1412	7	63	494	600
Hourly Exit Rate	381	83	52	17	85	75	255	1412	7	63	494	600
Input Volume	396	85	55	15	87	83	239	1411	6	63	497	592
% of Volume	96	98	95	111	97	90	107	100	117	100	99	101

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	All
Denied Delay (hr)	1.1
Denied Del/Veh (s)	1.1
Total Delay (hr)	37.1
Total Del/Veh (s)	37.5
Vehicles Entered	3508
Vehicles Exited	3524
Hourly Exit Rate	3524
Input Volume	3529
% of Volume	100

Total Network Performance

Denied Delay (hr)	3.8
Denied Del/Veh (s)	1.7
Total Delay (hr)	120.3
Total Del/Veh (s)	53.0
Vehicles Entered	7865
Vehicles Exited	7882
Hourly Exit Rate	7882
Input Volume	30182
% of Volume	26

Intersection: 1: Brockton Ln & CR 47

Movement	EB	EB	WB	WB	B11	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	T	L	T	R	L	T	R
Maximum Queue (ft)	236	102	685	160	31	344	696	351	77	220	22
Average Queue (ft)	101	10	301	114	1	42	348	68	25	103	4
95th Queue (ft)	191	44	570	212	16	197	596	307	55	196	16
Link Distance (ft)	1494		874		1774		745			819	
Upstream Blk Time (%)			1				1				
Queuing Penalty (veh)			3				0				
Storage Bay Dist (ft)		40		40		320		290	260		275
Storage Blk Time (%)	42	0	66	22			13			0	
Queuing Penalty (veh)	9	0	76	72			30			0	

Intersection: 2: Lawndale Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	105	272	70	305	542	320	489	603	469	208	286	83
Average Queue (ft)	44	127	25	89	236	162	91	383	48	105	148	23
95th Queue (ft)	90	228	57	199	434	303	291	559	199	185	246	64
Link Distance (ft)		1387			2581			1299			1274	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	275		275	210		200	310		330	260		340
Storage Blk Time (%)		0		0	14	3		20		0	1	
Queuing Penalty (veh)		0		0	67	18		53		0	2	

Intersection: 3: Vicksburg Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	168	200	56	100	325	92	243	221	209	74	95	173
Average Queue (ft)	70	83	20	36	170	36	122	155	128	32	42	102
95th Queue (ft)	133	167	45	78	278	73	203	219	200	60	82	163
Link Distance (ft)		1407			2485			816	816			678
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	110		130	280		270	300			300	210	
Storage Blk Time (%)	2	5			1							
Queuing Penalty (veh)	7	13			3							

Intersection: 3: Vicksburg Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	140	97
Average Queue (ft)	53	44
95th Queue (ft)	122	79
Link Distance (ft)	678	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		210
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Cheshire Pkwy/Fernbrook Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	9	185	49	88	171	28	182	85	110	30	26
Average Queue (ft)	0	61	12	37	62	5	80	8	26	4	7
95th Queue (ft)	4	141	37	73	135	19	149	62	70	20	21
Link Distance (ft)		905			2147			660			627
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	250		260	375		200	210		170	100	
Storage Blk Time (%)		0			0		1				
Queuing Penalty (veh)		0			0		1				

Intersection: 5: Northwest Blvd & CR 47/Pineview Ln

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	L	TR	L	T	TR	L	T	T	R
Maximum Queue (ft)	269	285	101	50	236	513	675	664	92	377	364	371
Average Queue (ft)	146	160	26	12	119	203	392	372	37	168	126	175
95th Queue (ft)	230	245	85	37	200	435	634	606	77	299	304	339
Link Distance (ft)		892			553		707	707		832	832	
Upstream Blk Time (%)							2	1			0	
Queuing Penalty (veh)							0	0			0	
Storage Bay Dist (ft)	280		200	140		350			280			325
Storage Blk Time (%)	0	4			10	0	16			0		3
Queuing Penalty (veh)	0	11			1	3	38			0		8

Network Summary

Network wide Queuing Penalty: 415

1: Brockton Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.0
Denied Del/Veh (s)	3.6	0.3	3.5	0.0	0.0	0.0	3.6	0.5	3.7	3.0	1.5	3.0
Total Delay (hr)	0.2	1.8	0.3	1.2	0.8	0.0	0.1	0.5	0.1	0.4	5.4	0.1
Total Del/Veh (s)	32.9	47.2	25.7	44.1	10.0	3.5	23.2	10.5	3.0	14.5	20.4	6.1
Vehicles Entered	23	132	40	100	292	27	9	170	116	89	934	54
Vehicles Exited	22	132	41	99	291	27	9	171	115	89	941	54
Hourly Exit Rate	22	132	41	99	291	27	9	171	115	89	941	54
Input Volume	23	138	38	101	298	24	10	169	113	93	934	52
% of Volume	97	96	107	98	98	114	88	101	102	96	101	104

1: Brockton Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.7
Denied Del/Veh (s)	1.3
Total Delay (hr)	10.8
Total Del/Veh (s)	19.4
Vehicles Entered	1986
Vehicles Exited	1991
Hourly Exit Rate	1991
Input Volume	1992
% of Volume	100

2: Lawndale Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.1	0.1	0.2	0.1	0.0	0.0	0.1	0.0	0.1	0.3	0.1	0.1
Denied Del/Veh (s)	2.5	1.1	2.7	1.2	0.2	0.9	3.8	0.2	3.6	2.5	0.4	2.5
Total Delay (hr)	0.7	6.5	1.6	4.0	1.8	0.2	0.5	1.9	0.4	4.6	8.9	1.2
Total Del/Veh (s)	24.7	54.3	19.7	41.9	26.7	7.4	36.8	48.9	15.1	44.7	40.2	31.8
Vehicles Entered	99	430	290	334	238	75	50	136	101	362	778	131
Vehicles Exited	100	429	290	337	240	77	50	136	101	360	777	130
Hourly Exit Rate	100	429	290	337	240	77	50	136	101	360	777	130
Input Volume	98	432	290	334	232	77	57	136	101	375	776	134
% of Volume	102	99	100	101	104	100	88	100	100	96	100	97

2: Lawndale Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	1.1
Denied Del/Veh (s)	1.4
Total Delay (hr)	32.2
Total Del/Veh (s)	37.7
Vehicles Entered	3024
Vehicles Exited	3027
Hourly Exit Rate	3027
Input Volume	3042
% of Volume	99

3: Vicksburg Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	1.0	0.1	0.8	3.5	0.2	3.5	3.0	0.3	2.9
Total Delay (hr)	0.8	3.1	0.9	0.5	1.3	0.1	0.5	1.4	0.2	0.6	4.7	0.4
Total Del/Veh (s)	21.9	23.6	10.5	20.1	21.2	3.8	29.9	29.3	7.0	26.7	32.3	7.6
Vehicles Entered	123	476	299	92	211	73	60	176	85	78	522	208
Vehicles Exited	123	476	297	91	211	72	60	176	85	77	524	208
Hourly Exit Rate	123	476	297	91	211	72	60	176	85	77	524	208
Input Volume	127	476	305	102	209	72	60	180	85	82	525	211
% of Volume	97	100	97	89	101	100	100	98	100	94	100	99

3: Vicksburg Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.5
Denied Del/Veh (s)	0.7
Total Delay (hr)	14.5
Total Del/Veh (s)	21.6
Vehicles Entered	2403
Vehicles Exited	2400
Hourly Exit Rate	2400
Input Volume	2435
% of Volume	99

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	0.3	0.1	0.4	0.0	0.0	0.0	3.8	0.3	3.9	4.1	0.1	0.2
Total Delay (hr)	0.0	1.4	0.1	0.3	0.3	0.0	0.5	0.0	0.3	0.3	0.2	0.0
Total Del/Veh (s)	8.7	9.9	3.2	11.2	4.9	2.1	33.7	32.9	9.2	40.1	49.5	7.3
Vehicles Entered	8	508	119	84	229	5	51	4	135	23	13	10
Vehicles Exited	8	506	119	84	228	5	51	4	135	23	13	11
Hourly Exit Rate	8	506	119	84	228	5	51	4	135	23	13	11
Input Volume	9	518	118	82	230	5	52	3	132	24	14	10
% of Volume	86	98	101	103	99	100	99	133	102	97	91	107

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.8
Total Delay (hr)	3.4
Total Del/Veh (s)	10.3
Vehicles Entered	1189
Vehicles Exited	1187
Hourly Exit Rate	1187
Input Volume	1197
% of Volume	99

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Denied Del/Veh (s)	1.2	1.3	2.1	3.8	0.2	0.2	3.3	0.1	0.1	2.4	0.4	2.4
Total Delay (hr)	9.2	0.6	1.1	0.1	0.4	0.7	0.3	3.2	0.0	0.1	12.6	0.5
Total Del/Veh (s)	41.8	44.3	20.9	54.8	73.3	29.6	39.5	26.3	3.4	28.8	40.6	6.1
Vehicles Entered	785	47	182	4	16	83	23	426	1	16	1097	281
Vehicles Exited	784	46	183	3	17	84	23	423	1	16	1090	280
Hourly Exit Rate	784	46	183	3	17	84	23	423	1	16	1090	280
Input Volume	808	42	184	3	15	83	28	421	1	21	1090	273
% of Volume	97	109	99	100	111	102	82	100	100	77	100	103

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	All
Denied Delay (hr)	0.7
Denied Del/Veh (s)	0.9
Total Delay (hr)	28.7
Total Del/Veh (s)	34.3
Vehicles Entered	2961
Vehicles Exited	2950
Hourly Exit Rate	2950
Input Volume	2969
% of Volume	99

Total Network Performance

Denied Delay (hr)	3.3
Denied Del/Veh (s)	1.6
Total Delay (hr)	101.5
Total Del/Veh (s)	46.4
Vehicles Entered	7596
Vehicles Exited	7599
Hourly Exit Rate	7599
Input Volume	27738
% of Volume	27

Intersection: 1: Brockton Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	52	190	67	134	113	32	42	134	57	271	444	112
Average Queue (ft)	16	87	21	64	39	7	6	43	17	39	246	13
95th Queue (ft)	41	155	53	116	85	22	25	96	40	133	401	94
Link Distance (ft)		1494			874			1267			1272	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250		250	250		250	320		290	260		275
Storage Blk Time (%)		0									6	
Queuing Penalty (veh)		0									9	

Intersection: 2: Lawndale Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	380	594	395	307	399	50	95	133	89	86	334	374
Average Queue (ft)	62	281	110	184	133	18	33	63	22	32	215	222
95th Queue (ft)	194	478	264	292	298	42	75	114	63	71	326	336
Link Distance (ft)		1375			2569			1303	1303			1274
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	275		275	210		200	310			330	260	
Storage Blk Time (%)		13	0	7	1						5	4
Queuing Penalty (veh)		50	1	23	2						21	15

Intersection: 2: Lawndale Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	367	166
Average Queue (ft)	210	68
95th Queue (ft)	320	140
Link Distance (ft)	1274	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		340
Storage Blk Time (%)	1	
Queuing Penalty (veh)	1	

Intersection: 3: Vicksburg Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	169	341	292	108	182	46	105	147	103	70	150	279
Average Queue (ft)	79	169	70	44	79	16	40	68	24	29	51	164
95th Queue (ft)	172	305	176	88	157	38	83	119	64	57	110	242
Link Distance (ft)		1407			2485			816	816			678
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	110		130	280		270	300			300	210	
Storage Blk Time (%)	1	20	1									2
Queuing Penalty (veh)	4	85	3									2

Intersection: 3: Vicksburg Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	250	112
Average Queue (ft)	121	53
95th Queue (ft)	218	91
Link Distance (ft)	678	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		210
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 4: Cheshire Pkwy/Fernbrook Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	13	265	60	84	113	14	90	19	93	63	47
Average Queue (ft)	2	87	20	34	26	1	28	2	27	17	11
95th Queue (ft)	8	202	49	67	75	6	66	9	66	44	32
Link Distance (ft)		905			2147			660			627
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	250		260	375		200	210		170	100	
Storage Blk Time (%)		0								0	
Queuing Penalty (veh)		0								0	

Intersection: 5: Northwest Blvd & CR 47/Pineview Ln

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	L	TR	L	T	TR	L	T	T	R
Maximum Queue (ft)	409	579	300	28	150	65	245	197	44	587	580	245
Average Queue (ft)	243	291	121	3	63	18	137	89	10	337	297	48
95th Queue (ft)	383	456	292	16	125	47	214	181	31	537	506	207
Link Distance (ft)		892			553		707	707		832	832	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	280		200	140		350			280			325
Storage Blk Time (%)	5	25	0		3					19	6	
Queuing Penalty (veh)	31	148	1		0					4	17	

Network Summary

Network wide Queuing Penalty: 419

1: Brockton Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	3.5	0.3	3.3	0.0	0.0	0.0	3.2	1.7	3.2	3.6	0.4	3.4
Total Delay (hr)	0.5	1.5	0.0	1.9	1.7	0.8	0.3	7.1	0.3	0.3	1.3	0.0
Total Del/Veh (s)	38.6	49.1	8.2	40.0	24.2	25.1	17.8	28.5	7.7	27.9	14.1	3.1
Vehicles Entered	47	106	21	169	250	116	51	879	163	37	328	27
Vehicles Exited	47	107	21	169	250	117	51	881	163	37	328	27
Hourly Exit Rate	47	107	21	169	250	117	51	881	163	37	328	27
Input Volume	49	108	20	173	255	114	52	876	175	35	334	24
% of Volume	96	99	104	98	98	103	99	101	93	105	98	111

1: Brockton Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.8
Denied Del/Veh (s)	1.3
Total Delay (hr)	15.8
Total Del/Veh (s)	25.5
Vehicles Entered	2194
Vehicles Exited	2198
Hourly Exit Rate	2198
Input Volume	2216
% of Volume	99

2: Lawndale Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1
Denied Del/Veh (s)	1.0	0.1	0.9	0.5	0.2	0.8	2.8	0.3	2.8	3.2	0.2	3.2
Total Delay (hr)	0.4	1.9	0.1	1.2	3.2	1.5	0.8	6.7	0.3	1.2	2.7	0.4
Total Del/Veh (s)	21.7	28.9	4.8	27.9	31.0	15.7	26.3	37.3	7.4	31.8	29.2	26.6
Vehicles Entered	60	234	87	150	369	336	107	638	157	139	322	59
Vehicles Exited	60	237	87	150	370	334	106	638	158	139	322	57
Hourly Exit Rate	60	237	87	150	370	334	106	638	158	139	322	57
Input Volume	65	237	88	137	377	325	107	634	162	147	322	58
% of Volume	92	100	99	109	98	103	99	101	97	95	100	99

2: Lawndale Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.6
Denied Del/Veh (s)	0.8
Total Delay (hr)	20.5
Total Del/Veh (s)	27.3
Vehicles Entered	2658
Vehicles Exited	2658
Hourly Exit Rate	2658
Input Volume	2660
% of Volume	100

3: Vicksburg Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.3	2.8	3.3	0.2	3.5
Total Delay (hr)	0.9	1.1	0.1	0.4	3.5	0.4	1.9	4.3	0.2	0.5	2.1	0.3
Total Del/Veh (s)	21.5	14.4	4.4	19.1	23.3	8.4	31.4	32.0	6.4	27.9	37.9	10.8
Vehicles Entered	155	286	97	76	528	155	211	479	116	61	193	111
Vehicles Exited	155	285	96	76	528	155	213	480	114	61	192	112
Hourly Exit Rate	155	285	96	76	528	155	213	480	114	61	192	112
Input Volume	152	298	96	78	524	155	207	480	112	60	199	111
% of Volume	102	96	100	97	101	100	103	100	102	102	97	101

3: Vicksburg Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.5
Denied Del/Veh (s)	0.7
Total Delay (hr)	15.7
Total Del/Veh (s)	22.7
Vehicles Entered	2468
Vehicles Exited	2467
Hourly Exit Rate	2467
Input Volume	2472
% of Volume	100

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0
Denied Del/Veh (s)	1.7	0.1	0.6	0.0	0.0	0.0	3.6	0.6	3.7	4.2	0.1	0.1
Total Delay (hr)	0.0	0.9	0.0	0.4	1.4	0.0	1.2	0.1	0.3	0.1	0.1	0.0
Total Del/Veh (s)	11.3	9.5	2.4	11.2	6.6	4.3	32.0	34.9	6.4	39.0	54.3	7.6
Vehicles Entered	1	355	70	133	742	36	139	9	174	6	4	12
Vehicles Exited	1	358	71	133	744	36	138	9	175	6	4	12
Hourly Exit Rate	1	358	71	133	744	36	138	9	175	6	4	12
Input Volume	3	363	68	132	750	36	131	10	166	6	3	10
% of Volume	33	99	104	101	99	99	106	90	105	100	133	120

4: Cheshire Pkwy/Fernbrook Ln & CR 47 Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.7
Total Delay (hr)	4.6
Total Del/Veh (s)	9.8
Vehicles Entered	1681
Vehicles Exited	1687
Hourly Exit Rate	1687
Input Volume	1679
% of Volume	100

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.5
Denied Del/Veh (s)	0.0	0.0	0.0	3.8	0.3	0.2	2.2	0.5	0.4	2.6	0.6	2.8
Total Delay (hr)	5.7	0.3	0.1	0.2	1.5	0.9	2.8	12.9	0.0	0.7	4.5	3.2
Total Del/Veh (s)	51.1	11.8	7.7	62.6	66.6	38.7	40.6	32.7	33.6	37.8	31.9	19.3
Vehicles Entered	397	86	56	14	79	81	241	1393	5	62	496	587
Vehicles Exited	391	86	55	14	79	79	246	1403	5	62	503	588
Hourly Exit Rate	391	86	55	14	79	79	246	1403	5	62	503	588
Input Volume	396	85	55	15	87	83	239	1411	6	63	497	592
% of Volume	99	101	100	92	91	95	103	99	83	98	101	99

5: Northwest Blvd & CR 47/Pineview Ln Performance by movement

Movement	All
Denied Delay (hr)	0.9
Denied Del/Veh (s)	1.0
Total Delay (hr)	32.8
Total Del/Veh (s)	33.2
Vehicles Entered	3497
Vehicles Exited	3511
Hourly Exit Rate	3511
Input Volume	3529
% of Volume	99

Total Network Performance

Denied Delay (hr)	3.1
Denied Del/Veh (s)	1.5
Total Delay (hr)	102.0
Total Del/Veh (s)	45.3
Vehicles Entered	7795
Vehicles Exited	7827
Hourly Exit Rate	7827
Input Volume	30182
% of Volume	26

Intersection: 1: Brockton Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	100	158	31	208	205	138	335	759	351	74	207	32
Average Queue (ft)	34	71	8	102	88	52	29	315	41	23	91	5
95th Queue (ft)	77	132	23	171	174	106	131	634	202	53	171	20
Link Distance (ft)		1494			874			1267			1272	
Upstream Blk Time (%)								1				
Queuing Penalty (veh)								0				
Storage Bay Dist (ft)	250		250	250		250	320		290	260		275
Storage Blk Time (%)					0			10			0	
Queuing Penalty (veh)					0			23			0	

Intersection: 2: Lawndale Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	82	240	67	243	351	266	139	288	272	86	166	175
Average Queue (ft)	32	107	21	77	163	93	51	182	157	30	74	93
95th Queue (ft)	66	202	47	162	279	183	106	260	240	64	134	153
Link Distance (ft)		1375			2569			1300	1300			1274
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	275		275	210		200	310			330	260	
Storage Blk Time (%)		0		0	5	0		0				
Queuing Penalty (veh)		0		0	24	1		0				

Intersection: 2: Lawndale Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	138	89
Average Queue (ft)	60	24
95th Queue (ft)	121	64
Link Distance (ft)	1274	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		340
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Vicksburg Ln & CR 47

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	158	177	59	149	342	85	196	232	208	81	107	155
Average Queue (ft)	69	75	21	36	171	32	108	143	110	35	40	88
95th Queue (ft)	123	148	45	100	297	62	173	211	183	63	82	147
Link Distance (ft)		1407			2485			816	816			678
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	110		130	280		270	300			300	210	
Storage Blk Time (%)	2	4			2							
Queuing Penalty (veh)	4	10			4							

Intersection: 3: Vicksburg Ln & CR 47

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	134	91
Average Queue (ft)	37	40
95th Queue (ft)	100	72
Link Distance (ft)	678	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		210
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Cheshire Pkwy/Fernbrook Ln & CR 47

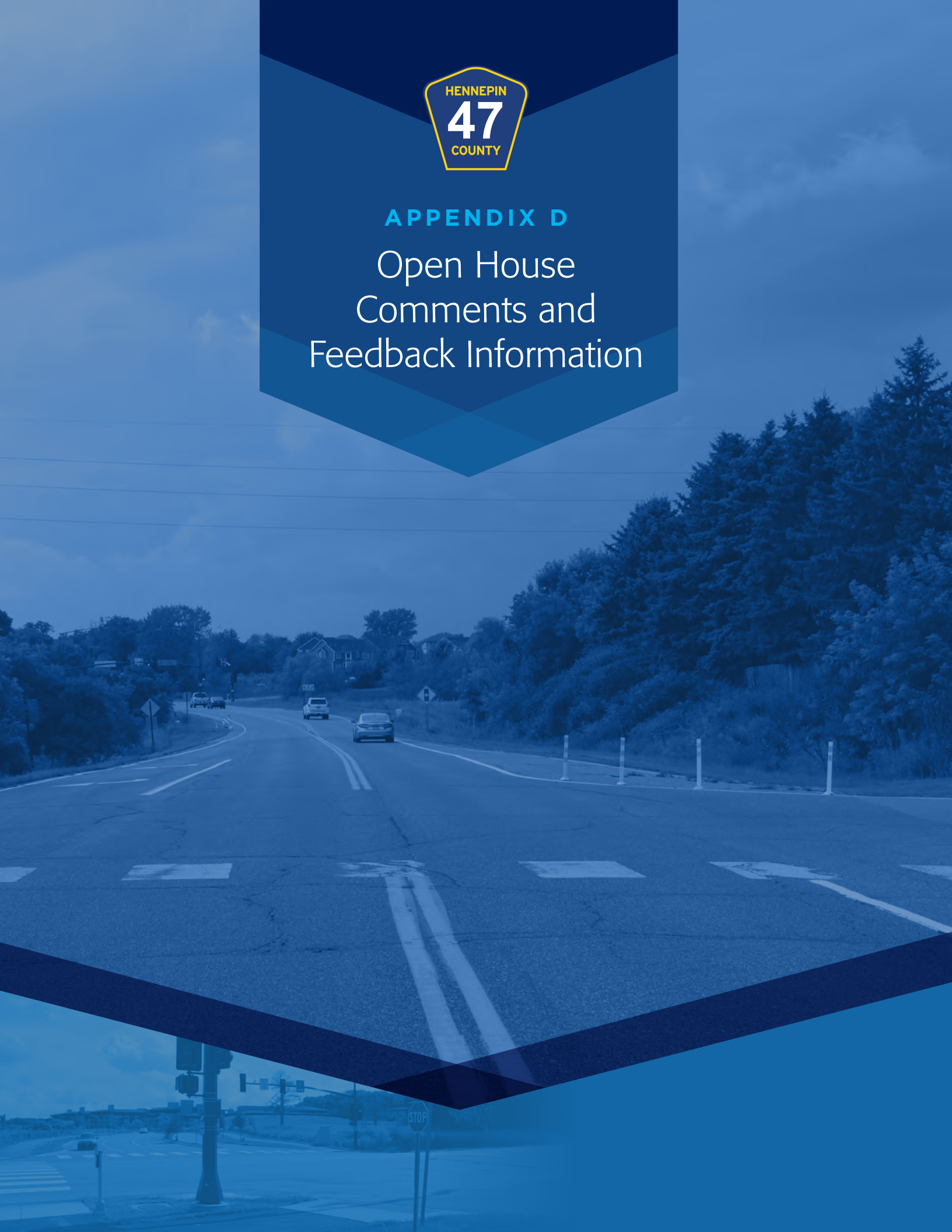
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	9	203	50	92	196	26	152	23	79	22	38
Average Queue (ft)	0	69	14	38	66	5	77	4	28	4	8
95th Queue (ft)	3	148	39	73	147	20	138	16	61	17	25
Link Distance (ft)		905			2147			660			627
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	250		260	375		200	210		170	100	
Storage Blk Time (%)		0			0						
Queuing Penalty (veh)		0			0						

Intersection: 5: Northwest Blvd & CR 47/Pineview Ln

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	L	TR	L	T	TR	L	T	T	R
Maximum Queue (ft)	251	280	111	106	241	487	601	598	108	272	284	414
Average Queue (ft)	152	165	28	13	116	158	332	314	39	158	110	162
95th Queue (ft)	229	247	75	55	206	312	505	487	85	233	222	322
Link Distance (ft)		890			553		1100	1100		832	832	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	280		200	140		350			280			325
Storage Blk Time (%)	0	4			9		8			0		2
Queuing Penalty (veh)	0	11			1		19			0		5

Network Summary

Network wide Queuing Penalty: 102



APPENDIX D

Open House Comments and Feedback Information

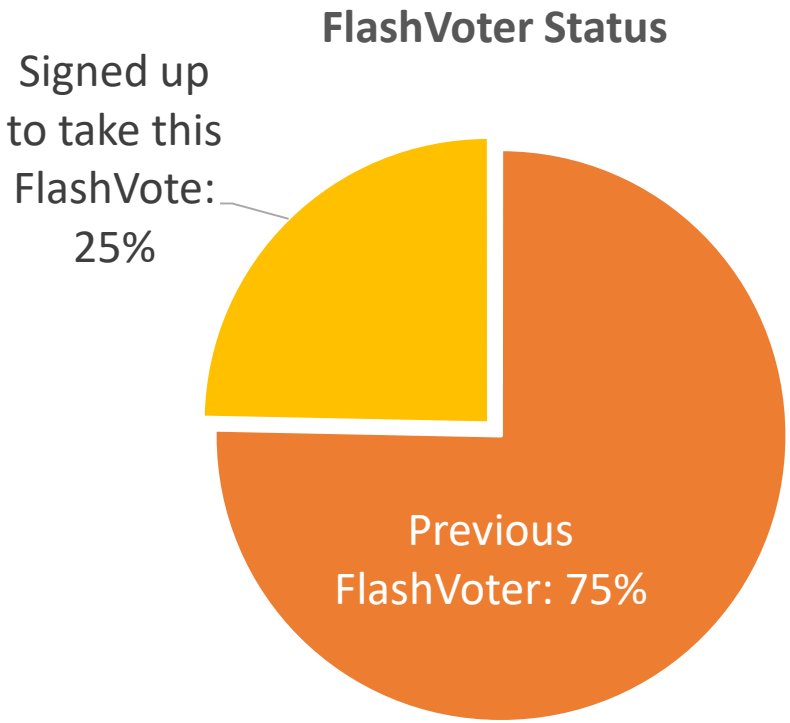
APPENDIX D: OPEN HOUSE COMMENTS AND FEEDBACK SUMMARIES

Appendix D is organized with the following attachments:

- FlashVote Feedback Summary: a PowerPoint presentation given to City Council staff to review feedback heard from the Flash Vote survey in February 2019.
- "Round 1" Engagement Items:
  - Open House #1 Engagement Summary: a document written to summarize the feedback heard at Open House #1. Also includes feedback heard from the feedback map posted online in February – April 2019 and at International Night in March 2019.
  - Verbatim comment cards from Open House #1 (and emails/notes provided after the Open House)
  - Sign-In Sheet from Open House #1
- "Round 2" Engagement Items:
  - Open House #2 Engagement Summary: a document written to summarize the feedback heard at Open House #2.
  - Verbatim comments from Open House #2 (and email/notes provided after the Open House)
  - Sign-In Sheet from Open House #2

FlashVote Survey Overview

- Available February 13 – 15
- 855 participants
- Participants were:
  - 60% women
  - 40% men
- Many new FlashVoters contributed to this survey



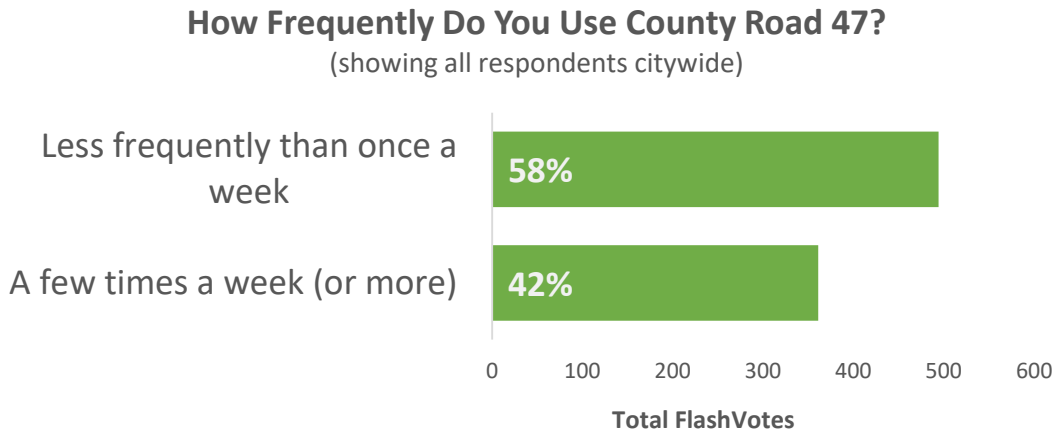
Source: City of Plymouth FlashVote, February 13-15, 2019

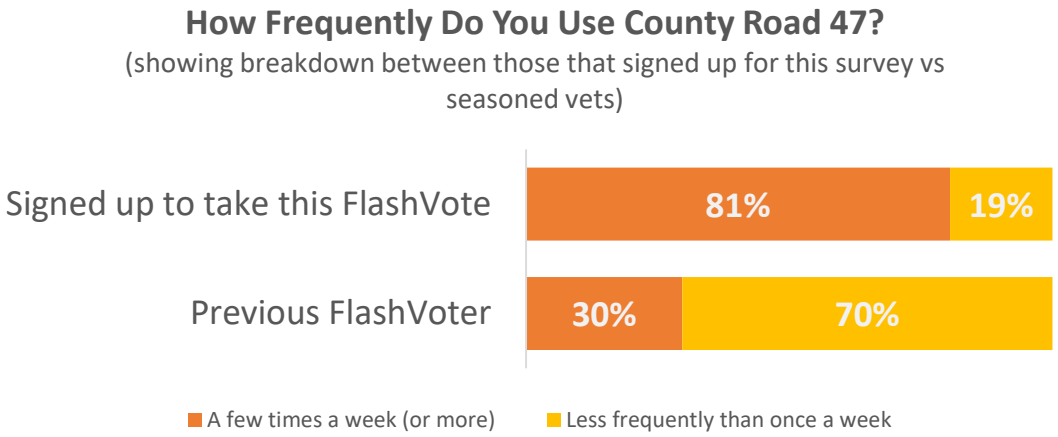
FlashVote Question 1

How frequently do you use County Road 47?

- Under half of the respondents use it a few times a week or more

- Those that signed up for FlashVote to take this survey largely use the corridor more than once a week

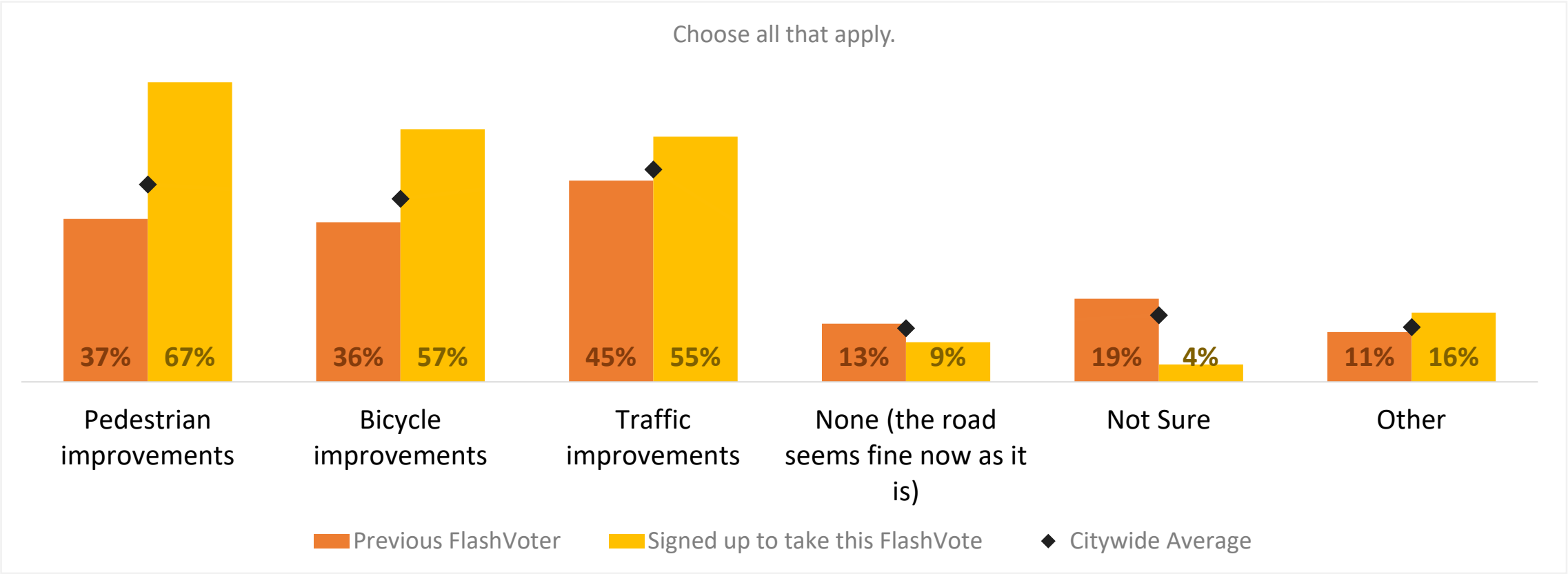




Source: City of Plymouth FlashVote, February 13-15, 2019

FlashVote Question 2

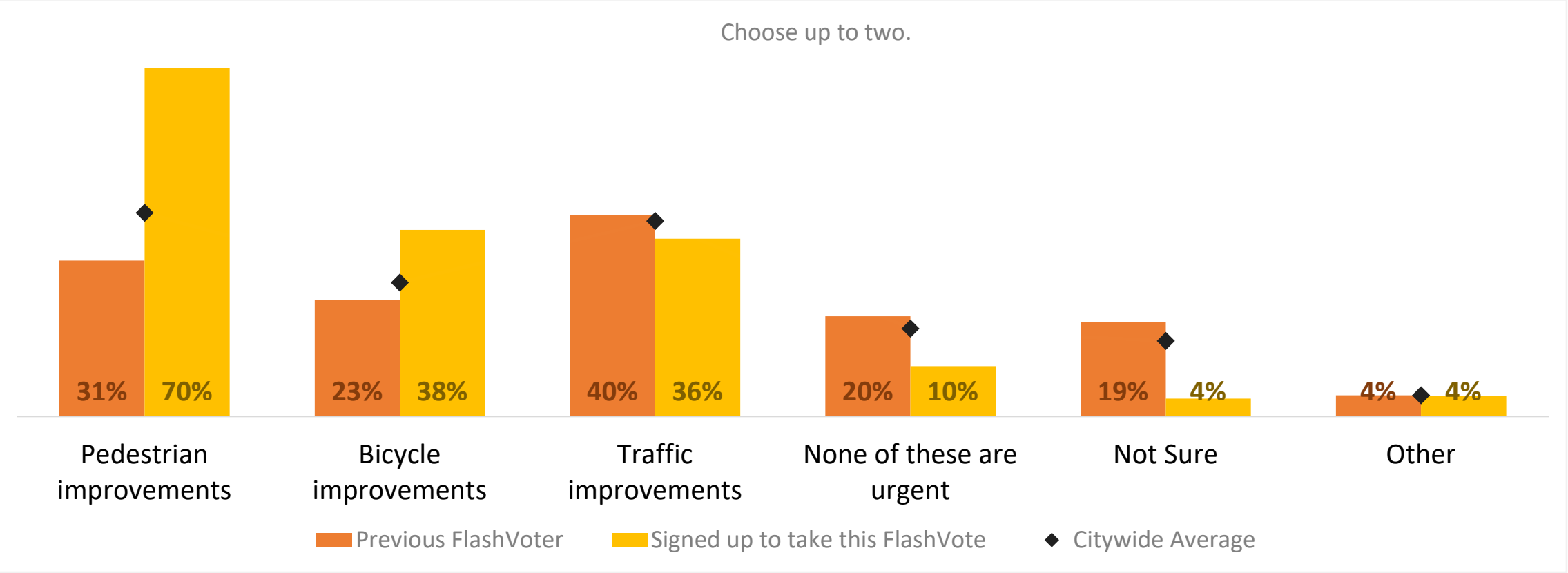
What type of improvements **would you like to see** on County Road 47?



Source: City of Plymouth FlashVote, February 13-15, 2019

FlashVote Question 3

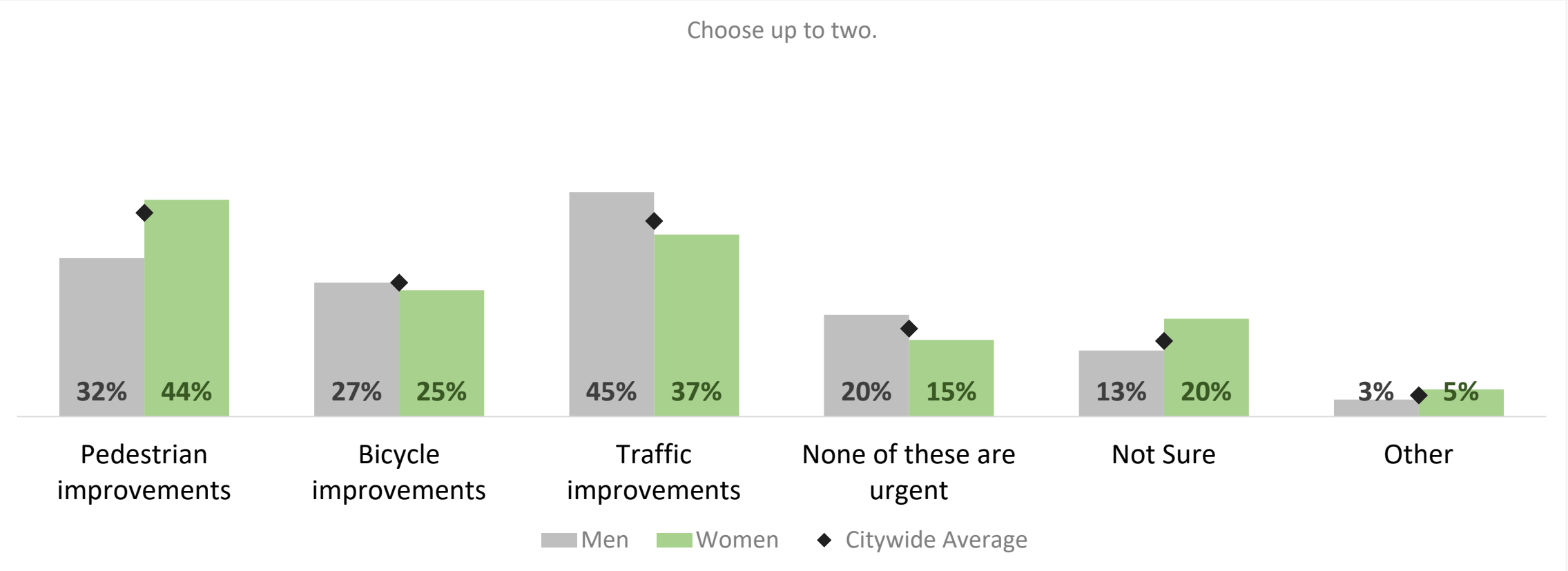
What types of improvements **are immediate needs** on County Road 47?



Source: City of Plymouth FlashVote, February 13-15, 2019

FlashVote Question 3

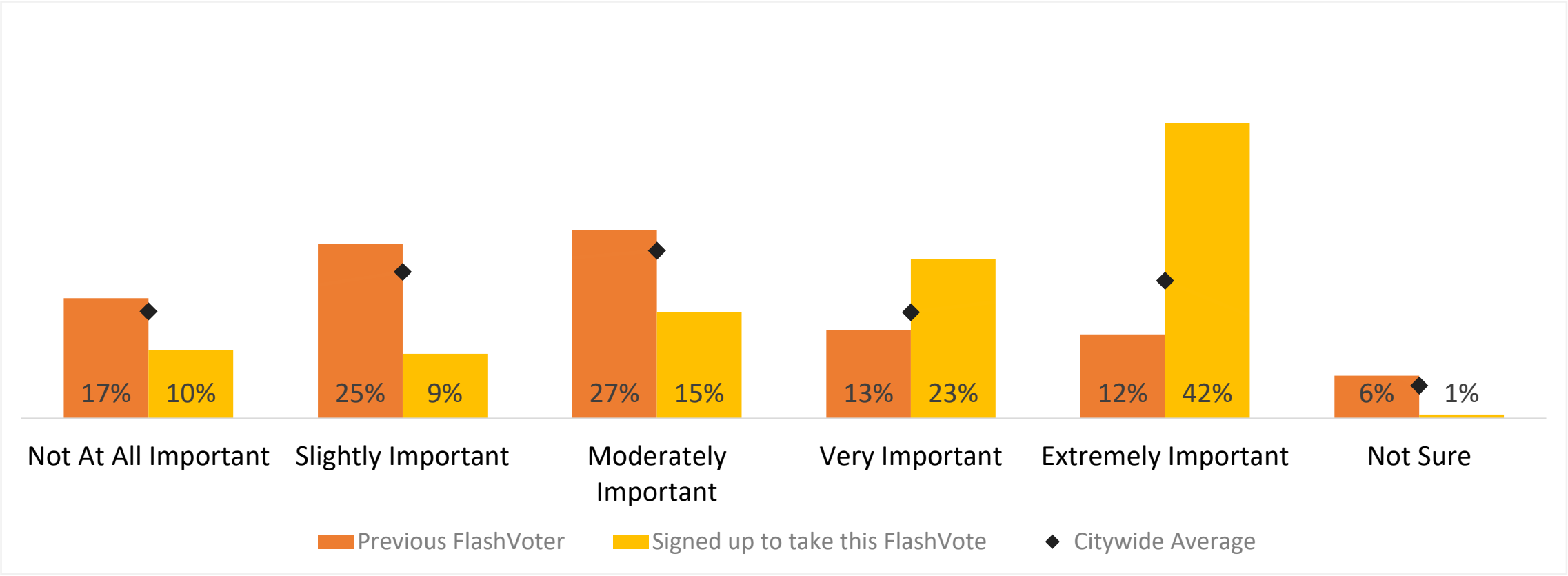
What types of improvements **are immediate needs** on County Road 47?



Source: City of Plymouth FlashVote, February 13-15, 2019

FlashVote Question 4

How important is it that **improvements are made** to County Road 47?



Source: City of Plymouth FlashVote, February 13-15, 2019

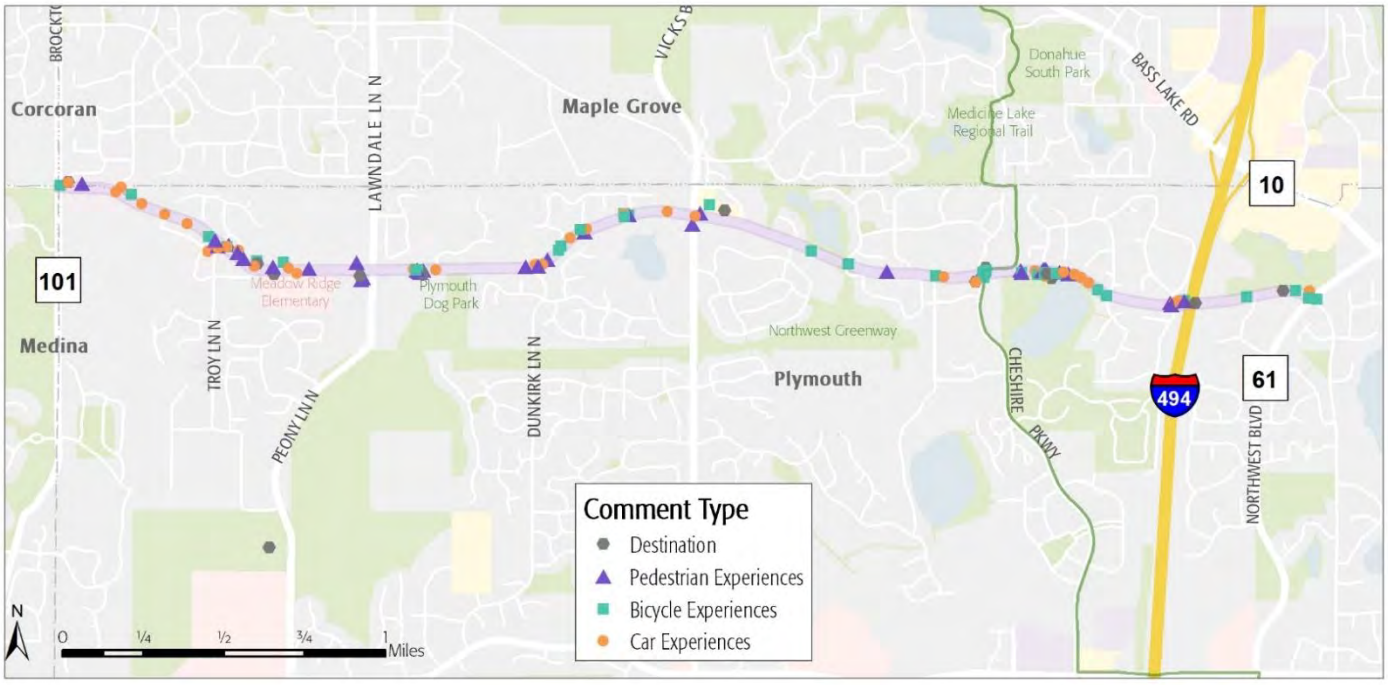
Open House 1 Public Engagement Process Summary

Feedback was obtained in many ways in the first round of engagement, which centered around Open House #1.

- **Open House Attendance & Activities**: Nearly 60 people signed in to the Open House on Wednesday, March 13. These sixty attendees participated in three in-person activities.
- **Comment Cards & Emails**: 35 comment cards were filled out at the Open House, and some comments were emailed to staff after the event. The vast majority this feedback was in support of changes to the corridor; 3 notes were in opposition of change. These comments can be found at the end of this document.
- **Online Feedback Map**: Nearly 250 pieces of feedback (such as experiences, likes or dislikes of comments, and identifiation of key destinations) were captured via the Online Feedback Map. 86 users logged in to the map by providing their emails.

Open House 1 Results Summary

The map below shows where each of the comments were in the corridor by mode. The comments were split evenly between the three modes, and concentrations of comments occur at **Troy Lane** and **Meadow Ridge Elementary**, at **Egan Dog Park** and **Dunkirk Lane**, **Cheshire Parkway**, **Dallas Lane** & **Annapolis Lane**, and **Yucca Lane**.

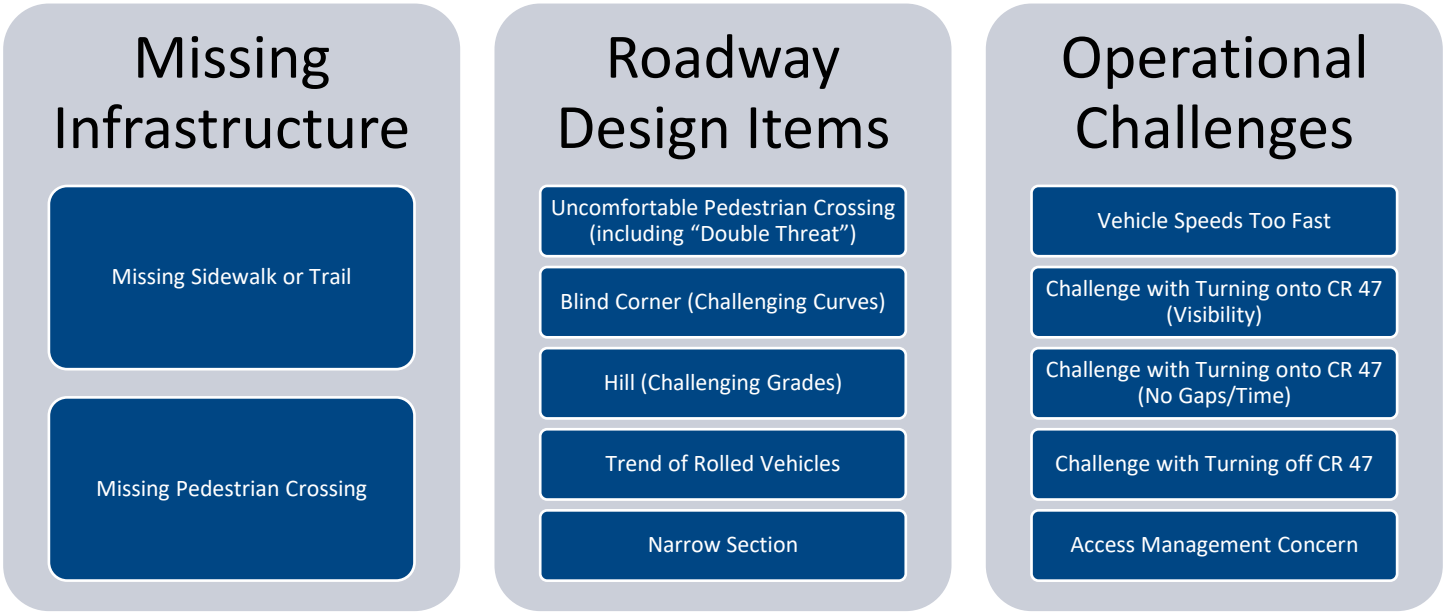


From the first round of public engagement, there is strong support for the following:

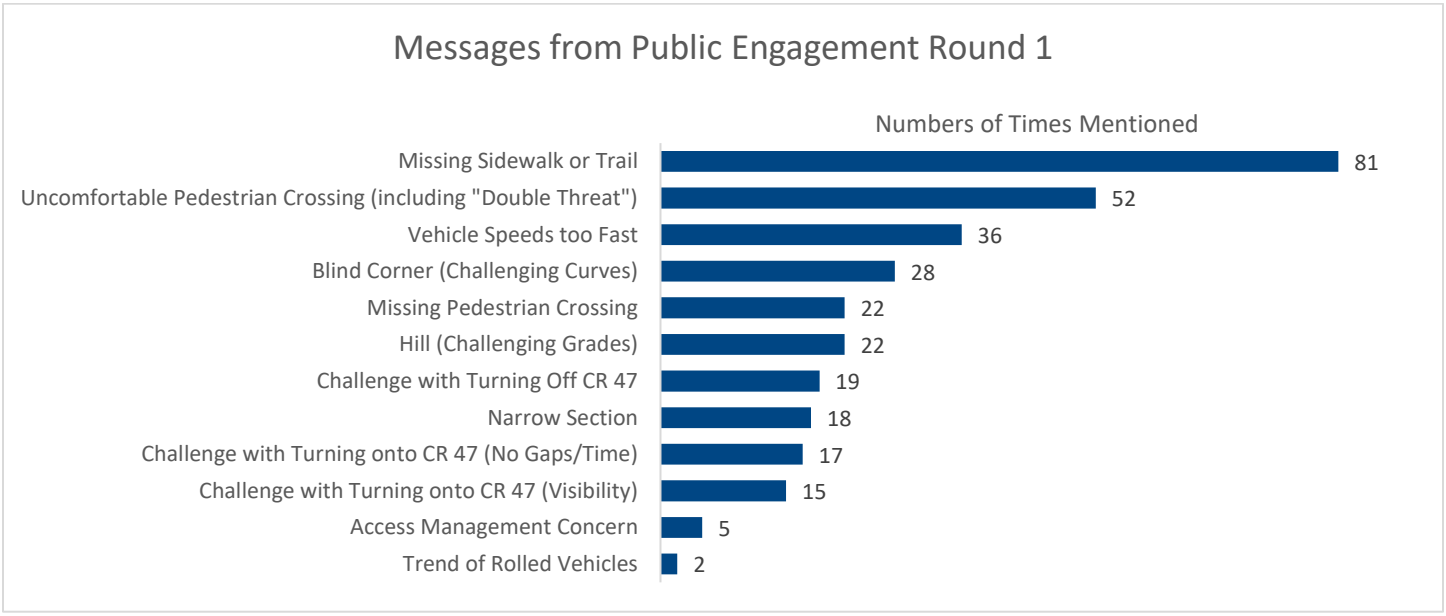
- Sidewalks & a trail along County Road 47
- Reduced vehicle speeds (with support for a lower speed limit)
- Increased sight distances and visibility for all users (as it relates to both horizontal and vertical curves)
- Elimination of the bypass lanes and/or untraditional turn lanes on the east end of the corridor

Open House 1 Detailed Results

The comments received in the first round of engagement can be grouped into three overall categories, with subcategories in each:

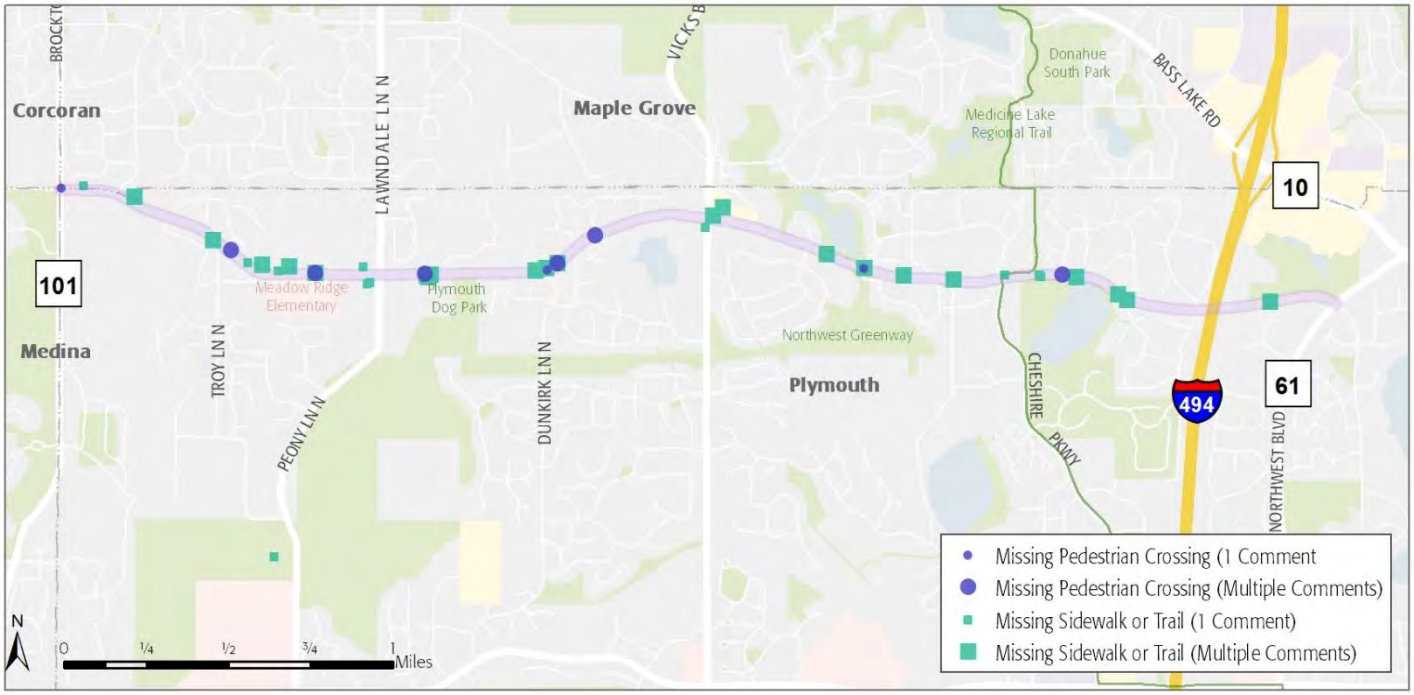


Missing sidewalks or trails, **uncomfortable pedestrian crossings**, and **vehicle speeds** were the most common messages.



The following pages show where the comments are that mention each topic from the public engagement process.

Missing Infrastructure Feedback

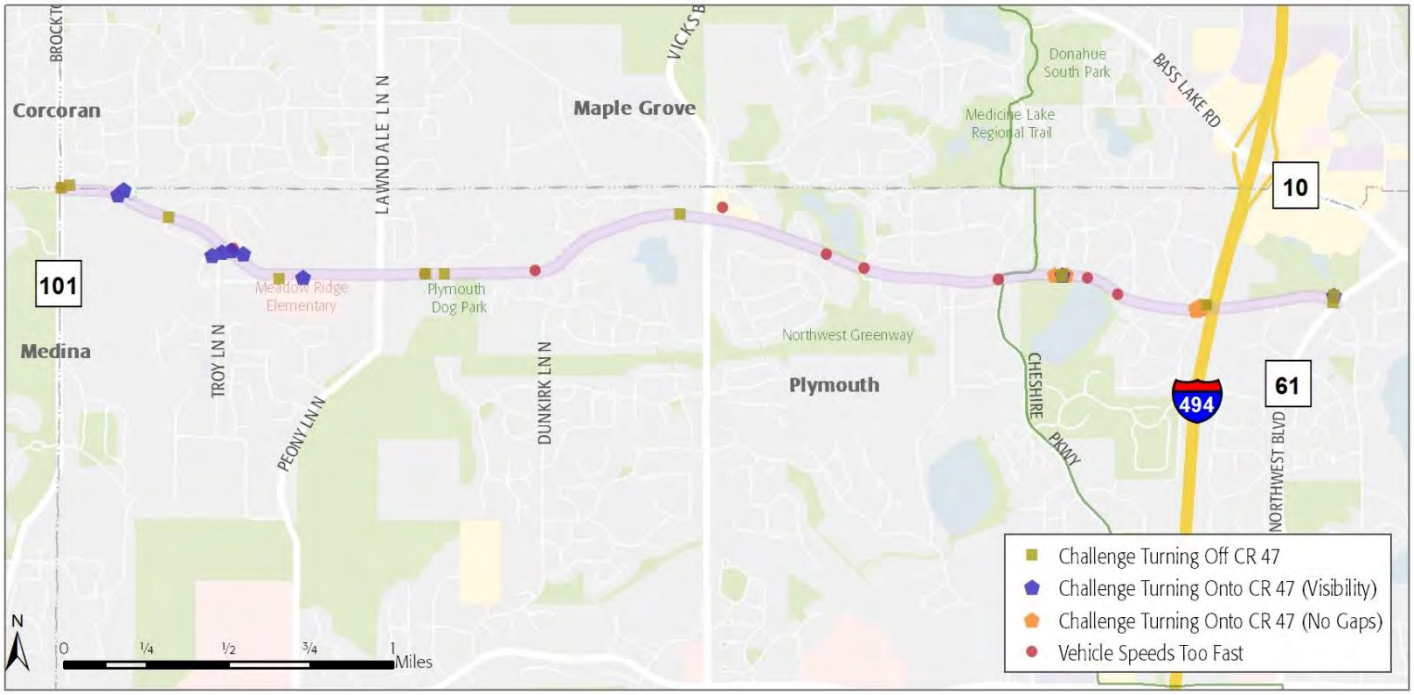


- Sidewalk, wide shoulder, and/or trail for pedestrian and bike users is noted as missing throughout
- More frequent pedestrian crossings desired on the west end of the corridor
  - Currently Lawndale Lane and Vicksburg Lane are the only intersections with marked crossings on that section
- Several people suggested that a crossing and/or infrastructure to bicycle or walk to **Meadow Ridge Elementary** school would be utilized
- The narrow bridge deck west of the **Plymouth Dog Park** makes walking along CR 47 to the park challenging

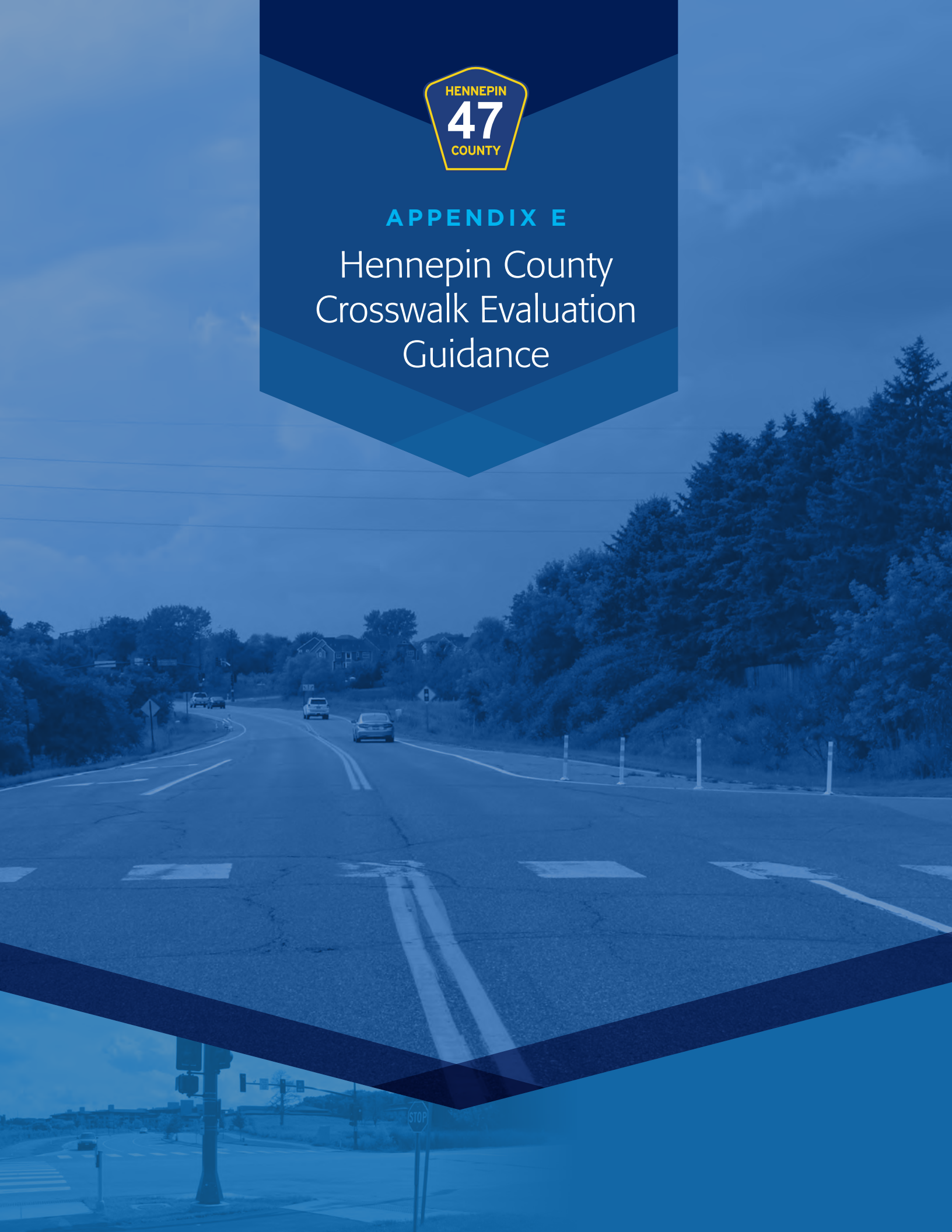
Roadway Design & Operational Feedback

- The most frequently noted locations had uncomfortable existing pedestrian crossings coupled with visibility and/or speed issues:
  - **Troy Lane**: Several comments described challenges turning to and from Troy Lane due to curvature & speeds of vehicles on County Road 47. Pedestrians don't like crossing here due to the high speeds of vehicles.
  - **Plymouth Dog Park**: A narrow bridge deck makes walking along CR 47 challenging and makes it hard to see pedestrians crossing to the park. This crossing was noted as uncomfortable due to vehicle speeds.
  - **Dunkirk Lane**: several comments noted a trend of rolled vehicles. Pedestrian crossing made challenging by limited sight distances along curves and high speeds of vehicles.
  - **Cheshire Parkway:** comments were mostly regarding trail connectivity, bicycle accommodations, and speeds of vehicles
  - **Dallas Lane**: Several comments noted that drivers disregard the pedestrian flashers or are required to come to very sudden stops when they did notice pedestrians in the crosswalk. Most comments are regarding speed of vehicles approaching crosswalk.
  - **Yucca Lane**: Several comments described challenges turning onto County Road 47 from Yucca Lane, and there were similar comments to Dallas Lane, where drivers are not yielding the right of way to pedestrians. There were double threat scenarios identified at Yucca (when drivers use the turning lanes as bypass lanes).

Operational Challenges Feedback



- Vehicle speeds are noted as too fast throughout the corridor, and turning is a challenge, but for different reasons depending on location:
  - On the west side of the corridor: Vehicle speeds were noted as a challenge for other vehicles to make turns. These challenges were due to a combination of vehicle speeds and limited visibility. **Troy Lane** is a primary concentration of these comments.
  - On the east side of the corridor: Vehicle speeds were noted as a challenge for pedestrians to cross County Road 47 and for vehicles to make turns. On the east side of the corridor, there were more comments regarding limited gaps in traffic, coupled with speed and some visibility issues. These comments were concentrated around **Dallas Lane**.
  - Vehicles experience back-pressure turning off County Road 47 throughout the corridor.

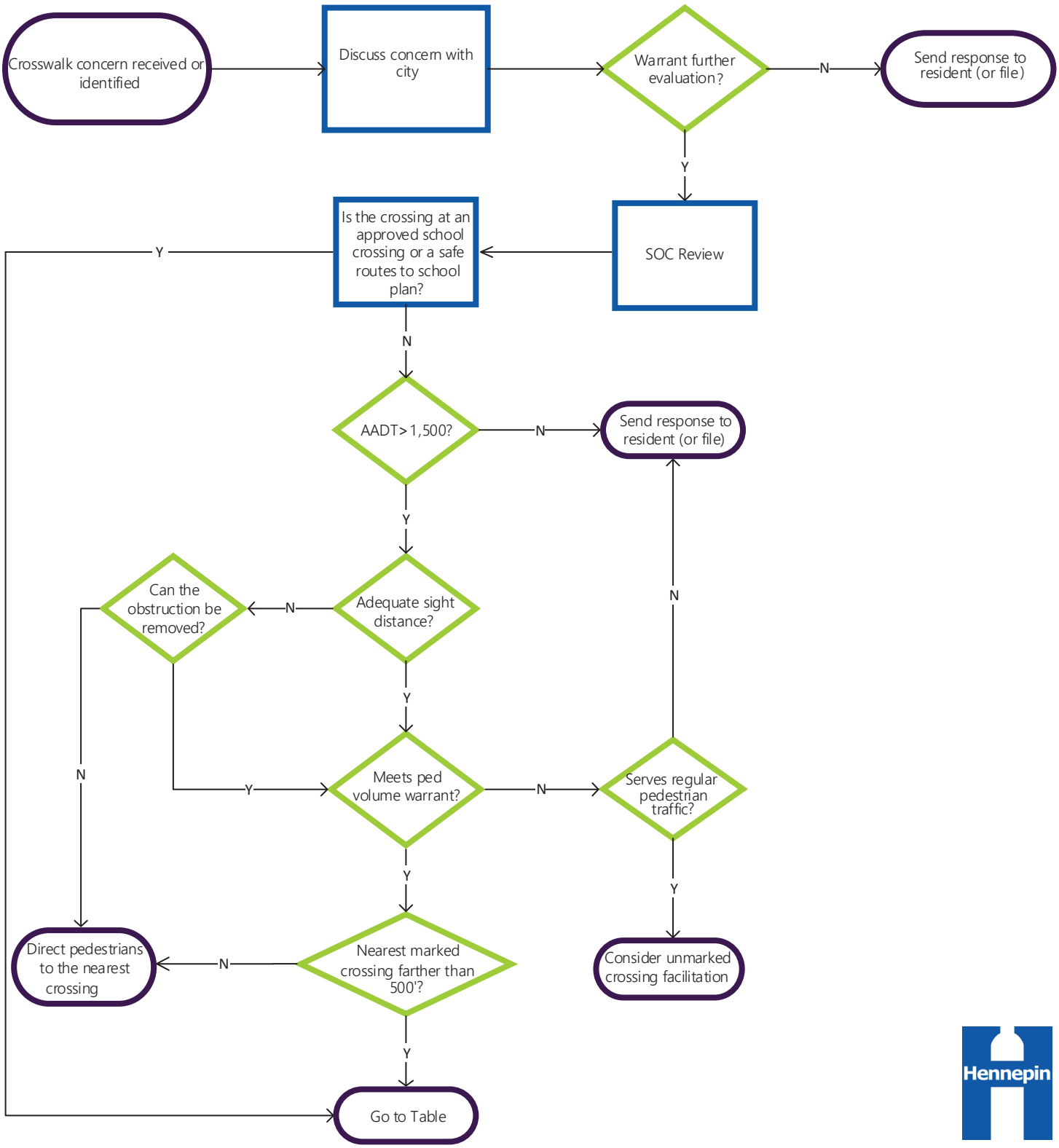


APPENDIX E

Hennepin County Crosswalk Evaluation Guidance

HENNEPIN COUNTY
MINNESOTA

Crosswalk Evaluation Guidance



Pedestrian Facility Treatments

Road Configuration	Roadway AADT and Posted Speed											
	1,500-12,000				12,000-15,000				15,000+			
	≤30	35	40	≥45	≤30	35	40	≥45	≤30	35	40	≥45
2 Lanes	A	B	C	E	B	C	D	E	B	C	D	E
3 Lanes with Raised Median	A	C	D	E	B	C	D	E	C	D	D	E
3 Lanes without Raised Median	C	C	D	E	C	C	D	E	C	D	D	E
4 Lanes with Raised Median	B	C	D	E	B	C	D	E	C	C	D	E
4 Lanes without Raised Median	C	D	D	E	C	D	D	E	D	D	D	E
5 Lanes with Raised Median	B	C	D	E	B	C	D	E	C	C	D	E
5 Lanes without Raised Median	D	D	D	E	D	D	D	E	D	D	D	E
6+ Lanes in any configuration	E	E	E	E	E	E	E	E	E	E	E	E

Consider the following treatments based on the criteria above:

A	Install marked crosswalk with roadside warning signs
B	Install marked crosswalk with roadside warning signs and in-roadway signs
C	Install marked crosswalk with roadside warning signs and in-roadway signs and geometric improvements
D	Install marked crosswalk with roadside warning signs and in-roadway signs and geometric improvements and RRFB
E	Do not install marked crosswalk. Consider geometric improvements, including grade separation. Review PHB or pedestrian signal warrants.

RRFB - Rectangular Rapid Flashing Beacon
PHB - Pedestrian Hybrid Beacon (aka High-Intensity Activated crossWalk beacon / HAWK)

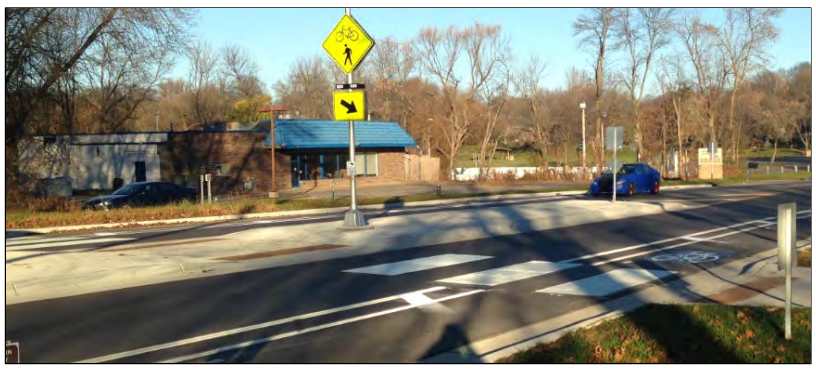
See following page for examples of various crossing treatment options

Pedestrian Crossing Treatment Examples

Signage, roadside warning signs, and markings

Delineators & Barriers

Bump-outs, Median Refuge Islands, Speed Tables

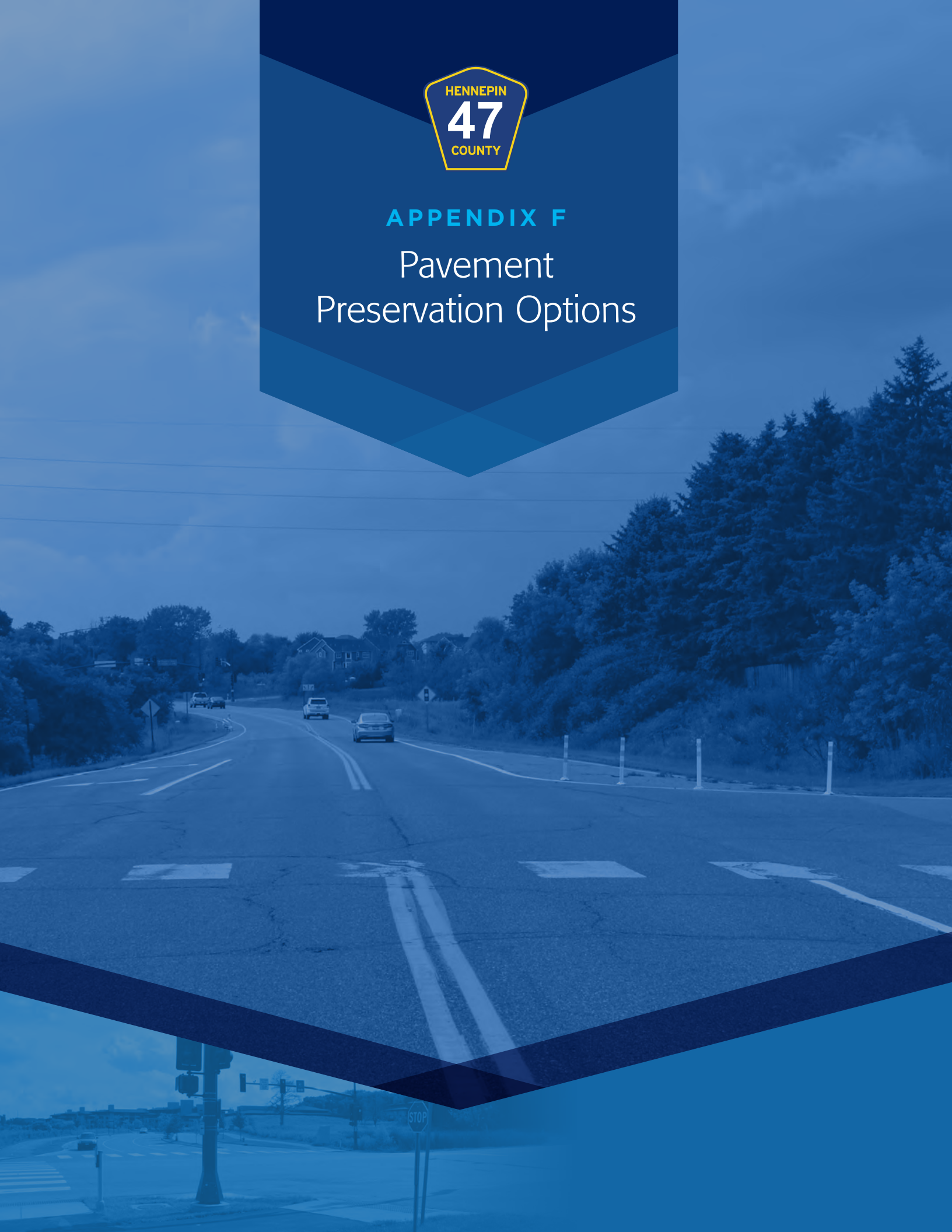


Warning flashers & signals

Rectangular Rapid Flashing Beacon (RRFB)

High-Intensity **A**ctivated **C**ross**W**alk (HAWK)

Pilot test for crossing signal (Minneapolis)



APPENDIX F

Pavement Preservation Options

COUNTY ROAD 47 PROPOSED PAVEMENT TREATMENT

ICON Custom Report 11/14/2019

MAPID	From	To	Length in Miles 4.07	Lane Miles 13.66	Proposed Treatment	PRS 2.67	PCI 80	PQI 67	Original Construction	Original Construction Year	Design	Last Surface Treatment	Last Surface Date
470000	CSAH 101 - BROCKTON LN	100 feet E of CSAH 101	100	0.08	Mill & Overlay	2.40	64	56	Construction-AC	2004	Urban	Construction-AC	07/01/04
470000	100 feet E of CSAH 101	CSAH 101 - BROCKTON LN (630' EAST	530	0.35	Reclamation	2.40	64	56	Construction-AC	1960	Rural	Overlay	07/24/08
470010	CSAH 101 - BROCKTON LN (630' EAST	TROY LN - RT	2,110	1.45	Reclamation	2.48	93	71	Construction-AC	1960	Rural	Overlay	07/24/08
470020	TROY LN - RT	LAWNDALE LN (860' W OF)	1,915	1.28	Reclamation	2.48	93	71	Construction-AC	1960	Rural	Overlay	07/24/08
470030	LAWNDALE LN (860' W OF)	300 feet West of Lawndale	560	0.35	Mill & Overlay	3.28	94	80	Construction-AC	2015	Urban	Construction-AC	10/01/15
470030	300 feet West of Lawndale	400 feet East of Lawndale	700	0.44	Mill & Overlay	3.28	94	80	Construction-AC	2015	Urban	Construction-AC	10/01/15
470030	400 feet East of Lawndale	LAWNDALE LN - RT (645' E OF)	245	0.15	Overlay	3.28	94	80	Construction-AC	2015	Rural	Construction-AC	10/01/15
470035	LAWNDALE LN - RT (645' E OF)	LAWNDALE LN - RT (765' E OF)	120	0.06	Overlay	3.28	94	80	Construction-AC	2015	Rural	Construction-AC	10/01/15
470040	LAWNDALE LN - RT (765' E OF)	DUNKIRK LN - RT	1,869	1.20	Reclamation	2.40	93	71	Construction-AC	1960	Rural	Overlay	07/24/08
470050	DUNKIRK LN - RT	VICKSBURG LN (78' W OF)	2,803	1.63	Reclamation	2.40	93	71	Construction-AC	1960	Rural	Overlay	07/24/08
470053	VICKSBURG LN (78' W OF)	VICKSBURG LN (87' E OF)	165	0.14	Overlay	2.80	74	65	Construction-AC	2016	Urban	Construction-AC	06/01/16
470055	VICKSBURG LN (87' E OF)	NIAGARA LN N (115' E OF)	2,674	2.20	Overlay	3.29	74	70	Construction-AC	2008	Rural	Construction-AC	01/01/08
470055	NIAGARA LN N (115' E OF)	400 feet East of Niagara	285	0.13	Overlay	3.29	74	70	Construction-AC	2008	Rural	Construction-AC	01/01/08
470060	400 feet East of Niagara	575 feet West of Fernbrook	1,230	0.58	Reclamation	2.88	72	65	Construction-AC	1960	Rural	Overlay	07/01/95
470070	575 feet West of Fernbrook	DALLAS LN - LT (306' W OF)	1,345	0.63	Reclamation	3.21	72	68	Construction-AC	1960	Rural	Overlay	08/01/15
470080	DALLAS LN - LT (306' W OF)	ANNAPOLIS LN	1,484	0.90	Reclamation	2.31	61	53	Construction-AC	1960	Rural	Overlay	06/23/10
470090	ANNAPOLIS LN	YUCCA LN	1,084	0.68	Reclamation	2.31	61	53	Construction-AC	1960	Rural	Overlay	06/23/10
470120	YUCCA LN	TEAKWOOD LN - RT	1,327	0.80	Reclamation	2.31	61	53	Construction-AC	1960	Rural	Overlay	06/23/10
470130	TEAKWOOD LN - RT	CSAH 61 - NORTHWEST BLVD	953	0.62	Mill & Overlay	2.31	61	53	Construction-AC	2008	Urban	Overlay	06/23/10

Higher than predicted scores due to intersection modifications within the sample sections.
Segment information to be updated in the AM System

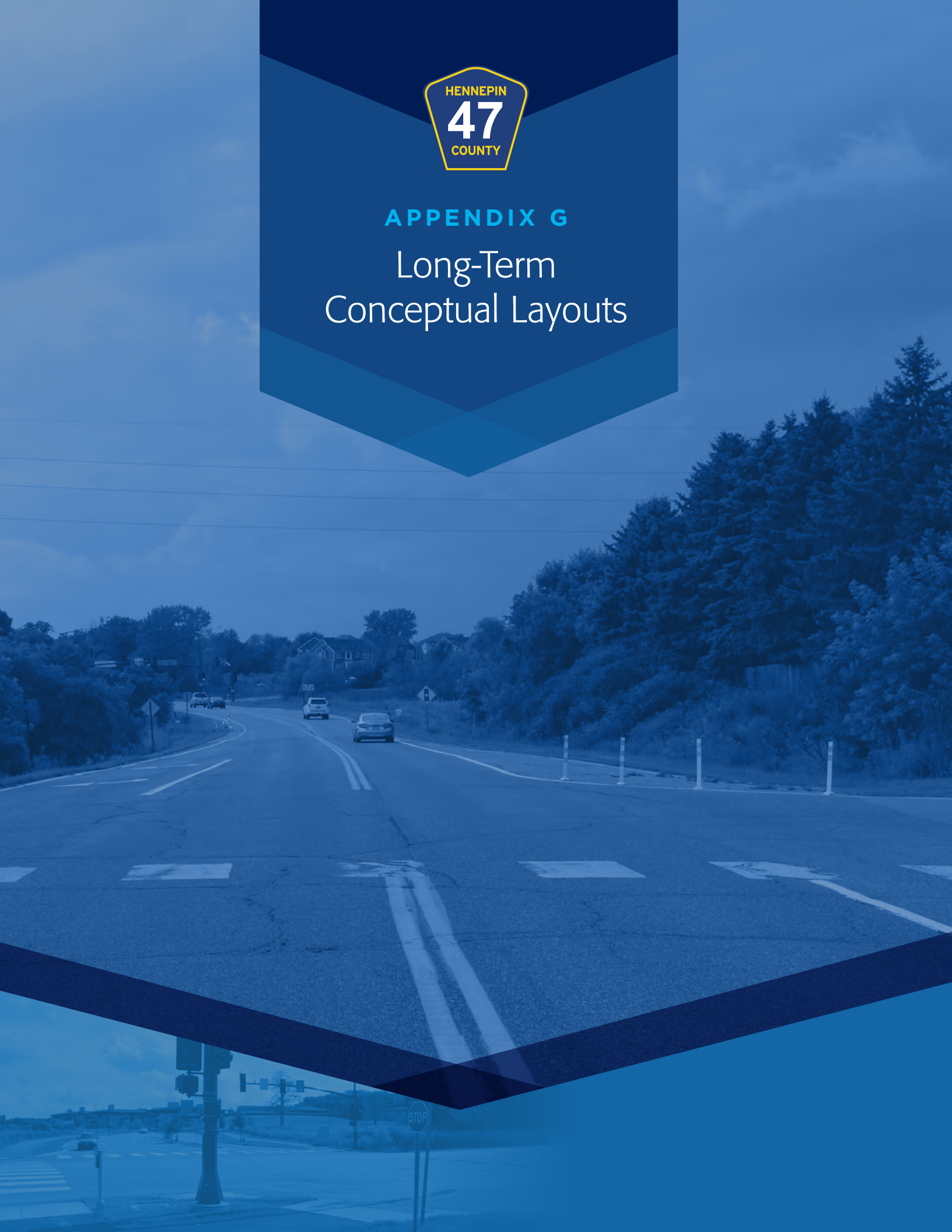
Lane Miles	Treatment
2.7	Overlay
1.5	Mill & Overlay
9.5	Reclamation
13.7	

PRS (Performance Related Specification) - A measure that predicts the pavement performance under certain maintenance scenarios
PCI (Pavement Condition Index) - Rating 1-100, based on a visual survey of the number and types of distresses in a pavement
PQI (Pavement Quality Index) - Rating 1-100, based on a calculation that includes the Ride Quality Index and Surface Rating

HENNEPIN 47 COUNTY

APPENDIX G

Long-Term Conceptual Layouts



LEGEND

PROPOSED ROADWAY	NEW RIGHT OF WAY
PROPOSED TRAIL	PROPOSED RIGHT OF WAY
PROPOSED RETAINING WALL	EXISTING RIGHT OF WAY

NOTE:
THIS CONCEPT IS INTENDED TO PROVIDE A LONG-TERM VISION AS A FOUNDATION FOR SUBSEQUENT DETAILED ENGINEERING AND DESIGN

COUNTY ROAD 47
LONG-TERM CONCEPT #1 (WITHOUT SHOULDER)

COUNTY ROAD 101 TO NORTHWEST BLVD (COUNTY ROAD 61)
SEPTEMBER 2019

City of Plymouth

Kimley»Horn

LEGEND

- PROPOSED ROADWAY
- PROPOSED TRAIL
- PROPOSED SHOULDER
- PROPOSED RETAINING WALL
- NEW RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING RIGHT OF WAY

NOTE:
THIS CONCEPT IS INTENDED TO PROVIDE A LONG-TERM VISION AS A FOUNDATION FOR SUBSEQUENT DETAILED ENGINEERING AND DESIGN

COUNTY ROAD 47
LONG-TERM CONCEPT #2 (WITH SHOULDER)

COUNTY ROAD 101 TO NORTHWEST BLVD (COUNTY ROAD 61)
SEPTEMBER 2019

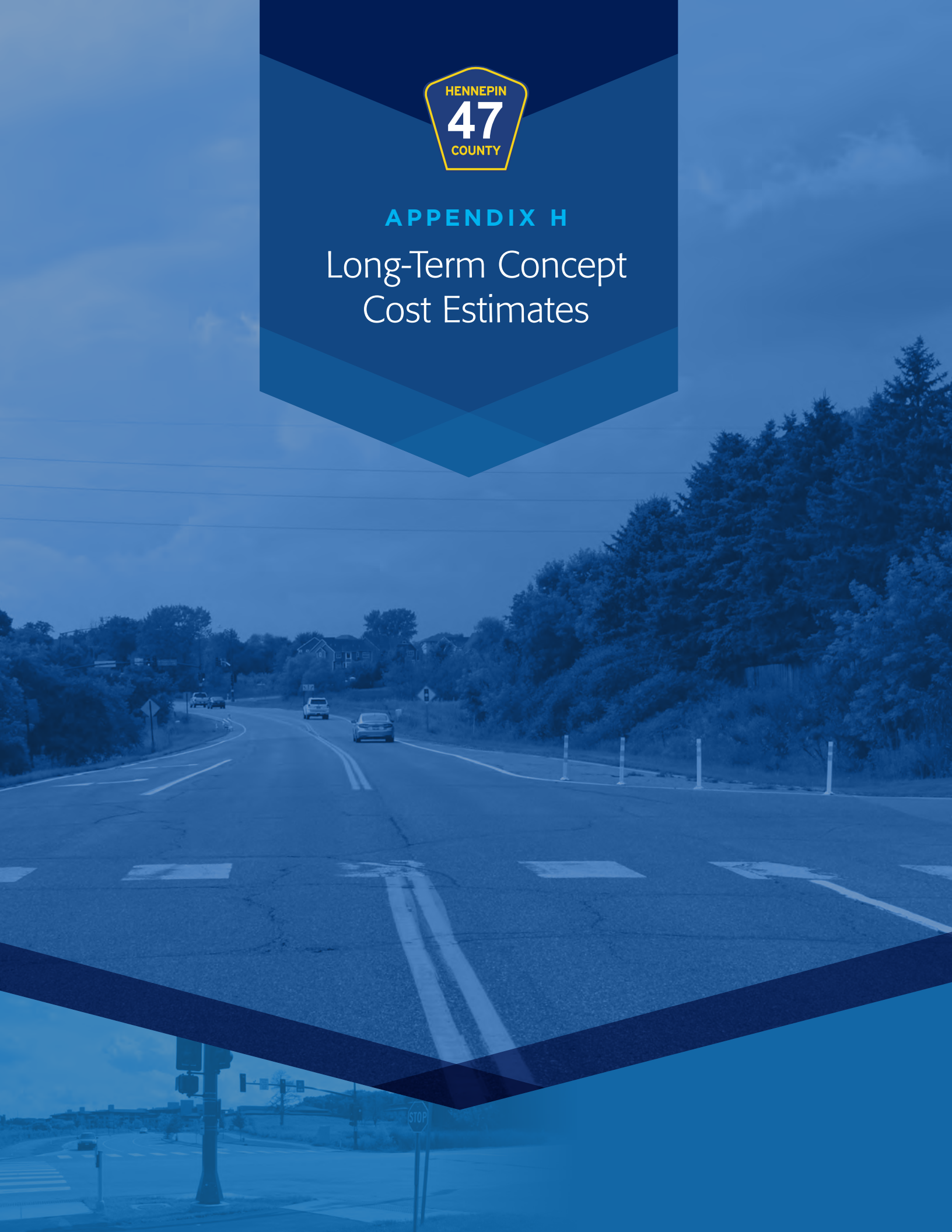
City of Plymouth

Kimley»Horn

HENNEPIN 47 COUNTY

APPENDIX H

Long-Term Concept Cost Estimates



COUNTY ROAD 47 CORRIDOR STUDY
CSAH 101 TO CSAH 61
OPTION 1 (WITHOUT SHOULDER)

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
1	MOBILIZATION	LUMP SUM	1	$ 850,000.00	$ 850,000.00
2	CLEARING AND GRUBBING	LUMP SUM	1	$ 50,000.00	$ 50,000.00
3	REMOVE CONCRETE CURB	LIN FT	5000	$ 3.00	$ 15,000.00
4	REMOVE BITUMINOUS PAVEMENT	SQ YD	130000	$ 3.00	$ 390,000.00
5	REMOVE CONCRETE WALK	SQ FT	10000	$ 1.00	$ 10,000.00
6	REMOVE DRIVEWAY PAVEMENT	SQ FT	10000	$ 1.00	$ 10,000.00
7	REMOVE BITUMINOUS WALK	SQ FT	45000	$ 1.00	$ 45,000.00
8	REMOVE GUARDRAIL	LIN FT	700	$ 10.00	$ 7,000.00
9	MISCELLANEOUS REMOVALS	LUMP SUM	1	$ 150,000.00	$ 150,000.00
10	COMMON EXCAVATION	CU YD	140000	$ 8.00	$ 1,120,000.00
11	SUBGRADE CORRECTION	CU YD	20000	$ 12.00	$ 240,000.00
12	CLASS 5 AGGREGATE BASE	CU YD	29000	$ 22.00	$ 638,000.00
13	SELECT GRANULAR BORROW	CU YD	75000	$ 20.00	$ 1,500,000.00
14	TYPE SP 12.5 NON WEARING COURSE MIXTURE (B) (4")	TON	25000	$ 70.00	$ 1,750,000.00
15	TYPE SP 12.5 WEARING COURSE MIXTURE (C) (3")	TON	19000	$ 75.00	$ 1,425,000.00
16	DRIVEWAY PAVEMENT	SQ YD	1000	$ 50.00	$ 50,000.00
17	BITUMINOUS TRAIL PAVEMENT	SQ FT	380000	$ 3.00	$ 1,140,000.00
18	6" CONCRETE WALK	SQ FT	20000	$ 5.00	$ 100,000.00
19	B618 CONCRETE CURB AND GUTTER	LIN FT	50000	$ 15.00	$ 750,000.00
20	TRUNCATED DOMES	SQ FT	1300	$ 50.00	$ 65,000.00
21	8X8 CONCRETE BOX CULVERT END SECT	EACH	4	$ 7,500.00	$ 30,000.00
22	8X8 CONCRETE BOX CULVERT	LIN FT	210	$ 1,000.00	$ 210,000.00
23	PREFABRICATED MODULAR BLOCK WALL	SQ FT	19000	$ 60.00	$ 1,140,000.00
24	WIRE FENCE	LIN FT	2300	$ 30.00	$ 69,000.00
25	TRAFFIC CONTROL	LUMP SUM	1	$ 100,000.00	$ 100,000.00
26	TURF ESTABLISHMENT	SQ YD	100000	$ 6.00	$ 600,000.00
27	TOPSOIL BORROW	CU YD	18000	$ 35.00	$ 630,000.00
28	EROSION CONTROL	LUMP SUM	1	$ 200,000.00	$ 200,000.00
29	SIGNING / STRIPING	LUMP SUM	1	$ 300,000.00	$ 300,000.00
30	SIGNAL SYSTEM REPLACEMENT	LUMP SUM	1	$ 250,000.00	$ 250,000.00
31	REVISE SIGNAL SYSTEM	LUMP SUM	4	$ 100,000.00	$ 400,000.00
32	PEDESTRIAN CROSSWALK ENHANCEMENTS	LUMP SUM	6	$ 30,000.00	$ 180,000.00
33	STORM SEWER SYSTEM	LUMP SUM	1	$ 2,000,000.00	$ 2,000,000.00
34	POND / BMP	EACH	15	$ 100,000.00	$ 1,500,000.00
35	DEWATERING	LUMP SUM	1	$ 100,000.00	$ 100,000.00
	Subtotal				$ 18,000,000.00
	15% Construction Contingency				$ 2,700,000.00
	30% Indirect Costs				$ 6,200,000.00
	Total Improvements Cost				**$ 26,900,000.00**

1. ASSUMES STANDARD COUNTY PAVEMENT SECTION OF 7" BITUMINOUS, 8" AGGREGATE BASE, AND 15" SELECT GRANULAR MATERIAL.
2. ASSUMES NO WATER MAIN OR SANITARY SEWER IMPROVEMENTS.
3. ASSUMES A NEW TRAFFIC SIGNAL AT CSAH 101 AND ONLY MODIFICATIONS TO ALL OTHER SIGNAL SYSTEMS.
4. ASSUMES REPLACEMENT OF THE EXISTING BOX CULVERT AT ELM CREEK
5. NO GEOTECHNICAL INFORMATION HAS BEEN PROVIDED.
6. ASSUMES NO STREET LIGHTING.
7. 30% INDIRECT COSTS INCLUDE ALL COSTS OUTSIDE OF CONSTRUCTION COSTS INCLUDING RIGHT-OF-WAY, WETLAND MITIGATION, ENGINEERING, FISCAL, LEGAL, ADMINISTRATION AND CAPITALIZED INTEREST.

COUNTY ROAD 47 CORRIDOR STUDY
CSAH 101 TO CSAH 61
OPTION 2 (WITH SHOULDER)

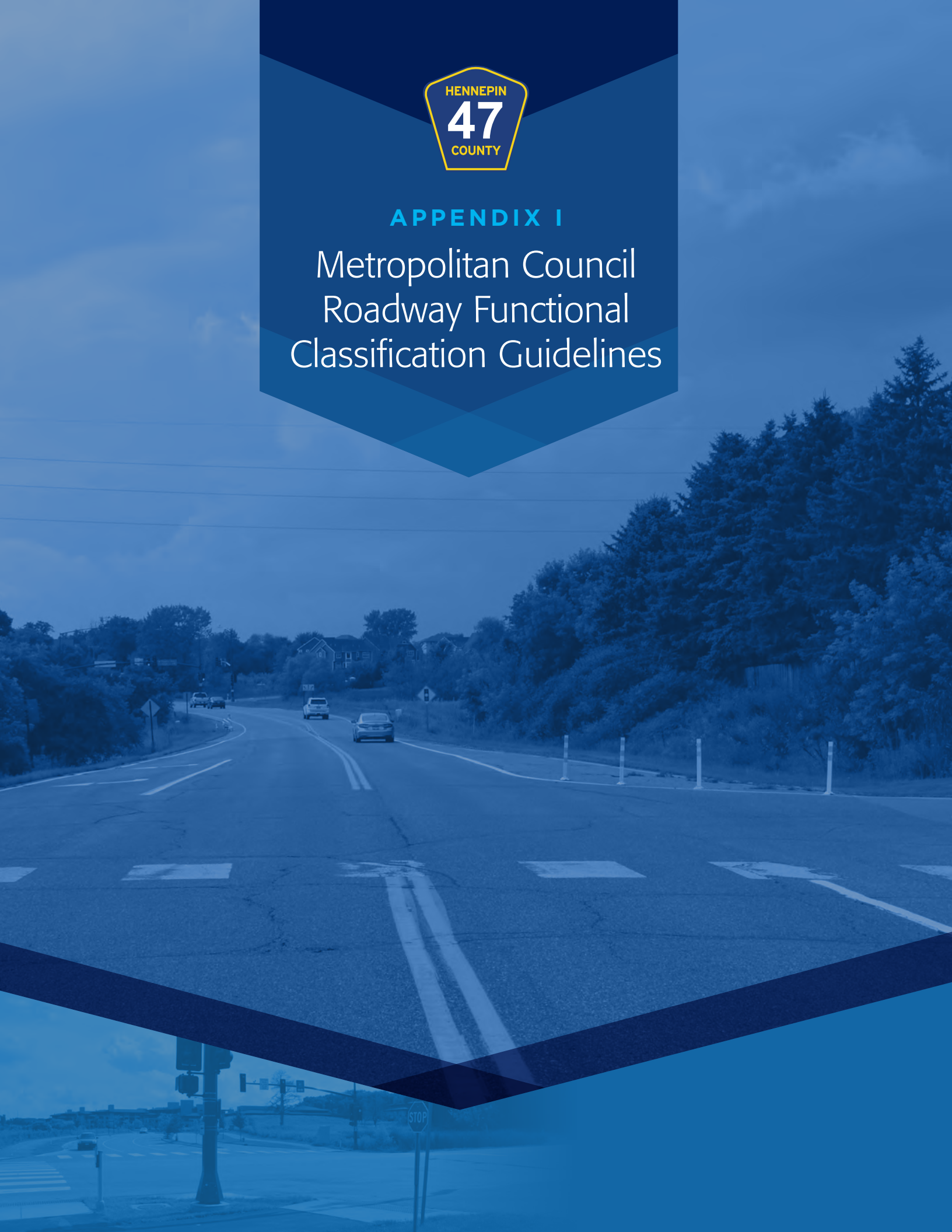
Item No.	Item Description	Unit	Quantity	Unit Price	Amount
1	MOBILIZATION	LUMP SUM	1	$ 900,000.00	$ 900,000.00
2	CLEARING AND GRUBBING	LUMP SUM	1	$ 50,000.00	$ 50,000.00
3	REMOVE CONCRETE CURB	LIN FT	5000	$ 3.00	$ 15,000.00
4	REMOVE BITUMINOUS PAVEMENT	SQ YD	130000	$ 3.00	$ 390,000.00
5	REMOVE CONCRETE WALK	SQ FT	10000	$ 1.00	$ 10,000.00
6	REMOVE DRIVEWAY PAVEMENT	SQ FT	10000	$ 1.00	$ 10,000.00
7	REMOVE BITUMINOUS WALK	SQ FT	45000	$ 1.00	$ 45,000.00
8	REMOVE GUARDRAIL	LIN FT	700	$ 10.00	$ 7,000.00
9	MISCELLANEOUS REMOVALS	LUMP SUM	1	$ 150,000.00	$ 150,000.00
10	COMMON EXCAVATION	CU YD	150000	$ 8.00	$ 1,200,000.00
11	SUBGRADE CORRECTION	CU YD	20000	$ 12.00	$ 240,000.00
12	CLASS 5 AGGREGATE BASE	CU YD	32000	$ 22.00	$ 704,000.00
13	SELECT GRANULAR BORROW	CU YD	80000	$ 20.00	$ 1,600,000.00
14	TYPE SP 12.5 NON WEARING COURSE MIXTURE (B) (4")	TON	29000	$ 70.00	$ 2,030,000.00
15	TYPE SP 12.5 WEARING COURSE MIXTURE (C) (3")	TON	22000	$ 75.00	$ 1,650,000.00
16	DRIVEWAY PAVEMENT	SQ YD	1000	$ 50.00	$ 50,000.00
17	BITUMINOUS TRAIL PAVEMENT	SQ FT	380000	$ 3.00	$ 1,140,000.00
18	6" CONCRETE WALK	SQ FT	20000	$ 5.00	$ 100,000.00
19	B618 CONCRETE CURB AND GUTTER	LIN FT	50000	$ 15.00	$ 750,000.00
20	TRUNCATED DOMES	SQ FT	1300	$ 50.00	$ 65,000.00
21	8X8 CONCRETE BOX CULVERT END SECT	EACH	4	$ 7,500.00	$ 30,000.00
22	8X8 CONCRETE BOX CULVERT	LIN FT	226	$ 1,000.00	$ 226,000.00
23	PREFABRICATED MODULAR BLOCK WALL	SQ FT	20000	$ 60.00	$ 1,200,000.00
24	WIRE FENCE	LIN FT	2400	$ 30.00	$ 72,000.00
25	TRAFFIC CONTROL	LUMP SUM	1	$ 100,000.00	$ 100,000.00
26	TURF ESTABLISHMENT	SQ YD	110000	$ 6.00	$ 660,000.00
27	TOPSOIL BORROW	CU YD	20000	$ 35.00	$ 700,000.00
28	EROSION CONTROL	LUMP SUM	1	$ 200,000.00	$ 200,000.00
29	SIGNING / STRIPING	LUMP SUM	1	$ 325,000.00	$ 325,000.00
30	SIGNAL SYSTEM REPLACEMENT	LUMP SUM	1	$ 250,000.00	$ 250,000.00
31	REVISE SIGNAL SYSTEM	LUMP SUM	4	$ 100,000.00	$ 400,000.00
32	PEDESTRIAN CROSSWALK ENHANCEMENT	LUMP SUM	6	$ 30,000.00	$ 180,000.00
33	STORM SEWER SYSTEM	LUMP SUM	1	$ 2,250,000.00	$ 2,250,000.00
34	POND / BMP	EACH	15	$ 100,000.00	$ 1,500,000.00
35	DEWATERING	LUMP SUM	1	$ 100,000.00	$ 100,000.00
	Subtotal				$ 19,300,000.00
	15% Construction Contingency				$ 2,900,000.00
	30% Indirect Costs				$ 6,700,000.00
	Total Improvements Cost				**$ 28,900,000.00**

1. ASSUMES STANDARD COUNTY PAVEMENT SECTION OF 7" BITUMINOUS, 8" AGGREGATE BASE, AND 15" SELECT GRANULAR MATERIAL.
2. ASSUMES NO WATER MAIN OR SANITARY SEWER IMPROVEMENTS.
3. ASSUMES A NEW TRAFFIC SIGNAL AT CSAH 101 AND ONLY MODIFICATIONS TO ALL OTHER SIGNAL SYSTEMS.
4. ASSUMES REPLACEMENT OF THE EXISTING BOX CULVERT AT ELM CREEK
5. NO GEOTECHNICAL INFORMATION HAS BEEN PROVIDED.
6. ASSUMES NO STREET LIGHTING
7. 30% INDIRECT COSTS INCLUDE ALL COSTS OUTSIDE OF CONSTRUCTION COSTS INCLUDING RIGHT-OF-WAY, WETLAND MITIGATION, ENGINEERING, FISCAL, LEGAL, ADMINISTRATION AND CAPITALIZED INTEREST.

HENNEPIN 47 COUNTY

APPENDIX I

Metropolitan Council Roadway Functional Classification Guidelines



Appendix D: Functional Classification Criteria and Characteristics, and MnDOT Access Guidance

Functional classification identifies the role a highway or street plays in the transportation system. Some highways are intended to emphasize mobility for longer distance trips, while other roads are intended to primarily provide access to land. Planners and engineers have developed functional classification categories based on the number and types of trips that roads carry, the surrounding land uses, and the stage of urban or rural development. Functional classification informs roadway design decisions that affect the road's function like roadway speed, width, and intersection spacing and control. Functional classification can also be considered when identifying the multimodal role of a road, including truck, bus transit, bicycle, and pedestrian use and accommodation. Highway and street projects should implement designs including multimodal accommodations that are compatible with a road's functional classification and surrounding land uses.

The main functional classes used in the metropolitan area are used nationwide and described in the Federal Highway Administration's (FHWA) *Highway Functional Classification Concepts, Criteria and Procedures, 2013 Edition*. They consist of urban and rural designations for four main classes of roads: principal arterials (which include all freeways), minor arterials, collector roads, and local roads. The FHWA definitions of urban and rural are different from those used in Thrive MSP 2040. The FHWA definitions are based on population density from the US Census; Thrive MSP 2040 definitions are based on the availability of regional sanitary sewer service. For the purpose of this appendix, the Thrive MSP 2040 definitions are used. Statewide functional classification analysis and reporting must use the FHWA urban and rural definitions.

In addition to the FHWA classifications, the region has identified the most important minor arterials in Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties. These A-minor arterials supplement the principal arterial system and support access to regional job concentrations and freight terminals. Within these seven counties, principal and A-minor arterials are eligible to compete for federal funds through the Transportation Advisory Board's Regional Solicitation.

This appendix to the Transportation Policy Plan identifies criteria and characteristics for use in assigning roadway functional classification. Criteria are the primary tool for identifying roadway function. Characteristics are intended to be supplementary information. When a decision about the functional classification of a road is not clear based on the criteria provided, characteristics may be used as supplementary decision factors. Functional classification system criteria are presented in Tables D-1, D-3, D-4 and D-6. Functional classification system characteristics are shown in Tables D-2, D-5, and D-7.

This appendix also includes a summary of Minnesota Department of Transportation (MnDOT) intersection spacing and control guidelines for federal, state and interstate highways in the metropolitan area. The MnDOT access management guidelines were developed for the entire state; MnDOT's functional classification category for the metropolitan area is summarized in Table D-8 and at http://www.dot.state.mn.us/accessmanagement/index.html.

Principal Arterials

The emphasis of principal arterials is on moving large volumes of traffic over long distances rather than providing direct access to land. They connect the region with other areas in the state, the nation, and the world. Principal arterials also connect regional concentrations and freight terminals within the metropolitan area. Principal arterials should support the longest trips in the region, including intercity bus, express bus, and highway bus rapid transit services.

Principal arterials consist primarily of interstate freeways and other freeways or highways. Most are owned and operated by MnDOT, but some are under the jurisdiction of Anoka, Dakota, Ramsey, and Scott counties or the City of Saint Paul. The Metropolitan Highway System, as defined in the Transportation Policy Plan, is composed of all principal arterials in Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties.

Principal arterial spacing and access spacing vary based on the density of surrounding development. Table D-1 shows principal arterial spacing varies from two to three miles in the most densely developed parts of the region to six to 12 miles in rural areas. Where an urban or suburban level of development is planned, spacing of principal arterials or future principal arterials may be two to three miles. Table D-1 also shows access spacing to principal arterials; non-interstate freeways provide land access somewhat more frequently than interstate freeways. At present, principal arterials connect with other principal and minor arterials, and select collectors and local streets. In the future, new connections to principal arterials should be limited to other principal and A-minor arterials, or to select minor arterials in Wright and Sherburne counties where A-minors are not identified.

Principal arterials are not intended to serve pedestrian and bicycle travel directly and they often act as barriers to bicycle and pedestrian travel in the centers and neighborhoods through which they pass. Adequate pedestrian and bicycle crossings separate from general traffic lanes are an important consideration along principal arterials.

Minor Arterials

The minor arterial system supplements the principal arterial system and provides connections to the principal arterial system. Minor arterials also support access to major traffic generators, including regional job concentrations and freight terminals, and between rural centers within and just outside the region. Minor arterials should serve medium-to-short trips, including arterial bus rapid transit, limited-stop bus, and local bus service.

In the urban service area the emphasis of minor arterials is on supplementing principal arterial mobility as opposed to providing direct access to land, and only concentrations of commercial, industrial, or residential land uses should have direct access to them. Minor arterials should connect to principal arterials, other minor arterials and collectors. Connections to some local streets are acceptable.

The spacing of minor arterials and access along them vary based on the density of surrounding development. Table D-3 shows minor arterial spacing varies from one-fourth mile to three-fourths

mile in the most densely developed parts of the region, to every one to two miles in the emerging suburban areas. Where an urban or suburban level of development is planned, minor arterials should be spaced every one-half mile to two miles. The criteria and characteristics in Table D-3 and Table D-5 apply to all minor arterials. The A-minor arterials are grouped into four categories – Augmentors, Relievers, Expanders, and Connectors – and are described in Table D-4.

Minor arterials are designed to carry higher volumes of general traffic than other local roads and these design characteristics often create a barrier for bicycle and pedestrian travel. Priority should be placed on addressing these barriers in areas with pedestrian traffic, such as within regional job concentrations, within local centers, and along major transit routes.

Collector Roads

Mobility and land access are equally important on the collector road system. The collector system provides connections between neighborhoods and from neighborhoods to regional job concentrations and local centers. It also provides supplementary connections between major traffic generators within regional job concentrations. Direct land access should primarily be to development concentrations. Connectors typically serve short trips of one to four miles. Collectors connect primarily to minor arterials, other collectors, and local streets.

Major and minor collectors should be identified in the urban and rural areas. Major collectors serve higher density residential areas (often penetrating residential neighborhoods for significant distances), job and activity centers and freight terminals that are not on the arterial system, and they serve longer local trips, including local bus service. Minor collectors serve shorter local trips and lower density land uses (often penetrating residential neighborhoods only for a short distance). Spacing in regional job concentrations and local centers may vary from one-eighth to one-half mile. In urban center and urban communities, collectors are needed one-fourth to three-fourths mile apart. In communities with suburban designations, spacing may range from one-half to one mile and may service existing development, but one-fourth to three-fourth mile spacing may be required in the future. Major collectors should be spaced farther apart than minor collectors.

Collector roads can be good candidates for bicycle routes because they serve shorter trips that bicyclists make and generally have more compatible traffic speeds and volumes as compared to arterials. Collectors in the urban service area should include pedestrian accommodations and may be candidates for traffic calming, especially where pedestrian traffic is greatest, such as within regional job concentrations and local centers and along transit routes. For more information on bicycle and pedestrian accommodations, refer to the Strategies and Bicycle and Pedestrian Investment Direction discussions.

Local Roads

Local roads connect blocks and land parcels, and the primary emphasis is on land access. In most cases, local roads connect to other local roads and collectors. In some cases, they connect to minor arterials. Local roads serve short trips at low speeds. In the urban center, local roads could be are spaced as close as 300 feet, while in the rural area, one-mile spacing may be adequate.

Local roads serve local travel for pedestrians and bicyclists. Transit is occasionally a consideration for local roads, depending on the surrounding land uses.

Table D-1: Functional Classification System Criteria for Principal Arterials

Criterion	Interstate and Freeway Principal Arterial		Other Principal Arterial	
	Urban Service Area	Rural	Urban Service Area	Rural
Place Connections	Connect regional job concentrations and freight terminals within the urban service area.	Connect the urban service area with urban areas and major cities in Minnesota and other states.	Connect regional job concentrations and freight terminals within the urban service area.	Connect the urban service area with major cities in Minnesota and other states.
Spacing	Within urban community designations: 2-3 miles Within suburban community designations: Spacing should vary in relation to development density of land uses served, 2-6 miles	6-12 miles Closer spacing may be required to connect portions of the urban service area to each other or to Rural Centers.	Urban community designations: 2-3 miles. Suburban community designations: Spacing should vary in relation to development density of land uses served, 2-6 miles	6-12 miles Closer spacing may be required to connect portions of Rural community designations to each other or to Rural Centers.
Operations	Designed for speeds of 45 miles per hour or more			
System Connections and Access Spacing*	To other Interstate freeways, other principal arterials and selected A-minor arterials. Connections between principal arterials should be of a design type that does not require vehicles to stop. Access at distances of 1-2 miles.	To other Interstate freeways, principal arterials, and selected A-minor arterials. Access at distances of 2-6 miles.	To Interstate freeways, other principal arterials, and selected A-minor arterials. Connections between principal arterials should be of a design type that does not require vehicles to stop. Intersections should be limited to 1-2 miles.	To Interstate freeways, other principal arterials, and selected A-minor arterials. Intersections should be limited to 2 miles or more.

Table D-1: Functional Classification System Criteria for Principal Arterials

Criterion	Interstate and Freeway Principal Arterial		Other Principal Arterial	
	Urban Service Area	Rural	Urban Service Area	Rural
Trip-Making Service	Trips greater than 8 miles with at least 5 continuous miles on principal arterials. Express and highway bus rapid transit trips		Trips greater than 8 miles with at least 5 continuous miles on principal arterials. Express and highway bus rapid transit trips	
Mobility vs. Land Access*	Emphasis is on mobility for longer trips rather than direct land access. No direct land access should be allowed.	Emphasis is on mobility rather than land access. No direct land access should be allowed.	Emphasis is on mobility for longer trips rather than direct land access. Little or no direct land access within the urbanized area.	Emphasis is on mobility rather than land access. Little or no direct land access.

*The key objective is stated under “Operations” heading in this table.

Table D-2: Functional Classification System Characteristics for Principal Arterials

Characteristic	Interstate and Freeway Principal Arterial		Other Principal Arterial	
	Urban Service Area	Rural	Urban Service Area	Rural
System Mileage	FHWA suggests statewide mileage for Interstate and other freeway principal arterials at 1 – 5% of system	FHWA suggests statewide mileage for Interstate and other freeway principal arterials at 1-5% of system	FHWA suggests statewide mileage for other principal arterials at 4-9% of system	FHWA suggests statewide mileage for other principal arterials at 2-6% of system
Percent of Vehicle Miles Traveled	FHWA suggests 17-43% of statewide VMT	FHWA suggests 18-45% of statewide VMT	FHWA suggests 16-33% of statewide VMT	FHWA suggests 15-31% of statewide VMT
Intersections	Grade separated	Grade separated	Grade separated desirable where appropriate. At a minimum, high-capacity controlled at-grade intersections	High-capacity controlled at-grade intersections
Parking	None	None	None	None
Large Trucks	No restrictions	No restrictions	No restrictions	No restrictions
Management Tools	Ramp metering, preferential treatment for transit, interchange spacing	Interchange spacing	Ramp metering, preferential treatment for transit, access control, median barriers, traffic signal progression, staging of reconstruction, intersection spacing	Access control, intersection spacing
Typical Average Daily Traffic Volumes	25,000-200,000+	5,000-50,000+	15,000-100,000+	2,500 - 25,000+
Posted Speed Limit	45-70 mph	55-70 mph	40-65 mph	Legal limit
Right-of-Way	300 feet	300 feet	100 - 300 feet	100 - 300 Feet

Table D-2: Functional Classification System Characteristics for Principal Arterials

Characteristic	Interstate and Freeway Principal Arterial		Other Principal Arterial	
	Urban Service Area	Rural	Urban Service Area	Rural
Transit Accommodations	Transit advantages that provide priority access and reliable movement for transit in peak periods where needed	None	Transit advantages that provide priority access and reliable movement for transit in peak periods where possible and needed	None
Bicycle and Pedestrian Accommodations	On facilities that cross or are parallel to the principal arterial, with greater emphasis along transit routes and in activity centers. Crossings should be spaced to allow for adequate crossing opportunities	On facilities that cross or are parallel to the principal arterial	On facilities that cross or are parallel to the principal arterial, with greater emphasis along transit routes and in activity centers. Crossings should be spaced to allow for adequate crossing opportunities	On facilities that cross or are parallel to the principal arterial

This table summarizes characteristics for existing roadways to be used in evaluating functional classification and should not be used as design guidelines.

Table D-3: Functional Classification System Criteria for Minor Arterials

Criterion	Minor Arterial (A-minor or other)	
	Urban Service Area	Rural
Place Connections	Provide supplementary connections between regional job concentrations, local centers, and freight terminals within the urban service area	Connect the urban service area with cities and towns in Minnesota outside the Twin Cites region. Connect rural growth centers inside the Twin Cities region and comparable places near the Twin Cities region
Spacing	Regional job concentrations: 1/4-3/4 mile Urban community designations: 1/2-1 mile Suburban community designations: 1-2 miles	Rural Areas: As needed, in conjunction with the major collectors, provide adequate interconnection of places identified in “Place Connections” criterion
System Connections	To most Interstate freeways and other principal arterials, other minor arterials, collectors, and some local streets	To most Interstate freeways and other principal arterials, other minor arterials, collectors, and some local streets
Trip-Making Service	Medium-to-short trips (2-6 miles depending on development density) at moderate speeds. Longer trips accessing the principal arterial network. Local, limited-stop, and arterial bus rapid transit trips	
Operations	Designed for speeds less than 45 miles per hour	Designed for speeds ranging from 45 to 55 miles per hour
Mobility vs. Land Access*	Emphasis on mobility for longer trips rather than on direct land access. Direct land access limited to concentrations of activity including regional job concentrations, local centers, freight terminals, and neighborhoods.	Emphasis on mobility for longer trips rather than on direct land access

*The key objective is stated under “Operations” heading in this table.

Table D-4: Additional Criteria for A-Minor Arterials

Criterion in addition to Table D-3	Relievers	Augmentors	Expanders	Connectors
Purpose	Provide supplementary capacity for congested, parallel principal arterial	Supplement the principal arterial system in more densely developed or redeveloping areas	Supplement the principal arterial system in less densely developed or redeveloping areas	Provide safe, direct connections between rural centers and to principal arterials in rural areas without adding continuous general purpose lane capacity
Location in Thrive MSP 2040 Community designations	Urban service area: Consists of urban center, urban, suburban, suburban edge, and emerging suburban edge community designations as defined in Thrive MSP 2040	Urban center and urban community designations	Urban, suburban, suburban edge, and emerging suburban edge community designations	Rural community designations. One end may be outside the seven county area or may be in the urban service area
Existing System	400 miles	200 miles	650 miles	680 miles

See the Metropolitan Council Web site for a current map of the A-minor arterial system.

Table D-5: Functional Classification System Characteristics for Minor Arterials

Characteristic	Minor Arterial (A-or other)	
	Urban Service Area	Rural
System Mileage	FHWA suggests statewide mileage for minor arterials in urbanized areas at 7-14% of system	FHWA suggests statewide mileage for minor arterials in rural areas at 2-6% of system
Percent of Vehicle Miles Traveled	FHWA suggests 14-27% of statewide VMT	FHWA suggests 7-14% of statewide VMT
Intersections	Traffic signals, roundabouts, and cross-street stops	Roundabouts and cross-street stops
Parking	Restricted as necessary	Restricted as necessary
Large Trucks	Candidates for local truck network, large trucks restricted as necessary	Candidates for local truck network, large trucks restricted as necessary
Management Tools	Traffic signal progression and spacing, land access management/control, preferential treatment for transit	Land access management/control
Typical Average Daily Traffic Volumes	5,000-30,000+	1,000-10,000+
Posted Speed Limit	30-45 mph	Legal limit
Right-of-Way	60-150 feet	60-150 feet
Transit Accommodations	Transit advantages for reliable movement where needed	None
Bicycle and Pedestrian Accommodations	On facilities that cross or are parallel to the minor arterial, with greater emphasis along transit routes and in activity centers. Crossings should be spaced to allow for adequate crossing opportunities	On facilities that cross the minor arterial

Table D-6: Functional Classification System Criteria for Collectors and Local Streets

Criterion	Collector		Local	
	Urban Service Area	Rural	Urban Service Area	Rural
Place Connections	Connect neighborhoods and centers within the urban service area. Major collectors provide supplementary connections of major traffic generators within job and activity centers.	Provide supplementary connection between rural centers inside the Twin Cities region and comparable places near the Twin Cities region.	Connect blocks and land parcels within neighborhoods and within commercial or industrial developments.	
Spacing	Job concentrations: 1/8 - 1/2 mile Urban community designations: 1/4 - 3/4 mile Suburban community designations: 1/2 - 1 mile Minor collectors should be spaced more closely than major collectors.	Rural Areas: As needed in conjunction with minor arterials, to provide adequate connections for places identified in “Place Connections” criterion. In addition, minor collectors should be designated at an average spacing of not less than 4 miles.	As needed to access land uses.	As needed to access land uses.
System Connections	To minor arterials, other collectors, and local streets. Major collectors may connect to principal arterials under exceptional circumstances	To minor arterials, other collectors, and local streets.	To a few minor arterials. To collectors and other local streets.	To a few minor arterials. To collectors and local roads.

Table D-6: Functional Classification System Criteria for Collectors and Local Streets

Criterion	Collector		Local	
	Urban Service Area	Rural	Urban Service Area	Rural
Trip-Making Service	Short trips (1-4 miles depending on development density) at low-to-moderate speeds. Major collectors may support longer trips accessing the arterial network including local bus transit and bicycle trips.		Short trips (under 2 miles) at low speeds, including bicycle and pedestrian trips. Longer trips accessing the collector or collector and arterial network.	
Mobility vs. Land Access	Equal emphasis on mobility and land access. Direct land access predominantly to development concentrations.		Emphasis on land access, not on mobility. Direct land access predominantly to residential land uses.	Emphasis on land access, not on mobility. Direct land access predominantly to agricultural land uses.

Table D-7: Functional Classification System Characteristics for Collectors and Local Streets

Characteristic	Collector		Local	
	Urban Service Area	Rural	Urban Service Area	Rural
System Mileage	Suggested federal statewide range for major and minor collectors: 3-16%	Suggested federal statewide range: 8-19% for major collectors, 3-15% for minor collectors	Suggested federal statewide range: 62-74%	Suggested federal statewide range: 62-74%
Percent of Vehicle Miles Traveled	Suggested federal statewide range for major and minor collectors: 2-13%	Suggested federal statewide range: 10-23% for major collectors, 1-8% for minor collectors	Suggested federal statewide range: 9-25%	Suggested federal statewide range: 8-23%
Intersections	Four-way stops and some traffic signals	Local street traffic should be required to stop	As required	As required
Parking	Restricted as necessary	Unrestricted	Permitted as necessary	Permitted as necessary
Large Trucks	May be candidates for local truck network, large trucks restricted as necessary	May be candidates for local truck network, large trucks restricted as necessary	Permitted as necessary	Permitted as necessary
Management Tools	Number of lanes, traffic signal timing, land access management	Land access management	Intersection control, cul-de-sacs, diverters	
Typical Average Daily Traffic Volumes	1,000-15,000	250-2,500+	Less than 1,000	Less than 1,000
Posted Speed Limit	30-40 mph	35-45 mph	Maximum 30 mph	Maximum 30 mph
Right-of-Way	60-100 feet	60-100 feet	50-80 feet	50-80 feet

Table D-7: Functional Classification System Characteristics for Collectors and Local Streets

Characteristic	Collector		Local	
	Urban Service Area	Rural	Urban Service Area	Rural
Transit Accommodations	Cross-sections and geometrics designed for use by regular-route buses, transit advantages for reliable movement, where needed	None	Normally used as bus routes only in nonresidential areas	None
Bicycle and Pedestrian Accommodations	On, along, or crossing the collector with higher emphasis along transit routes and in activity centers. Crossings should be spaced to allow for adequate crossing opportunities	On, along, or crossing the collector	On, along, or crossing the local road	On, along, or crossing the local road

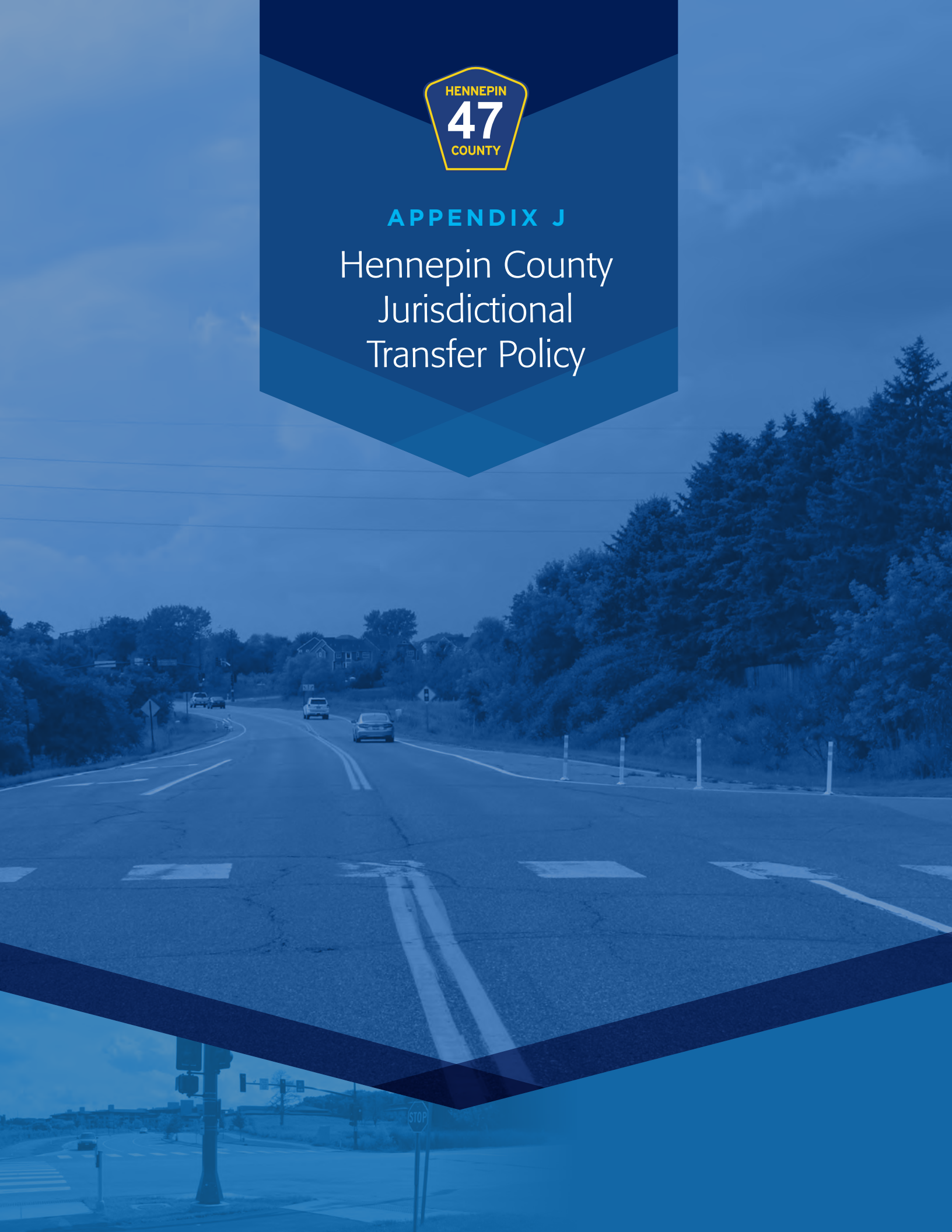
This table summarizes characteristics for existing roadways to be used in evaluating functional classification and should not be used as design guidelines.

Table D-8: Summary of MnDOT Public Street Spacing Access Guidelines for Interstate, U.S., and State Highways in the Twin Cities Metropolitan Area *

Functional Classification	Facility Type or Community Designation**	Public Street Spacing		Signal Spacing
		Primary Full-Movement Intersection	Secondary Intersection	
Principal Arterial	Interstate Freeway	Interchange Access Only		None
	Non-Interstate Freeway	Interchange Access Only		None
	Rural	1 mile	1/2 mile	Only at Primary Intersections
	Suburban	1/2 mile	1/4 mile	Only at Primary Intersections
	Urban	300-600 feet, dependent on block length		1/4 mile
Minor Arterial	Rural	1/2 mile	1/4 mile	Only at Primary Intersections
	Suburban	1/4 mile	1/8 mile	Only at Primary Intersections
	Urban	300-600 feet, dependent on block length		
Collector	Rural	1/2 mile	1/4 mile	Only at Primary Intersections
	Suburban	1/8 mile	Not Applicable	1/4 mile
	Urban	300-600 feet, dependent on block length		1/8 mile

* This table is a summary of MnDOT Access Guidance for the Metropolitan Area. This chart does not reflect all the MnDOT guidance. Agencies should work with MnDOT, the appropriate county highway authority, and the local land use authority when planning new or modified access.

**Community Designations are from Thrive MSP 2040, they are not MnDOT designations.



APPENDIX J

Hennepin County Jurisdictional Transfer Policy

Jurisdictional Transfer Policy

Adopted by the Hennepin County Board of Commissioners on June 26, 2018

The function of a roadway is ideally aligned with the appropriate jurisdiction. Misclassifications can lead to inefficiencies within the roadway system as well as funding complications for roadway improvements and preservation. A jurisdictional transfer may be necessary to optimize system connectivity, eliminate system redundancy, and achieve greater consistency in design guidelines and standards, all of which help to fulfill the county's broader Transportation vision and goals.

The function of roadways can change over time due to factors such as increased urbanization or significant changes to the regional roadway system. System realignments and adjustments are also prompted by new land development / redevelopment and modifications to the roadway network. These changes in roadway function, system realignment, and land use can prompt a need for a roadway to be transferred between agencies.

Jurisdictional transfers have generally been infrequent, however, the potential exists for a number of transfers to be considered in the near to mid-range future. Transfers between the state and county, as well as county and cities have varied in both process and detail. County leadership has expressed an interest for a more consistent and transparent process in the form of a policy that will ensure mutually beneficial jurisdictional transfer transactions in the future.

Transfer Requirements

To provide a more consistent approach to jurisdictional transfers, the following elements are required for a jurisdictional transfer involving Hennepin County:

1. A proposed transfer should be consistent with the proper jurisdictional hierarchy and identified long-range expectations of the Hennepin County Transportation Plan.
2. The impact of a proposed transfer should be evaluated within the context of the county's Asset Management Program to ascertain county resources required to maintain the potential addition to the highway system asset inventory. This process will include a review of operational requirements including available County State Aid Highway funds and needed local revenues, as well as any immediate capital equipment, facility, or personnel needs to support the potential roadway system addition.
3. Any proposed transaction involving a County State Aid Highway must have the support of the Minnesota Department of Transportation (MnDOT) State Aid office for consistency with County State Aid and/or Municipal State Aid requirements.
4. Transfers must include a formal agreement between the county and affected city(s) and/or state with mutually agreed upon terms between the parties.
5. The Hennepin County Board of Commissioners must approve all proposed jurisdictional transfers and financial agreements between the county and affected city(s) and/or state.

Transfer Justification

As potential jurisdictional transfers are considered, the following relationships should be evaluated: the alignment of roadway function and ownership; continuity and roadway spacing within the overall system/network; connectivity and integration with current and future land use; traffic volumes and type of traffic (e.g. freight) using the roadway.

Roadways transferred to Hennepin County from a city or MnDOT need to meet the criteria for County State Aid Highways along with several of the following conditions:

- Road functions as a minor arterial
- System continuity and spacing provide for an integrated and coordinated highway system
- The road connects communities, shipping points, or markets within the county or in adjacent counties
- The road provides access to major activity centers, industrial areas, state institutions, employment clusters, or recreational areas
- The traffic demand is appropriate for an arterial road, including heavy commercial / freight traffic

Roadways transferred to Hennepin County from MnDOT will also need to meet state requirements for trunk highway turnbacks. The county will use MnDOT turnback funds, when available, for reconstruction of former trunk highways. If reconstruction is not an option, restoration of the road will be considered. Additional roadway features, including traffic signal upgrades, pedestrian ramp upgrades, trails, retaining walls, and drainage structures will be evaluated as part of the roadway restoration.

Roadways transferred from Hennepin County to a city will likely need to meet municipal state aid street requirements and may have several of the following conditions:

- The road functions as a collector or non-regional minor arterial
- The road has experienced significant change in character over time (adjacent land development patterns, traffic volumes, access spacing, connections, etc.)
- The road system continuity or spacing of roads has changed where newly constructed or reconstructed roads have diverted traffic away from the county road
- The road serves to connect municipal land uses such as parks, parkways or recreational areas
- Development density along the road has increased substantially

In order for a county road to be transferred to MnDOT, the road's function will need to match the characteristics of a principal arterial such as a trunk highway or expressway.

Conditions of Transfer

A proposed transfer will be evaluated within the context of the county's Asset Management Program to determine the resources needed as the county works toward ensuring that the transferred roadway has an adequate 15-year service life to avoid burdening the accepting jurisdiction with

undue maintenance needs. The county's intent is to provide a stable road to the accepting agency with adequate time to plan, fund, and ultimately reconstruct the road per its standards, specifications, and vision.

Improvements and resources necessary to meet a 15-year service life may include a new pavement surface such as a bituminous overlay, spot drainage repairs such as curb and catch basin maintenance, pedestrian ramp improvements, accessible pedestrian signal upgrades, pavement markings, and roadside maintenance. Major structures such as culverts and bridges will be evaluated separately for consideration within the transfer agreement.

The county will consider providing a cash equivalent equal to the value of the necessary improvements to bring the roadway up to a 15-year service life. Subject to board approval, the inclusion of additional corridor improvements beyond those mentioned previously may be considered within an agreement. The county will not proceed with a roadway transfer until all parties approve of the agreement terms.

Similar to a transfer of a county roadway to another jurisdiction, asset condition corrections similar to those mentioned previously are expected prior to any transfer to the county.