7 Corridor Vision

The role and function of streets has changed beyond solely serving motor vehicle travel. Central Entrance, like other major streets in North American cities, was designed primarily to move vehicle traffic and minimize vehicle travel delay, neglecting the needs of other users. In combination with more auto-oriented land use policies and patterns, a built form emerged that limited mobility choice, grew vehicle traffic, and disconnected communities.

The vision for Central Entrance, developed through this planning process, represents a return to streets that **put people and place first**. The future of Central Entrance is **multimodal**. Central Entrance should become a corridor that is designed, managed, and operated to **enable safe access for all** people, all users, regardless of age, ability, or mode of transportation. Central Entrance can become a place, a **gateway** to Duluth, celebrating the unique qualities of the community through a boulevard-like feel. Transportation investments should prioritize people walking, biking, and using transit, while still accommodating vehicle traffic, and encourage land use practices that are healthier, more sustainable, and more human-centered and walkable by design.

Creating safe places for people to walk [and bike] is essential to improving equity and mobility, addressing climate change, and ultimately providing a better quality of life for everyone.

-MnDOT Statewide Pedestrian System Plan

The term walkable is more than providing sidewalks and crossings. It represents an approach that puts people back at the center of street and community design. Walkable places are also bike- and transit-oriented; provide a mix of uses (e.g. housing, shops, places of work, parks, schools) within close proximity (easily reached by foot or bike, rewarding the short trip); promote human-scale design where buildings are built to the street and surface parking is minimized or placed to the back of buildings; and foster the social- and business-life of quality public spaces, from the street itself to parks and plazas. Ultimately, streets are ecosystems unto themselves and when they are equitable by design, they help communities realize their full economic, social, and environmental potential. This shift in how we understand street design aligns with the Guiding Values of this Plan, described in more detail on the following pages.

The concepts in this Plan focus on corridor design that is not only multimodal, encouraging transportation choice for people of all ages and abilities, but also makes safety a top priority. Central Entrance has crash rates well above the state average (see **Section 4.8**). MnDOT is part of the Minnesota Toward Zero Deaths statewide partnership working to reduce crashes, injuries, and traffic-related deaths on Minnesota roads. This Plan takes a context sensitive approach. Recognizing that there are different contexts and conditions along the corridor, it does not present a single recommended concept for the entire corridor. Instead, it provides a set of concepts and design elements that can be combined based on further evaluation to realize the overall vision. The following components are included in this section:

- Project goals and recommendations based on the Guiding Values
- Recommended concepts for future engineering analysis and refinement

- Elements to consider when developing evaluation and decision-making criteria
- Land use scenarios that explore the development potential which could be realized with corridor improvements

Paired with policy frameworks like Complete Streets, Vision Zero and Climate Action plans, cities and states that make changes to better support all users start to see mode shifts, resulting in less CO_2 emissions, less single occupancy vehicle growth, and improved safety, among many other physical and social benefits. These changes are occurring even in winter cities. According to the City of Minneapolis 2017 Pedestrian and Bicycle Count Report, Minneapolis' commuting population increased **nine percent** from 2005-2017. During this time motor vehicle commute mode dropped **four percent**, **walk commute mode increased seven percent**, and bike commute mode increased 18%. The number of people bicycling is growing by an average of **eight percent** per year, which in large part is due to the City's continued investment in walking, biking, and transit.

7.1 Guiding Values

Based on the planning process goals and input provided through public engagement opportunities, a set of guiding values was developed to shape final plan recommendations. These values are intended to describe the high-level vision for the future of Central Entrance , and should set the overall direction for improvements moving forward:

Safe & equitable multimodal transportation system: Central Entrance will be a safe, accessible, and comfortable street for all people, making walking, biking and transit viable and an easy choice while moving people and goods in cars, trucks, and buses safely and efficiently.

Healthy, walkable community: Central Entrance will support denser, connected, and transit-oriented land use patterns and multimodal travel year-round.

Thriving local business community: Central Entrance will meet the needs of new and existing businesses by providing reasonable access and creating opportunities for new types of development and redevelopment.

Sustainable and resilient corridor: Central Entrance improvements will address long-term infrastructure needs and create opportunities for green infrastructure.

A vibrant gateway to Duluth: Central Entrance will be an attractive corridor that welcomes visitors and residents alike to the City of Duluth and the Central Entrance business district by establishing a sense of place.

7.2 Goals and Recommendations

Based on the guiding values discussed above, project goals and recommendations were developed to address the issues and concerns discussed during the Steering Committee and public engagement processes (**Table 6**). These are meant to supplement the recommended concepts and provide additional guidance for the project as it progresses towards design and additional public engagement. Where appropriate, the locations noted in the recommendations are shown in **Figure 12**.

Table 6 - Values, Goals, and Recommendations

Guiding Value	Goals	Recommendations	Lead Agencies
Safe & equitable multimodal transportation system	A) Implement a design that supports the role of Central Entrance as a key link in the roadway network between downtown Duluth and the Miller Hill commercial area.	A.1) Evaluate 3- and 4-lane section and one-way pair concepts for implementation in Zones 2-4. A.2) Evaluate the need for construction of turn lanes at intersections throughout the corridor. A.3) Apply context-sensitive street design elements, including exploration of opportunities such as narrowing travel lanes (11 feet shown in recommended concepts). A.4) At a minimum, evaluate the construction of roundabouts at the intersections of Central Entrance and the following cross streets (see **Figure 12**): • Anderson Road • Arlington Avenue (CSAH 90) • Pecan Avenue	MnDOT
	B) Create a corridor that supports existing transit service and is ready for potential BRT service.	B.1) Avoid using bus pull-out lanes to reduce delays associated with buses re-entering traffic. B.2) Ensure that pedestrian access is provided to all transit stops in the corridor. B.3) Coordinate with the Duluth Transit Authority during design to ensure it supports BRT operations on Central Entrance. B.4) Update the Central Entrance-Miller Hill Small Area Plan to implement this study and the Better Bus Blueprint for Routes 102 and 112. *See also: Goal A recommendations*	MnDOT, DTA
	C) Improve the ability to walk and bike along and across Central Entrance.	C.1) At a minimum, provide pedestrian facilities along both sides of Central Entrance and a bicycle facility along at least one side, as recommended in MnDOT's Pedestrian and Bicycle Recommendations Report.	MnDOT

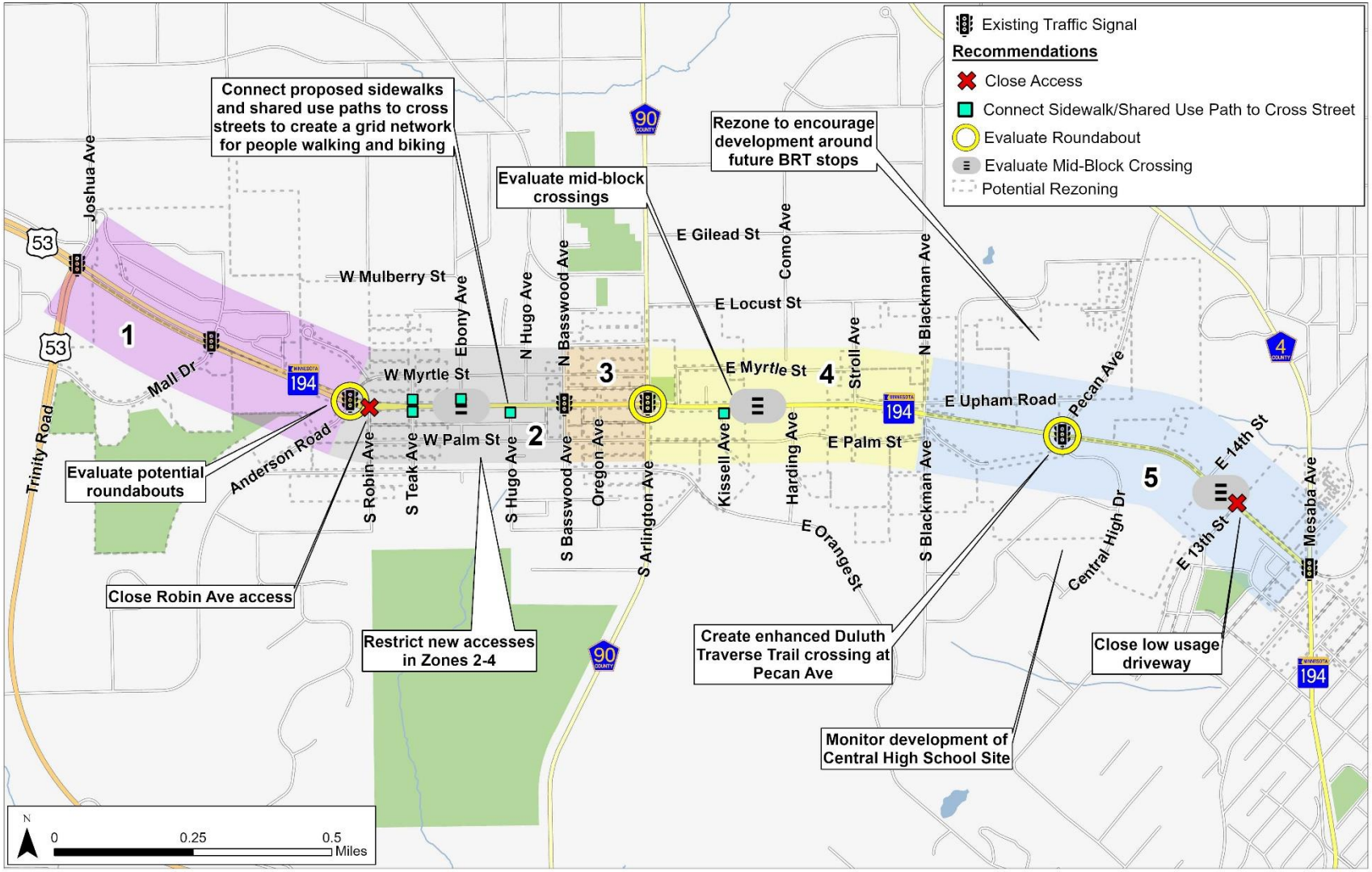
Guiding Value	Goals	Recommendations	Lead Agencies
		C.2) Consider mid-block crossings with appropriate markings and warning technology, such as advanced stop bars, high-visibility crosswalk markings, raised tables, Pedestrian Hybrid Beacons (PHBs) or Rectangular Rapid Flashing Beacons (RRFBs) in the vicinity of the following locations (see **Figure 12**): • Ebony Avenue • Kissell Avenue or Harding Avenue • East 14th Street or East 13th Street C.3) Provide ADA-compliant pedestrian infrastructure throughout the corridor with connections to adjacent destinations. C.4) Create an enhanced bicycle crossing for the Duluth Traverse Trail at Pecan Avenue (see **Figure 12**). C.5) Connect new nonmotorized facilities along Central Entrance to the following cross streets with pedestrian and/or bicycle facilities as appropriate to enhance the nonmotorized transportation network and improve neighborhood access to transit stops (see **Figure 12**): • Teak Avenue • Ebony Avenue • Hugo Avenue • Kissell Avenue	
	D) Create a safe and comfortable corridor for all users, with a target of zero traffic injuries or deaths.	D.1) Construct boulevards between vehicle travel lanes and nonmotorized facilities to provide physical separation from traffic to support users of all ages and abilities, as supported by MnDOT's Statewide Pedestrian System Plan. *(Note: see Action Item IP-12, "Seek opportunities to provide wide vegetated buffers between people walking and vehicle traffic")* D.2) Include pedestrian safety countermeasures at signalized intersections in the corridor, including, but not limited to, curb bump outs, Leading Pedestrian Intervals (LPIs), advanced stop bars, and raised crosswalks.	MnDOT

Guiding Value	Goals	Recommendations	Lead Agencies
Healthy, walkable community	E) Create a walkable land use pattern; reward the short trip.	E.1) Implement nodal-based zoning along the corridor to allow for mixed-used transit-oriented development patterns for Route 102 BRT. E.2) Consider a creating hybrid MU-C zone that does not allow for the "vehicle related," "building materials sales," "garden material sales," and large retail store uses. E.3) Rezone the nodes within 1/4 mile from the Route 102 BRT stops to MU-C or a hybrid MU-C (see **Figure 12**). E.4) Monitor the redevelopment of the former Central High School site and update this plan, the Better Bus Blueprint, and the Central Entrance-Miller Hill Small Area Plan accordingly (see **Figure 12**). E.5) As redevelopment occurs, consider encouraging the following design guidelines: • Site designs with reduced setbacks that place buildings closer to the roadway • Site designs that relocate parking to the back of buildings (away from the street) rather than adjacent to the street • Connectivity standards (e.g. street connectivity index or link-to-node ratio, maximum block lengths (400-600 ft)) and bonuses for pedestrian and trail connections between streets or the end of cul-de-sacs to ensure a more walkable development pattern, disperse vehicle travel, and increase emergency response time	MnDOT, City of Duluth
	F) Create a year-round multimodal corridor.	F.1) Work with City of Duluth and DTA staff to craft a model maintenance agreement that provides for winter snow removal and clearing of leaves, brush, and other debris during the remainder of the year. *(Note: see MnDOT Statewide Pedestrian System Plan Action Items M-1, "Design to support effective maintenance," M-2 "Explore options for how MnDOT can help local agencies take the lead on maintenance work," and M-3,*	MnDOT, City of Duluth, DTA

Guiding Value	Goals	Recommendations	Lead Agencies
		"Clarify MnDOT's policies to reflect the expectation of year-round maintenance of pedestrian facilities") F.2) Add Central Entrance to the City of Duluth's winter sidewalk and pathway priority network for clearing pedestrian and bicycle facilities to ensure that the best access is provided to all people, regardless of mode choice. F.3) Construct boulevards wherever possible to provide snow storage and keep nonmotorized facilities clear of snow and ice. *See also: Goal C recommendations*	
Thriving local business community	G) Maintain reasonable access for businesses along the corridor.	G.1) Develop an access management policy, as recommended in the Central Entrance Corridor Study. G.2) As redevelopment occurs, encourage site designs that limit curb cuts on Central Entrance, where possible, through requiring shared driveways and only allow "right-in, right-out" driveways where necessary as recommended in the Central Entrance-Miller Hill Small Area Plan. G.3) Establish driveway guidelines that address driveway width and other design features to slow turning vehicles and limit pedestrian exposure. G.4) As recommended in the Central Entrance Corridor Study, do not allow any new accesses on Central Entrance in Zones 2-4. G.5) Consider removing access to Central Entrance at the following locations (see **Figure 12**): • Robin Avenue • MnDOT driveway at East 13th Street	MnDOT, City of Duluth
	H) Identify and increase opportunities to enhance the public realm for outdoor dining, sitting, and	H.1) Encourage public realm development through plazas, pocket parks, or additions to the sidewalks with café zones through opportunities such as public-private partnerships.	MnDOT, City of Duluth

Guiding Value	Goals	Recommendations	Lead Agencies
	access to green space to support businesses in the corridor.	*See also: Goal E recommendations*	
Sustainable and resilient corridor	I) Address long-term infrastructure needs in the corridor.	I.1) Replace aging infrastructure through full reconstruction of Central Entrance from Trinity Road to Mesaba Avenue.	MnDOT
	J) Prioritize opportunities to incorporate green infrastructure and street trees into the design to support stormwater management and mitigate climate change.	J.1) Evaluate the potential for construction of stormwater best management practices (BMPs) in boulevard and median spaces. J.2) Work with the City of Duluth Forestry Department to identify appropriate tree locations and species for inclusion in the final design. *(Note: see MnDOT Statewide Pedestrian System Plan Action Item IP-13, "Prioritize street trees as critical pedestrian infrastructure for adapting to climate change")* *See also: Recommendation D.1*	MnDOT, City of Duluth
A vibrant gateway to Duluth	K) Create an aesthetically pleasing corridor that supports placemaking and establishes a sense of place.	K.1) Work with the City of Duluth to design and construct gateway features in Zones 1 and 5 that welcome visitors to the Central Entrance business district and the City of Duluth, as discussed in the Central Entrance Corridor Study. K.2) Develop a streetscape plan to create a cohesive feel for the corridor, as recommended in the Central Entrance Corridor Study. K.3) Identify opportunities to enhance sense of place, particularly in Zones 2-3, through the inclusion of streetscape elements such as benches, planter boxes, and native plantings.	MnDOT, City of Duluth

Figure 12 - Recommendations Map



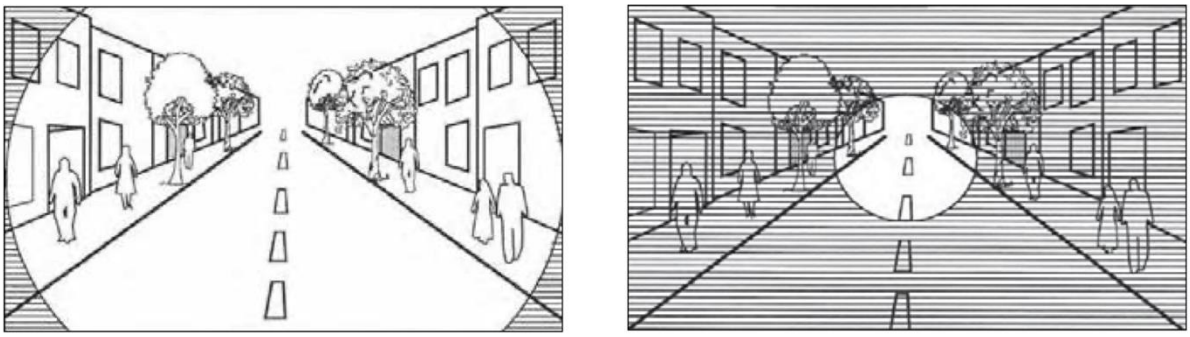
7.3 Recommended Concepts for Future Study

A key component of the Central Entrance Vision Plan is to develop viable roadway concepts for each of the zones in the study area for consideration during design. The concepts developed as part of this Plan are intended to be at a planning level, and will require further study and engineering analysis before moving forward. While the concepts shown include specific widths or a range of widths for certain features, final designs considered for construction may or may not match these initial concepts or could be assembled from a combination of these concepts, depending on the results of more detailed future analyses. The concepts here are intended as a general guide.

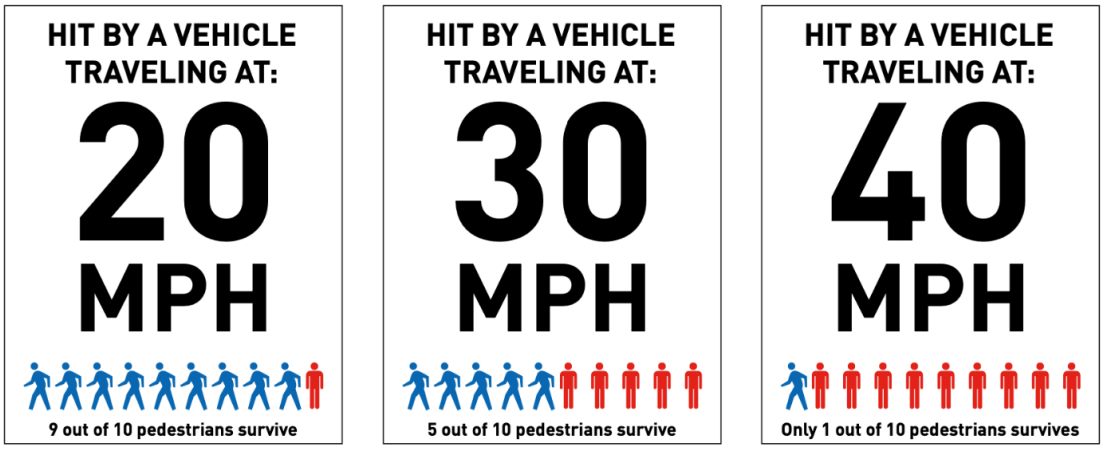
Based on land use context, existing right of way, and other characteristics, the study area zones were placed into two groups for the purposes of developing concepts. Concepts are presented first for Zones 1 and 5, then for Zones 2-4.

In addition to the basic concepts, the project team developed a set of corridor visualizations to better represent the overall scale and feel that could be achieved for Central Entrance. These visualizations are intended to be a general guide for the overall feel of the corridor and are included in the descriptions of each zone on the following pages. As noted previously, any specific improvements are subject to further design and engineering analysis.

Making Safety a Top Priority: Why Speed Matters
Speed kills places and people and plays a major role in serious injuries and fatal collisions. The most vulnerable users—people walking and bicycling, and children, elders, low-income persons, and people of color—are disproportionately affected. A person walking who is hit by a person driving at 20 mph has a 90 percent chance of surviving the crash. **The chances of survival are reduced by nearly 50 percent when the person driving is traveling 10 mph faster** (30 mph). At lower speeds, drivers can see more of their surroundings and have more time to see, react, yield, and stop for others.



A driver's field of vision increases as speed decrease. Driver's field of vision at 15 MPH (left) compared to driver's field of vision at 30-40 MPH (right)



The risk of injury and fatality increases as speed increases, especially for vulnerable users like people walking (Graphics: City of Seattle Vision Zero Plan)

People's driving behavior and thus vehicle speeds match the "design speed" of the road. Streets should be designed to achieve the "target" speed—the speed the community want motorists to drive—by applying engineering treatments that give greater visual cues and have proven traffic calming effects like lane width, street trees, and medians and edge treatments, including building form and its relationship to the street. Today, Central Entrance is primarily posted at 30 MPH, but the visual cues (or lack thereof) create an environment where traveling at speeds above the posted speed is common. The future corridor design should support limiting speeds to 30 MPH and consider a target speed of 25 MPH. The concepts and recommendations for the corridor present tools to encourage motorists to drive at the desired target speed including, but not limited to:

- Medians*
- Pedestrian Refuge Islands and crosswalk visibility enhancements*
- Roundabouts*
- Signal Improvements (e.g. signal progression, Leading Pedestrian Interval*)
- "Road diets" or lane reconfiguration*
- Street trees
- Bikeways and walkways*

*FHWA Proven Safety Countermeasures effective in reducing roadway fatalities and serious injuries.

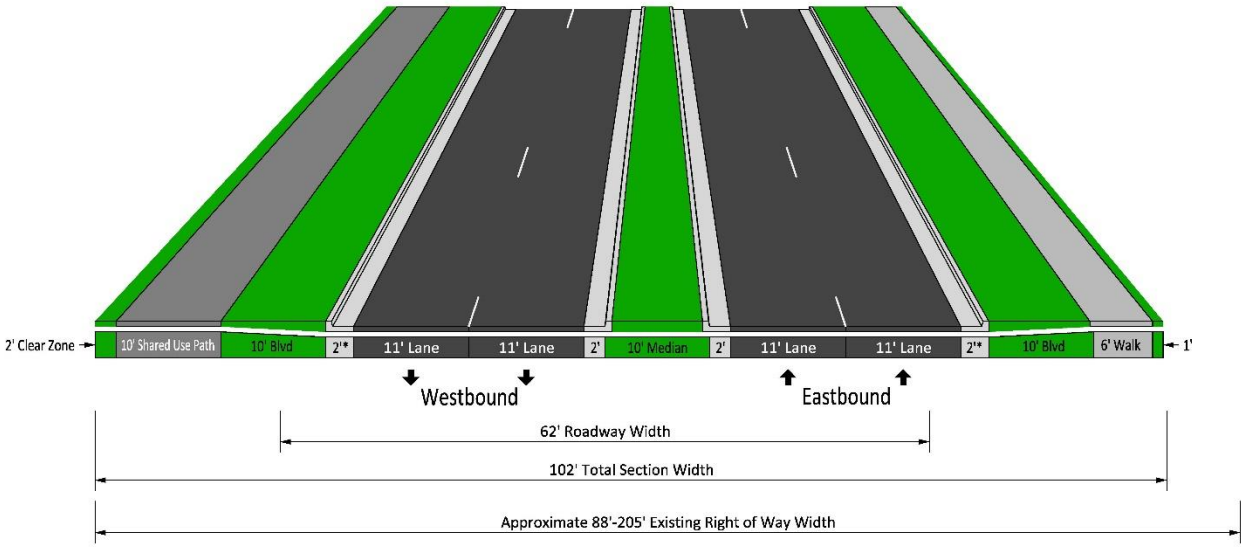
7.3.1 Zones 1 and 5

There are many similarities between Zones 1 and 5. Both are generally less developed and have more available right of way than Zones 2-4. They also have fewer access locations and include locations with grass ditches and/or concrete medians. They form the endpoints of the study area, act as gateways, and link to the broader roadway network. Because of these similarities, a single concept was developed to illustrate the overall vision for these zones. The specific roadway design that is ultimately implemented will vary based on conditions along the corridor.

Figure 13 shows the recommended concept for Zones 1 and 5. This concept maintains two eastbound and two westbound vehicle travel lanes, similar to what exists today. However, they have been narrowed to 11 feet. The key features of this concept include:

- Two 11-foot travel lanes in each direction
- A 6-foot sidewalk on the south side of the road
- A 10-foot shared use path on the north side of the road
- A 10-foot center median
- 10-foot boulevards on both sides of the road between the travel lanes and the sidewalk or shared use path

Figure 13 - Zones 1 and 5: Recommended Concept



There are a number of anticipated benefits from the recommended concept:

- Sidewalk and shared use path provide safe, separated areas to walk and bike
- Center median provides a refuge for people crossing the street at intersections or mid-block crossings and helps manage access for turning vehicles
- Boulevard areas provide winter snow storage area, keeping sidewalk/shared use path clear
- Wide boulevard and median areas create the opportunity to create a gateway feel with street trees—a triple canopy also provides a traffic calming effect—and provides space for other landscaping and stormwater treatments. Maintains similar vehicle capacity to the existing roadway by keeping four travel lanes
- Maintains an outside lane for use by transit vehicles, and provides an option for future conversion to a bus-only lane

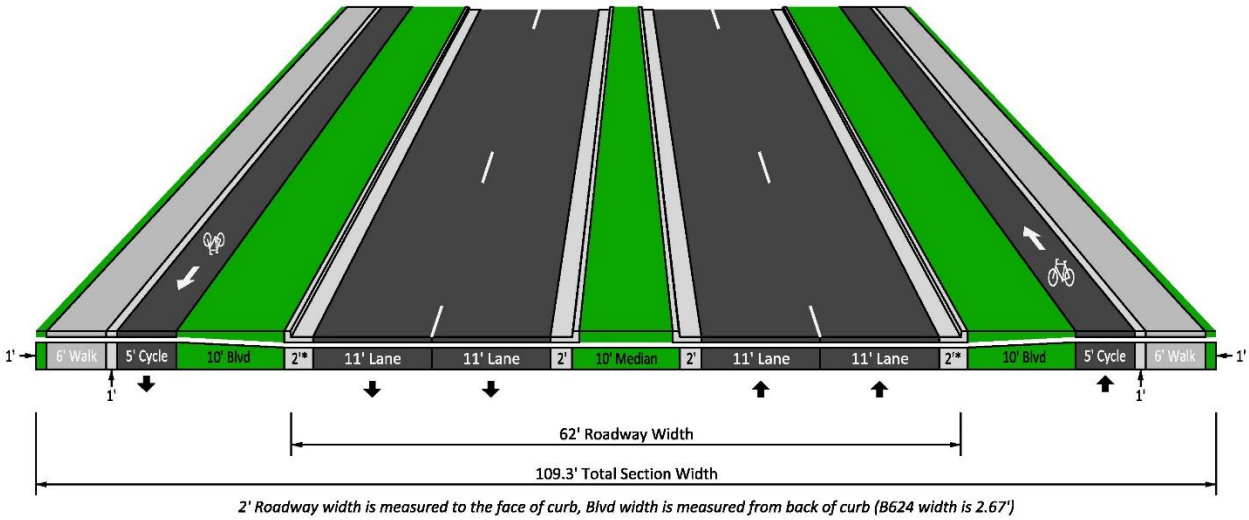
Several potential challenges of implementing this concept include:

- Careful design will be needed to transition to any concept that is selected for Zones 2-4.
- While travel along Central Entrance for people walking and biking will be greatly improved, special attention will need to be paid to mid-block and intersection crossings, as users will still need to cross two lanes of vehicle traffic at a time.
- People might bike on the sidewalk

While the shared use path could be provided on either side of the roadway, it is shown on the north side of the road in this concept to maintain consistency with the shared use path shown in the four-lane concept for Zones 2-4. There are several compelling reasons for a shared use path on the north side in these zones as described in **Section 7.3.2**. **Figure 15** shows an enhanced visualization of the recommended concept for Zones 1 and 5.

Figure 14 shows an alternate concept for Zones 1 and 5. This concept features a pair of one-way cycle tracks that would allow for separated bicycle travel along both sides of the roadway. This alternate concept is not recommended at this time due to the potential for wrong-way riding on cycle tracks that is likely to occur given the distance that must be crossed to reach the opposite direction facility.

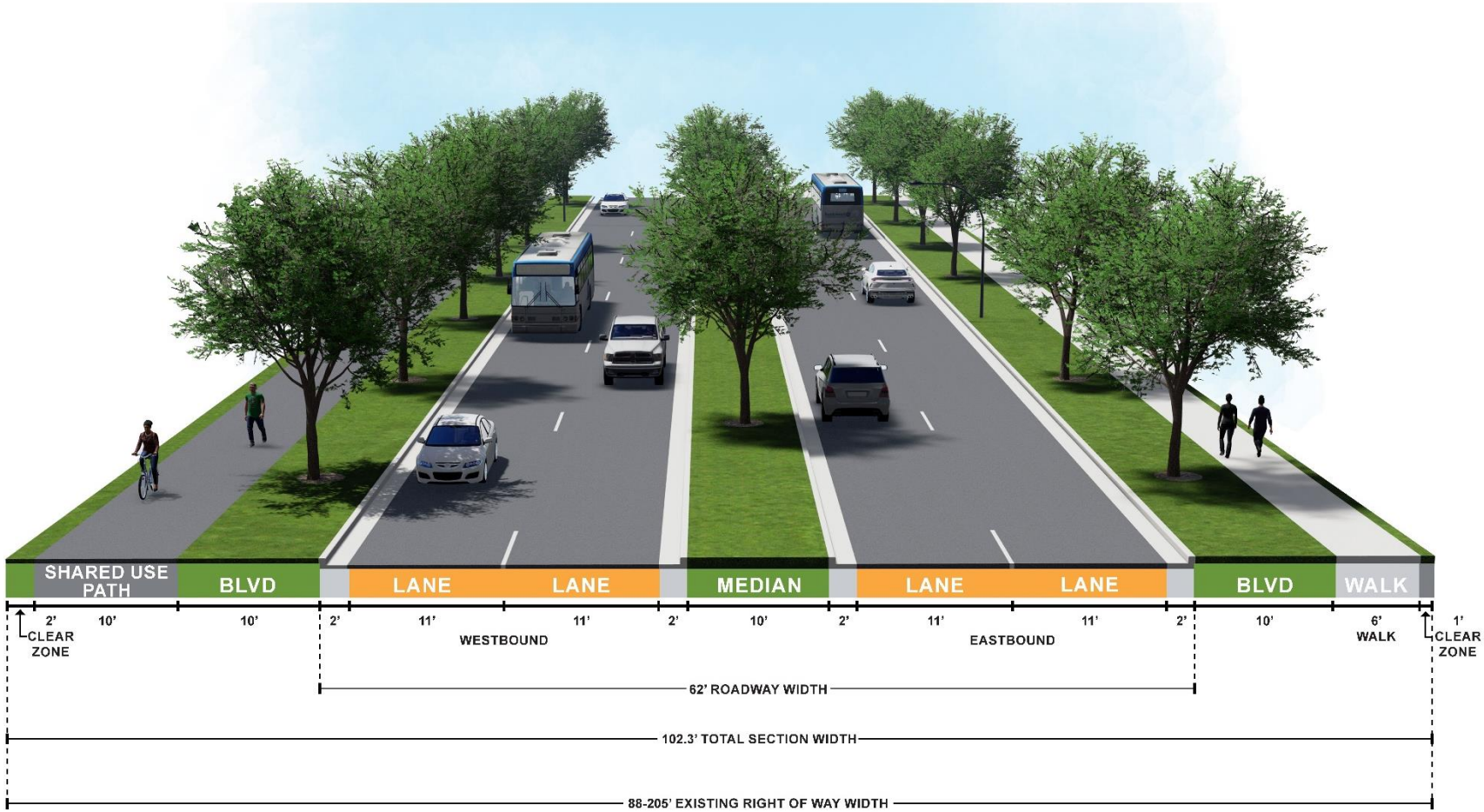
Figure 14 - Zones 1 and 5: Alternate Concept



As described in **Section 6**, there is interest in exploring opportunities to use gateway features in Zones 1 and 5 to better establish a sense of place along Central Entrance, welcoming visitors to Duluth. One example of a gateway feature that could be added to the center median is shown on the following page.

CSAH 20 (Blake Road), Hopkins, MN

Figure 15 - Zones 1 and 5: Recommended Concept Visualization



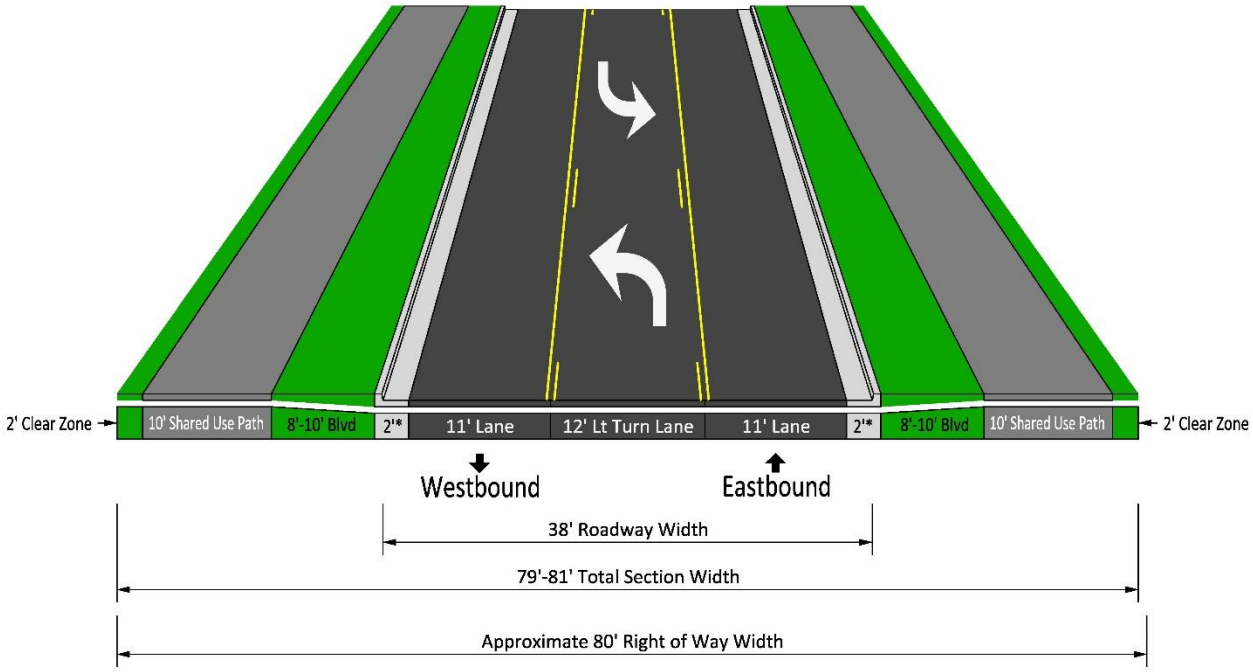
7.3.2 Zones 2-4

Although existing land uses and roadway sections vary across Zones 2-4, there are several similarities in terms of available right of way and transportation needs. The existing right of way in Zones 2-3 is approximately 80 feet, expanding slightly to approximately 86 feet in Zone 4. This means that available space is much more constrained than in Zones 1 and 5. As a result, the concepts developed include options for attempting to meet project goals using only the available space and options that would require MnDOT to purchase additional right of way. To the extent possible, a consistent design should be maintained through Zones 2-4 to provide a predictable environment for all users. Three potential concepts for these zones are described on the following pages.

Three-Lane Section Concept (two travel lanes)
This concept is centered around a design with a total of two travel lanes, one eastbound and one westbound, as shown in **Figure 16.** The key features of this concept include:

- One 11-foot travel lane in each direction
- A 10-foot shared use path on both sides of the road
- A 12-foot center left-turn lane
- 8-10-foot boulevards on both sides of the road between the travel lane and the shared use path

Figure 16 - Zones 2-4: Three-Lane Concept



There are a number of anticipated benefits from the three-lane concept:

- Shared use paths provide safe, separated areas to walk and bike

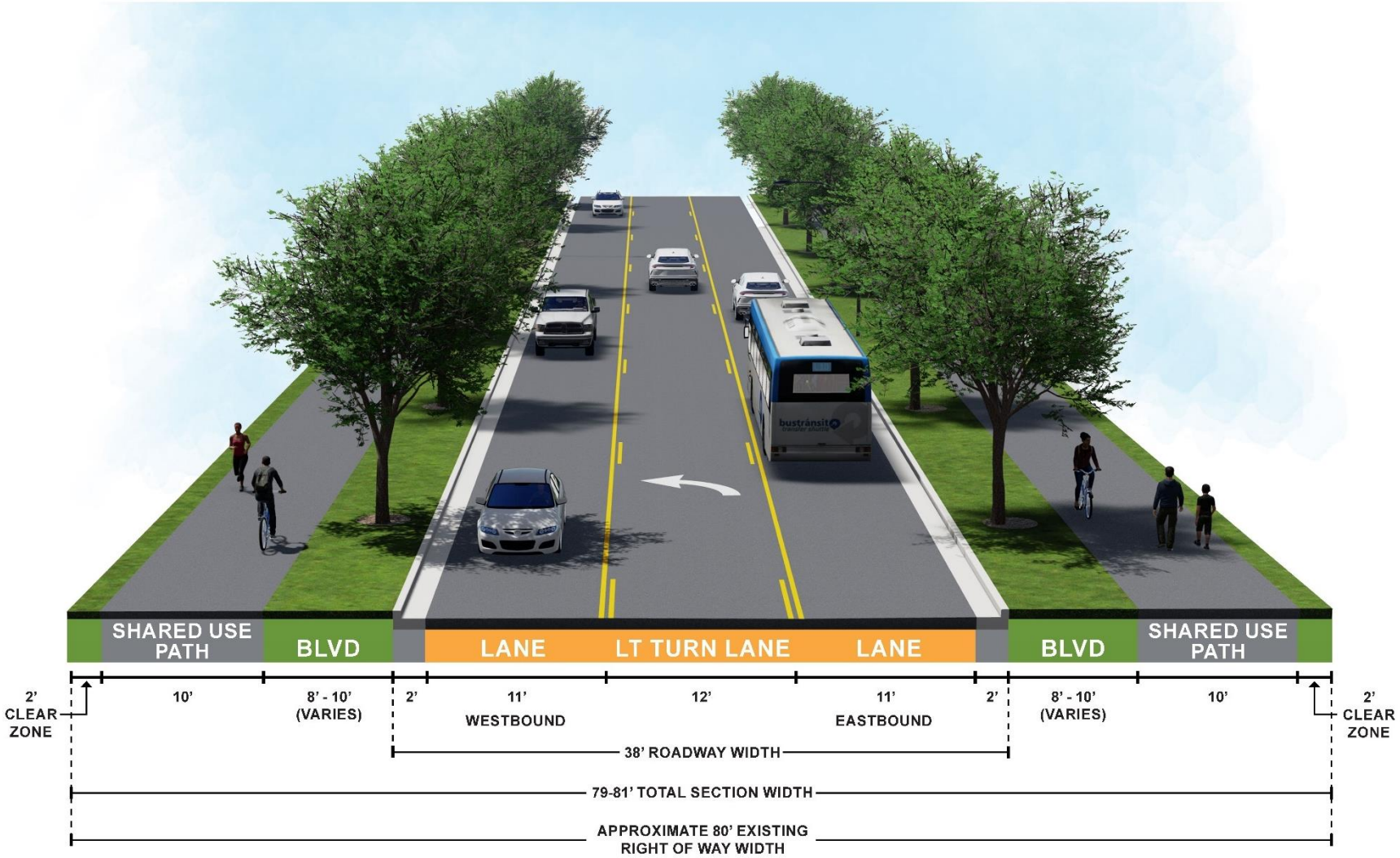
- Potential mid-block crossing locations are improved by allowing for a crossing island in the median, shortening the crossing distance for people walking and biking (people have to cross only one lane of traffic at a time)
- Crossing distances at intersections may be reduced, depending on the intersection design
- Road diets can reduce the risk of crashes and serious injuries
- Boulevard areas provide winter snow storage area, keeping shared use path clear
- Wide boulevards create opportunity to add trees, stormwater treatment, or other landscaping

Several potential challenges of implementing this concept include:

- Careful design will be needed to transition to the Zones 1 and 5 concept
- Reduces the lane capacity of the roadway, potentially impacting traffic operations
- Restricts transit vehicle operations and limits future options for bus-only lanes

Figure 17 shows an enhanced visualization of the three-lane concept for Zones 2-4.

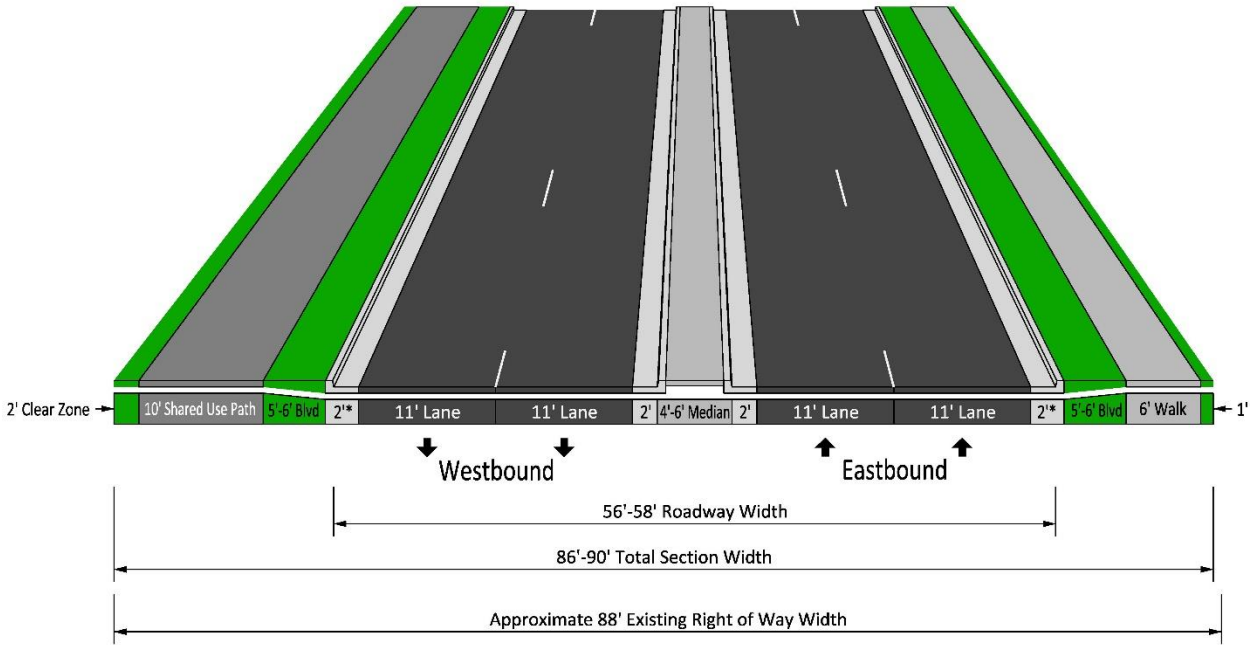
Figure 17 - Zones 2-4: Three-Lane Concept Visualization



Four-Lane Section Concept (four travel lanes)
This concept is centered around a design with a total of four travel lanes as shown in **Figure 18**. The key features of this concept include:

- Two 11-foot travel lanes in each direction
- A 6-foot sidewalk on the south side of the road
- A 10-foot shared use path on the north side of the road
- A 4-foot center median, widening to 6 feet at pedestrian crossing locations
- 5-6-foot boulevards on both sides of the road between the travel lanes and the sidewalk or shared use path

Figure 18 - Zones 2-4: Four-Lane Concept



There are a number of anticipated benefits from the four-lane concept:

- Sidewalk and shared use path provide safe, separated areas to walk and bike
- Center median provides a refuge for people crossing the street at intersections or mid-block crossings and helps manage access for turning vehicles
- Boulevard areas provide winter snow storage area, keeping sidewalk/shared use path clear
- Maintains similar vehicle capacity to the existing roadway by keeping four travel lanes
- Maintains an outside lane for use by transit vehicles, and provides an option for future conversion to a bus-only lane

Several potential challenges of implementing this concept include:

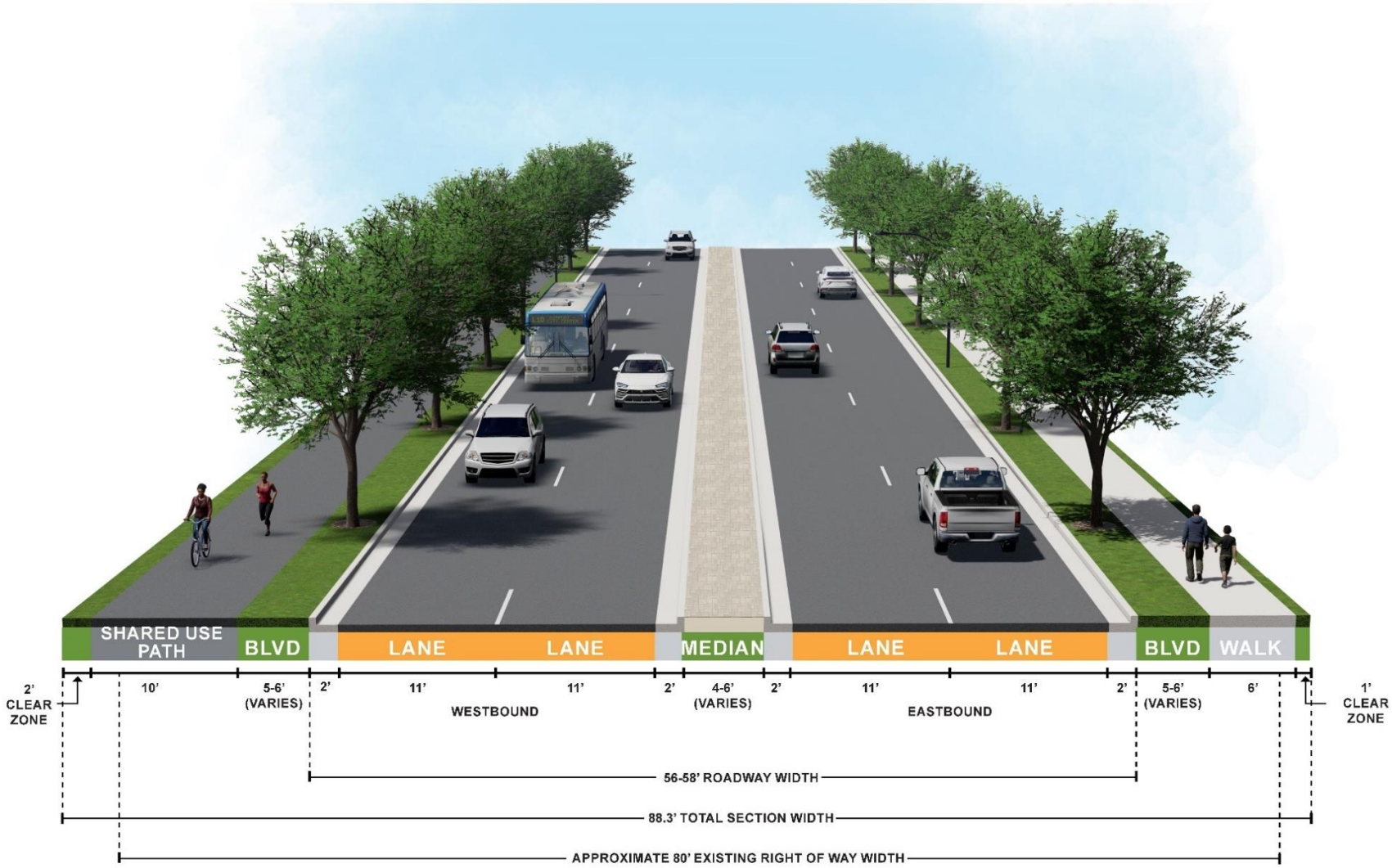
- Exceeds the available right of way width, and requires MnDOT to purchase additional right of way to implement (with dimensions shown)
- Careful design will be needed to transition to the Zones 1 and 5 concept
- While travel along Central Entrance for people walking and biking will be greatly improved, special attention will need to be paid to mid-block and intersection crossings, as users will still need to cross two lanes of vehicle traffic at a time.
- While boulevard and median areas are present, the narrower width limits options for street trees, stormwater treatment, or other landscaping compared to Zones 1 and 5.
- People might bike on the sidewalk

While the shared use path could be provided on either side of the roadway, it is shown on the north side of the road in this concept for several reasons:

- There is an existing bike route south of Central Entrance that is a combination of a signed shared lane on Palm Street and an existing multiuse trail. A shared use path along the north side of Central Entrance creates a parallel route for bicycle travel that does not require crossing the roadway.
- There are portions of Zones 2-4 with no or fewer driveways that would hinder shared use path construction and operations.
- There are schools on and just beyond the north side of the corridor (see **Figure 1**).

Figure 19 shows an enhanced visualization of the four-lane concept for Zones 2-4.

Figure 19 - Zones 2-4: Four-Lane Concept Visualization



One-Way Pair Concept

This concept is centered around a design that expands the project area to include both Central Entrance and Palm Street. Two westbound travel lanes would be provided on Central Entrance, and two eastbound travel lanes would be provided on Palm Street, as shown in **Figure 20**. The key features of this concept include:

- On Central Entrance:
  - Two 11-foot westbound travel lanes
  - 6-foot sidewalk on both sides of the road
  - 5-foot cycle track on both sides of the road (providing both eastbound and westbound travel on the corridor)
  - 10-foot boulevards between travel lanes and cycle track

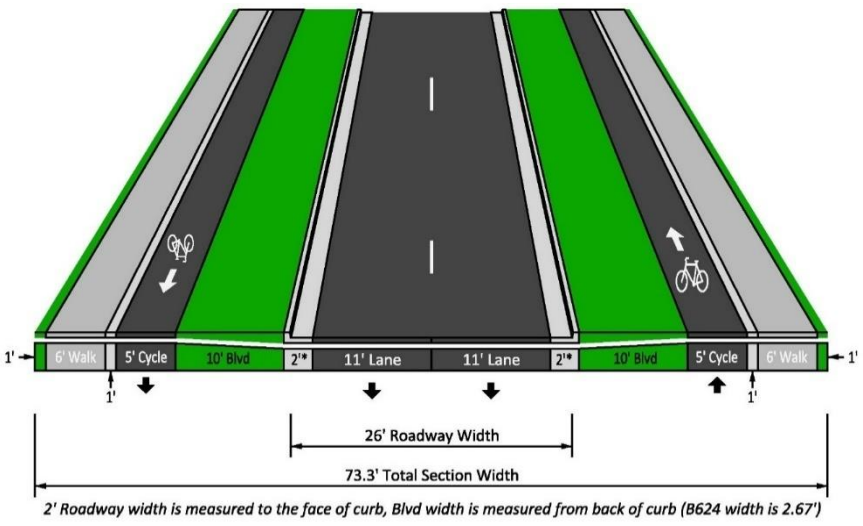
- On Palm Street:
  - Two 12-foot eastbound travel lanes (may vary, would match existing street width)
  - Boulevard and pedestrian and bicycle facilities to be determined based on existing street widths

There are a number of anticipated benefits from the one-way pair concept:

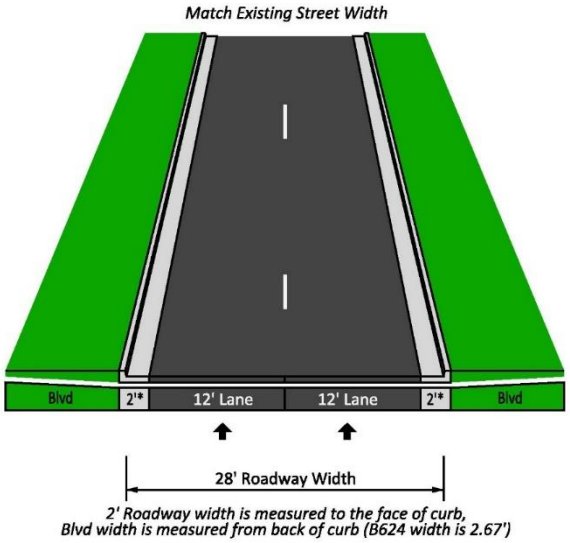
- Sidewalks and cycle tracks provide safe, separated areas to walk and bike (in both directions)
- Shortens the crossing distance for people walking and biking by removing two travel lanes on Central Entrance
- Provides high level of vehicle capacity by maintaining two travel lanes in each direction
- Boulevard areas provide winter snow storage area, keeping sidewalks and cycle tracks clear
- Wide boulevard areas create opportunity to add trees, stormwater treatment, or other landscaping

Figure 20 - Zones 2-4: One-Way Pair Concept

Central Entrance (Westbound)



Palm Street (Eastbound)



The potential challenges of implementing the one-way pair concept include:

- The City of Duluth and the Duluth Transit Authority are currently not in favor of this concept.
- Careful design would be needed to transition to the Zones 1 and 5 concept and determine where the one-way pair would start and end.
- Potential for significant right of way acquisition, relocation, and/or purchase of entire properties at connection points between Central Entrance and Palm Street (near Zones 1 and 5)
- One-way streets encourage higher motor vehicle speeds and limit how walk-, bike- and transit-friendly the street is

- Creates a "pass-through" feel and may limit how people reach their destinations—people may need to travel further (more vehicle circling)
- Many cities are converting their one-way streets back to two-way streets, including in downtown Duluth
- Multi-lane one-ways still create multiple threat conditions for pedestrians
- Two-way bicycle travel along a one-way road may result in confusing movements
- Increases traffic on Palm Street, which currently operates as a low-volume neighborhood street and backage road
- Restricts access for property owners and residents along both corridors to one direction of travel (right-in/right-out or left-in/left-out)
- Potential negative impact on property values along Palm Street due to increased noise and other impacts associated with higher traffic volumes
- Potential to negatively impact existing transit operations by introducing additional route deviation
- Complicates existing transit service and future BRT implementation by increasing the distance transit users must walk between stops in opposite directions
- Requires construction of additional sidewalks or other pedestrian infrastructure to maintain connections between transit stops and other destinations

Note that while a separate visualization is not shown for the one-way pair concept, many of the treatments shown in the other Zone 2-4 concepts could be applied to this concept.

High-level Concept Evaluation
To help support MnDOT's decision making process as the project moves into the design phase, the project team conducted a high-level evaluation of the primary base options that could be implemented in Zones 2-4 based on the overall planning process goals outlined in **Section 2**. This information draws on the potential benefits and challenges described above and is provided in **Table 7**. Each cell includes a "Yes," "Mixed/Unclear," or "No" response indicating whether or not the concept is likely to advance each component of the planning process goals. A brief explanatory statement is also provided. This evaluation is not meant to address all components that should be evaluated, but instead provides a starting point for the alternatives evaluation and public engagement to be conducted during the design phase.

The one-way pair concept was discussed extensively among the Steering Committee and project team members. As noted above, it has the potential for impacts to the surrounding neighborhood and land uses during both construction and operations. There are concerns from the City of Duluth about the overall economic impact of the concept and from the DTA about the impact on transit operations and future BRT plans. Under a full alternatives analysis completed as part of a future environmental documentation process, it is anticipated that a one-way pair concept would not score favorably when compared with the three- or four-lane concepts. These other concepts are more likely to be advanced.

Although not shown in **Table 7**, reconstruction of Central Entrance exactly as it exists today should not be advanced as a viable alternative. The issues noted in the existing conditions section above would not be addressed, and the planning process goals would not be advanced.

Table 7 - Zones 2-4 Primary Base Concept Evaluation

Goal	Three-Lane Section	Four-Lane Section	One-Way Pair
Walkability	**Yes -** Additional space for sidewalks and shared use paths. Crossing distances are also reduced where median refuges are provided.	**Mixed/Unclear -** Additional space for sidewalks and shared use paths. Median provides pedestrian refuge. People walking must still cross two vehicle travel lanes at once.	**Mixed/Unclear -** Additional space for sidewalks and shared use paths. Crossing distances are reduced. Walking distances and vehicle speeds likely to increase.
Bikeability	**Yes -** Additional space for shared use paths. Crossing distances are also reduced where median refuges are provided.	**Mixed/Unclear -** Additional space for shared use paths. Median provides pedestrian refuge. People biking must still cross two vehicle travel lanes at once.	**Mixed/Unclear -** Additional space for shared use paths. Crossing distances are also reduced. Two-way bicycle travel along a one-way road may result in confusing movements. Biking distances and vehicle speeds likely to increase.
Transit	**Mixed/Unclear -** Improves access to transit stops. Limits future options for transit-only lanes. Impact on transit operations unclear.	**Yes -** Improves access to transit stops. Maintains future option for transit-only lanes.	**No -** Potential to negatively impact transit operations. Increases distance between transit stops.
Motorized Vehicles	**Mixed/Unclear -** Reduces number of travel lanes. Potentially increases travel times. Impact on crashes and safety unclear.	**Yes -** Maintains current number of travel lanes.	**Mixed/Unclear -** Maintains current number of travel lanes. One-ways may require backtracking to reach destinations.
Encourages Development	**Yes -** Improves access to adjacent land uses for people walking and biking. Provides opportunities for aesthetic improvements and placemaking.	**Yes -** Improves access to adjacent land uses for people walking and biking. Provides opportunities for aesthetic improvements and placemaking.	**No -** Potential to discourage development and reduce property values.

7.3.3 Project Elements

In addition to the primary base option concepts, a variety of other design elements were discussed with the Steering Committee and the public. These include a wide range of safety, aesthetic, and streetscape features that could apply to multiple concepts and address issues related to all modes of transportation on Central Entrance. These elements should be incorporated into the final design for all zones where effective and viable to advance the guiding values and project goals. They are meant to be a starting point rather than a limited set of options. **Table 8** outlines the benefits and potential challenges of implementing these elements. Elements that have been designated as Proven Safety countermeasures by the Federal Highway Administration (FHWA) have been noted.

Table 8 - Benefits and Potential Challenges of Preferred Multimodal, Safety, and Placemaking Elements

Preferred Elements	Benefits	Potential Challenges
Boulevards[4] 	• Provides separation between vehicles and nonmotorized users, which increases the comfort and quality of the walking/biking environment • Creates a winter snow storage area to keep sidewalks or shared use paths clear • Provides space for stormwater treatment, street trees, or landscaping	• Can require additional right of way • Requires additional maintenance if stormwater treatment or aesthetic features are added
Center Median and Pedestrian Refuge Islands[1] 	• ***FHWA Proven Safety Countermeasure*** • Separates opposing vehicle travel lanes and allows pedestrians/bicyclists to cross the roadway in two stages rather than all at once • Reduces certain types of motor vehicle crashes • Can slow vehicle speeds by providing visual narrowing/traffic calming of the roadway • May provide space for stormwater treatment or landscaping	• Restricts driveway access • May require more significant design features and construction costs if stormwater management is impacted • Can require additional right of way • Can require winter maintenance

Preferred Elements	Benefits	Potential Challenges
Shared Use Path[5] 	• ***FHWA Proven Safety Countermeasure*** • Creates a safe and comfortable facility for people walking and biking that is separated from motor vehicles • Can reduce travel times for nonmotorized users if it creates a more direct route to destinations. • Encourages multimodal activity and active living	• May require additional right of way or utility relocations • Requires winter maintenance • May require additional lighting for personal safety • Requires careful intersection and driveway design
Sidewalk[4] 	• ***FHWA Proven Safety Countermeasure*** • Improves the safety and mobility of people walking • Encourages multimodal activity and active living	• May require additional right of way or utility relocations • Requires winter maintenance • May require additional lighting for personal safety
Raised Crosswalk[1] 	• ***FHWA Proven Safety Countermeasure*** • Improves driver ability to perceive and react to bicyclists and pedestrians in the intersection • Reduces vehicle speeds at intersections • Reduces bicycle and pedestrian crash severity • Has been shown to reduce pedestrian crashes by 45 percent	• Feasibility depends on roadway speed • Requires careful design to avoid creating an obstacle for low-clearance commercial and emergency vehicles. • Winter maintenance considerations

Preferred Elements	Benefits	Potential Challenges
Leading Pedestrian Interval[1]  	• ***FHWA Proven Safety Countermeasure*** • Can be added to many existing traffic signals at low cost • Increases visibility of crossing pedestrians, especially slower pedestrians • Improves comfort for pedestrians at high volume intersections • Increases likelihood of motorists yielding to pedestrians. • Has been shown to reduce pedestrian-vehicle crashes by 60 percent at intersections	• Can increase delay for drivers • May not work with older traffic signals
Pedestrian Hybrid Beacon (PHB)[3] 	• ***FHWA Proven Safety Countermeasure*** • Improves visibility of pedestrians at mid-block crossings • Assigns right of way for vehicles and pedestrians • Effective option for crossing locations with higher speeds and vehicle volumes but no traffic signal warranted • Has been shown to lead to a 55 percent reduction in pedestrian crashes, 29 percent reduction in total crashes, 15 percent reduction in serious injury and fatal crashes, and over 90 percent compliance rate	• Education key to effectiveness • Appropriate only for locations with moderate to high pedestrian crossing needs • Challenging on roadways with high driveway density • Can increase vehicle delay

Preferred Elements	Benefits	Potential Challenges
Roundabouts[2] 	• ***FHWA Proven Safety Countermeasure*** • Potential to increase intersection capacity compared to signalized intersection (depending on signal and roundabout configuration) • Reduces vehicle speeds • Medians at intersection legs decrease crossing distance for pedestrians • Reduces the severity of crashes • Typically cost less to maintain than a signalized intersection	• Multi-lane roundabout crosswalks have more conflict points than single lane, and may require additional enhancements such as raised crosswalks, Rectangular Rapid Flashing Beacons (RRFBs), Pedestrian Hybrid Beacons (PHBs), etc. • May require additional right of way • May lead to an increase in the number of crashes at the intersection
Turn Lanes[2] 	• Improves vehicle operations by creating separation between turning vehicles and through traffic • Reduces the potential for crashes involving turning vehicles	• Can require additional right of way • Increases the number of lanes that people biking and walking must cross
Street Trees[4] 	• Slows traffic by constricting the view space of drivers • Provides shade for sidewalk and shared use path users, and people waiting for transit. Improves attractiveness of using these modes • Improves sense of place	• Additional up-front cost to plant • Requires additional ongoing maintenance (both for trees and sidewalk/shared use path facilities below)

Preferred Elements	Benefits	Potential Challenges
Sidewalk/Shared Use Path Lighting[2] 	• Increases visibility and sense of safety • Can improve ability of drivers to see people walking and biking	• Additional installation costs if constructed in addition to street lighting • Can require additional right of way
Green Stormwater Infrastructure[2] 	• Can improve water quality • Can help reduce overall stormwater volume by treating water in place • Can help reduce stormwater flows during heavy rain events	• Requires regular upkeep and maintenance to function properly • Effective locations determined by treatment type, physical constraints, soil conditions, slopes, and other factors

Sources: Minnesota's Best Practices for Pedestrian and Bicycle Safety (January 2021), FHWA Proven Safety Countermeasures, NACTO Urban Street Design Guide
Photo Credits: (1) Minnesota's Best Practices for Pedestrian and Bicycle Safety; (2) WSB; (3) FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations; (4) Google Street View; (5) MnDOT Bicycle Facility Design Manual

Table 9 identifies the objectives from the MIC's Long-Range Transportation Plan (LRTP) that may be advanced by the implementation of each project element.

Table 9 - LRTP Applicability of Preferred Multimodal, Safety, and Placemaking Elements

Preferred Elements	Likely or Potential LRTP Objectives to be Met
Boulevards	To be added
Center Median and Pedestrian Refuge Islands	
Shared Use Path	
Sidewalk	
Raised Crosswalk	
Leading Pedestrian Interval	
Pedestrian Hybrid Beacon (PHB)	
Roundabouts	
Turn Lanes	
Street Trees	
Sidewalk/Shared Use Path Lighting	
Green Stormwater Infrastructure	

Sources: Long Range Transportation Plan - Sustainable Choices 2045 (MIC, 2019)

7.3.4 Design and Evaluation Guidance

There is ample evidence and design guidance to support the vision for Central Entrance, including:

- FHWA *Bikeway Selection Guide*
- FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*
- MnDOT *Statewide Pedestrian System Plan*
- MnDOT *Bicycle Facility Design Manual*
- MnDOT *Minnesota's Best Practices for Pedestrian and Bicycle Safety*
- ITE *Implementing Context Sensitive Design on Multimodal Corridors*
- National Association of Transportation Officials (NACTO) Street Design Guides

Communities embracing the change in street design focused on integrating transportation and land use policies and practices that advance multimodal, compact, walkable form are seeing an increase in walking, biking, and transit and spurring greater community support. It is a self-perpetuating cycle that ultimately shows that transportation projects of the future help **build and connect community**, while also moving people and goods through a community.

To achieve a more balanced, safe, complete, and welcoming multimodal corridor the practice of how streets are designed, evaluated, and maintained requires a multimodal approach to evaluation. Traditional planning and engineering measures, such as vehicle Level of Service (LOS), vehicle throughput, and long-range traffic projections, cannot be the sole measure of performance or decision making. The Institute of Transportation Engineers (ITE) *Implementing Context Sensitive Design on Multimodal Corridors: A Practitioner's Handbook*, outlines methods to remain future minded without limiting a project from investing in quality infrastructure to support walking, biking and transit,

especially when traditional traffic projections predict a growth of vehicle travel; there is limited data on the number of people walking, biking, or using transit; or maintenance practices are not yet aligned. For example, the handbook states that capacity should be focused on the movement of people and goods versus capacity in terms of vehicle volumes. This starts to favor many user groups from bicyclists, transit to freight over single occupancy vehicles.

As MnDOT and project partners move the vision for Central Entrance forward, an equal level of rigor should be applied to improving mobility outcomes for people walking, biking, using other mobility devices (e.g. wheelchairs, scooters) or transit.

Key Questions for Further Analysis
The project team developed a list of key questions related to safety and operations for all transportation modes that further evaluation of the concepts should answer. These questions will add further detail to the high-level evaluation provided in this Plan:

- How does the concept respond or not respond to community needs?
- What are the potential impacts to people and resources along Central Entrance?
- What additional treatments are needed to reduce conflicts between people biking and walking, and between these users and motor vehicles (if any)?
- How does two-way bicycling impact driveway, crossings, and intersection design to ensure conflict is minimized? What additional measures are needed for crossings/crossing locations to connect people biking to the shared use path?
- Is sidewalk bicycling allowed/okay? If not, is bicycling a high priority mode on Central Entrance? If so, how can the roadway space be reconfigured to better support people biking and connections to destinations on both streets? If not, what parallel routes and connections need to be improved to support people biking and help them link to key destinations, including transit?
- How does the lane configuration maintain or improve transit efficiency and impact transit travel times?
- How does this roadway configuration preserve flexibility so future BRT efficiency can be improved (e.g. dedicated lane) to make it more reliable and viable choice for people?
- How does boulevard space support transit/BRT needs (e.g. stop design)?
- How could improvements at intersections such as transit signal priority or bus- and right turn-only lanes keep transit moving effectively through the corridor, while managing turning movements at intersections?
- How is overall safety improved? What type of vehicle crashes are reduced (or not)? Are intersections and mid-block crossings safer?
- How do intersection changes help achieve the desired target speed and improve safety at the intersections?
- Are there opportunities to make new street network connections that reduce the pressure of all cars needing to use Central Entrance?
- How much time will be added to a person's trip by car compared to the time it takes to travel in a car along Central Entrance today? How should travel time increases for vehicles (may or may not include transit) be weighed against other benefits?

- How does the intersection help to better manage vehicle flow (e.g. support with access management, turning movements, and traditional planning measures like LOS)?
- How can signal timing changes help manage traffic flow?
- How does boulevard and/or median space support landscaping, stormwater and/or maintenance? What are additional considerations?

7.3.5 Preliminary Concept Testing

Preliminary traffic modeling was conducted to provide information on the potential impacts of implementing the three-lane section and one-way pair concepts. Additional traffic operations analysis and further analysis of other issues will be necessary to select a final concept.

The traffic operations analysis results suggest that a three-lane concept between Anderson Road and Pecan Avenue may be feasible, depending on how many trips are diverted to other roadways. Modest growth of 3-4 percent to the year 2045 is expected along Central Entrance. Between 24 and 28 percent of existing traffic could divert from Central Entrance under a three-lane concept due to the reduced roadway capacity. A three-lane facility is likely to lead to increased travel times through the corridor, however additional benefits could be provided for transit, bicyclists, and pedestrians.

An analysis of potential roundabouts at Anderson Road, Arlington Avenue (CSAH 90), and Pecan Avenue was also conducted for the three-lane concept, as well as the current roadway configuration. Roundabouts at Anderson Road and Pecan Avenue may be feasible with a three-lane concept if traffic diverts to other routes as the model suggests. If no traffic diverts, there will be a noticeable increase in travel times and delay compared to signalized intersections, however roundabouts may still provide important safety benefits.

The initial analysis suggests that the Arlington Avenue intersection is not an ideal candidate for a roundabout. Under a three-lane scenario, it is expected that travelers would experience poor operations. A four-lane corridor roundabout may be feasible. Implementation of any roundabouts will require an analysis of roadway impacts and available right of way to determine if construction is feasible.

The traffic operations analysis for the one-way pair concept indicated no expected operational or LOS issues. A roundabout analysis was not completed for this scenario. It is expected that acceptable operations would be maintained under roundabout control. Additional details on the preliminary traffic modeling can be found in **Appendix E** and **Appendix F**.

7.4 Land Use Scenarios

7.4.1 Introduction

The project team conducted a land use scenario analysis to complement the development of roadway concepts. The purpose of this analysis is to illustrate the potential for development along Central Entrance and make the visioning process more comprehensive by incorporating land use. Based on discussions with the Steering Committee, the land use scenarios focused on the potential for transit-

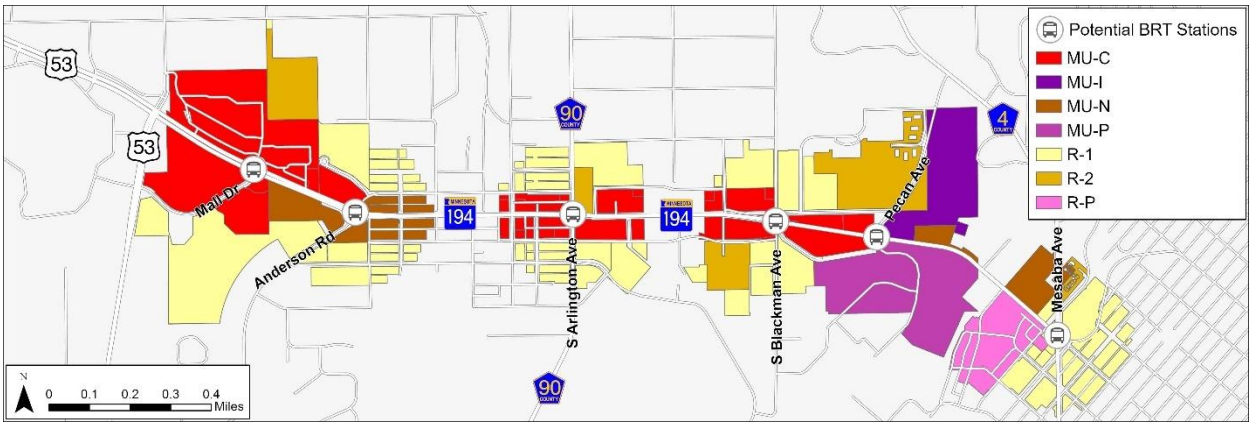
oriented development around anticipated DTA "pre-BRT" stops. With assistance from the DTA, the team identified six nodes where potential bus rapid transit stations could be located along Central Entrance:

- Mall Drive
- Anderson Road
- Arlington Avenue (CSAH 90)
- Blackman Avenue
- Pecan Avenue
- Mesaba Avenue

7.4.2 Identify Target Zoning

The team created 1/4-mile buffers around each of the six nodes and identified all parcels within this buffer. These parcels became the land use study areas. The total area of these parcels is 2,069 acres. The current zoning of each of these parcels was also identified (**Figure 21**).

Figure 21 - Study Nodes: Existing Zoning



After reviewing Duluth's zoning code, the team looked at rezoning all parcels to a singular zone that would give the highest redevelopment density potential around the transit stops. Three zoning districts were analyzed: Mixed Use Commercial (MU-C), Mixed Use Neighborhood (MU-N), and Residential Urban (R-2). The target zoning district was based on the highest density and most uses allowed. Density and allowable uses for each district are shown below.

<u>Density</u>

- MU-C – allows 87 units/acre
- MU-N – allows 87 units/acre, but stricter setbacks than MU-C
- R-2 – allows 58 units/acre

<u>Uses</u>

- MU-C: Allows the most permitted retail/commercial opportunities as well as the largest square footage allowed. No single-family homes are permitted.
- MU-N: Allows some permitted retail/commercial uses but less than MU-C and at a smaller scale. Allows single-family homes (undesirable).

- R-2: Virtually no permitted retail/commercial uses. Intended for residential homes.

Based on this information, the team concluded that rezoning the project area to MU-C would allow for the highest density redevelopment opportunities to serve future transit stops.

7.4.3 Identify Existing Value

After identifying the target zoning district, the team examined redevelopment values for the project area. Using 2021 St. Louis County Assessment Data for each parcel, the current value per unit (residential) or per square foot (commercial) was calculated. The number of dwelling units for residential properties and building square footage for non-residential properties was included in the data. The assessed value of these properties was divided by the number of units or by the total building square footage.

There is a total of 3,586 total existing dwelling units in the identified nodes with a combined value of $271,890,227. The combined value divided by the number of dwelling units equals $75,820 per unit. There is a total of 5,655,443 square feet of non-residential space with a combined value of $274,325,564. The combined value divided by the square footage equals $48.50 per square foot. The combined total existing total is approximately $546 million.

7.4.4 Identify Potential Value

Based on conversations with City of Duluth staff, the team referenced Kenwood Village, a newer MU-C redevelopment project, to have a comparable project to understand how the Central Entrance study area nodes could develop in the future.

Kenwood Village development

Using 2021 assessment data for Kenwood Village, the team calculated its residential value at $157,000 per unit and its retail space at $108 per square foot. These values were applied to the project area. As noted earlier, the project area is 2,069 acres and MU-C allows a maximum density of 87 units/acre. At the maximum density, the project area could allow 180,003 residential units. The total maximum potential residential value equals the maximum number of units multiplied by the value per unit of Kenwood Village for a total of roughly $28 billion. Converting 2,069 acres to square feet results in 90,125,640 square feet of potential retail space. The total maximum retail value equals total square footage multiplied by the value per square foot of Kenwood Village retail for a total of roughly $9.7 billion. Total combined maximum potential value for residential and non-residential is $37.7 billion.

7.4.5 Realistic Potential Value

Realistically, creating 180,000 residential units and 90 million square feet of retail along Central Entrance is not a reasonable expectation, especially within a reasonable timeline. To formulate a realistic approach, the team determined the yearly average of new housing permits for units of five or more family dwellings the City of Duluth granted over the past 10 years, which is 166 (**Table 10**), and assumed 20 percent of new yearly permits are near Central Entrance (33 units per year). Over a period of 25 years, Central Entrance could create 825 residential units. At $157,000 per unit, $129.5 million of realistic potential residential value could be created.

Table 10 - City of Duluth Residential Housing Permits by Year

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
New permits (residential)	146	151	132	105	87	45	31	55	25	35	41	58	32	43	49	59	72	37
Units of 1 family dwellings	138	121	113	87	70	36	31	36	21	33	39	44	29	42	46	40	57	31
Units of 2 family dwellings	10	30	17	2	26	8	0	34	4	4	4	4	0	0	0	16	15	4
Units of 3 or 4 family dwellings	8	28	16	19	0	0	0	6	0	0	0	16	0	0	0	4	1	
Units of 5 or more family dwellings	6	206	103	494	18	104	0	0	16	106	60	126	381	54	153	154	454	160
Number of Units Created	**162**	**385**	**249**	**602**	**114**	**148**	**31**	**76**	**41**	**143**	**103**	**190**	**410**	**96**	**199**	**214**	**527**	**195**

Source: City of Duluth Housing Indicator Report 2020, *Table 20: Residential Housing Permits*

To calculate potential retail development, the square footage of Kenwood Village (14,733 square feet) was divided by the number of residential units at Kenwood Village (83) to determine retail space per unit (177 square feet/unit). A total of 825 potential units in the project area multiplied by 177 square feet/unit equals roughly 146,000 square feet of potential retail space. This retail space multiplied by the value per square foot ($108) equals approximately $15.8 million of realistic potential retail value that could be created. An assumption is made that there will be an equal portion of strictly retail space built for every MU-C retail space. Using this assumption, the strictly retail space would also be valued at $15.8 million for a total realistic potential retail value of roughly $31.5 million. Total combined realistic potential value for the project area, both residential and retail, is roughly $161 million.

Table 11 summarizes the findings of the land use scenario analysis. Key characteristics are provided for each of the following scenarios outlined in great detail above:

Existing: Current residential and retail development in the study area nodes.

Maximum Density Scenario: Maximum development potential city code allows for the MU-C zoning district within the study nodes. Does not consider time or market trends.

Realistic Development Scenario: Feasible development scenario based on housing permit history and retail market assumptions for Central Entrance over time. Some of the project area will develop, but the remainder would stay the same.

Table 11 - Land Use Scenario Summary

	Existing	Max. Density Development Scenario (unrealistic)	Realistic Development Scenario (realistic)
Dwelling Units	3,586 units (includes single-family homes)	180,003 units (only 5 or more dwelling units)	825 units over 25 years (only 5 or more dwelling units)
Residential Value per unit ($)	$~75,820/unit	$~157,000 per unit*	$~157,000 per unit*
Total Residential Value ($)	$~272 million	$~28 billion	$~129.5 million
Standalone Retail Space (sf)	5,655,443 sf	0 sf	146,000 sf
Mixed Use Retail Space (sf)	0 sf	90,125,640 sf	146,000 sf
Total Retail Space (sf)	5,655,443 sf	90,125,640 sf	292,000 sf
Retail Value per square foot	$~48.50/sf	$~108/sf*	$~108/sf*
Total Retail Value	$~274 million	$~9.7 billion	$~31.5 million
Total Project Area Value	$546 million	$~37.7 billion	$~161 million

*Based on Kenwood Village development

7.4.6 Trip Generation

Based on the realistic development scenario, an estimate of the approximate number of additional trips that would be generated by developments in the study area nodes over a 25-year period was calculated based on the Institute of Transportation Engineers (ITE) Trip Generation Manual. This estimate was based on high level assumptions of the types of retail and commercial destinations that could be developed in addition to new multifamily development. Over a 25-year growth period, the additional development described in the scenario could generate roughly 17,000 additional weekday trips, or an increase of 4.6 percent over the current number of weekday trips estimated through a high-level review of existing land uses.

With the potential implementation of BRT as well as improved nonmotorized transportation facilities, it can be assumed that some portion of these additional trips would be taken via transit, biking, or walking. This analysis is purely preliminary and is based on high-level assumptions. More detailed traffic studies will be required as specific developments are proposed to determine the impacts of these land

use changes in greater detail. Additional data from the trip generation analysis is provided in **Appendix G**.

8 Next Steps

The purpose of the Central Entrance Vision Plan was to establish a cohesive vision for the Central Entrance corridor. As MnDOT moves into the pre-design process, additional analysis and public involvement will be necessary to refine the vision established in this Plan. The concepts developed as part of this Plan are high-level, and will require further study and engineering analysis before moving forward. Project design and engineering are anticipated to take place between 2022 and 2025, with construction in 2026. This schedule may change based on funding opportunities, engineering analysis, or other factors.