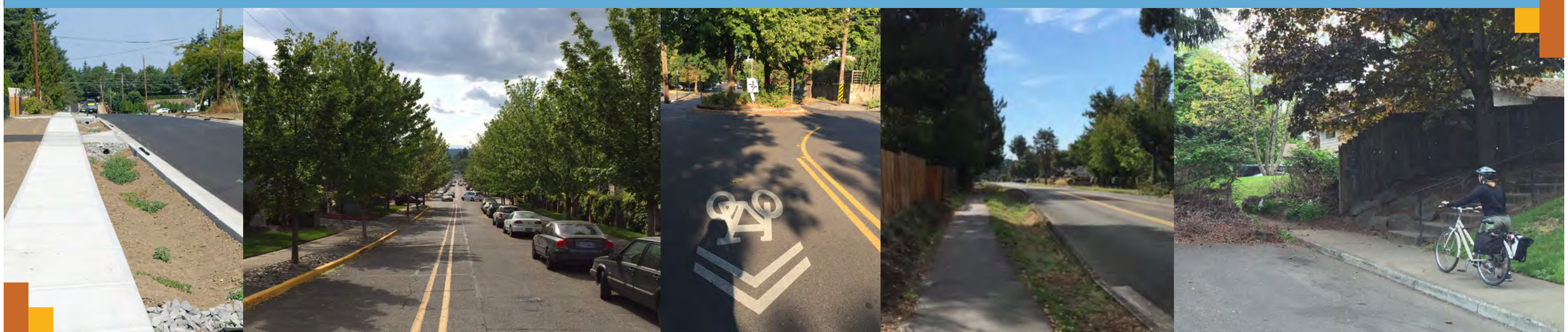
Monroe Neighborhood Street Design Plan



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The contents of this document do not necessarily reflect views or policies of the State of Oregon.

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1. Project Purpose and Background

Project Description and Policy Context

Located in northern Clackamas County, Monroe Street has long been envisioned as a primary active transportation route linking the Trolley Trail in Milwaukie to the Interstate 205 (I-205) Multi-Use Path located in the unincorporated portion of the County. This connection would improve local access to two lines on the regional Metropolitan Area Express (MAX) light rail system – the Green Line along I-205 and the newly completed Orange Line in Milwaukie – and would provide safer bicycling and walking to the Clackamas Regional Center. Ultimately, the project would link downtown Milwaukie and Clackamas Town Center, connecting local neighborhoods to schools, jobs, shopping and parks.

The Clackamas County *Monroe Neighborhood Street Design Plan* was developed to help make this vision a reality, and to meet active transportation goals and policies set forth in the County's Transportation System Plan, Active Transportation Plan, and Bicycle and Pedestrian Master Plans, which identify Monroe Street as a key east-west pedestrian and bicycle connection. Monroe Street is identified as a "Tier 1" 20-year Capital Project in Clackamas County's Transportation System Plan, and as a Principal Active Transportation Route in the County's Active Transportation Plan.

In addition, Metro's *Regional Transportation Plan* and *Active Transportation Plan* classify Monroe Street as a Bicycle Parkway – that plan's highest bicycle classification. These routes are considered the "highest order" bicycle routes for their function in connecting communities and destinations, including regional transit and employment centers, commercial, and recreation areas.

A related plan – the *Monroe Street Neighborhood Greenway Concept Plan* – was prepared by the City of Milwaukie for the section of Monroe Street located within the City's jurisdiction. The Monroe Street Neighborhood Greenway Concept Plan was completed in an effort to realize the vision for Monroe Street included in the *City of Milwaukie Transportation System Plan*, as well as to help reach regionally-mandated targets of 45%-55% non-single occupant vehicle (SOV) mode share by 2035. In 2015, the Milwaukie City Council adopted the Monroe Street Neighborhood Greenway Concept Plan and is in the process of acquiring project funding as of the writing of this plan. A more thorough analysis of these plans and policies can be found in Appendix A, Policy Framework Memorandum.

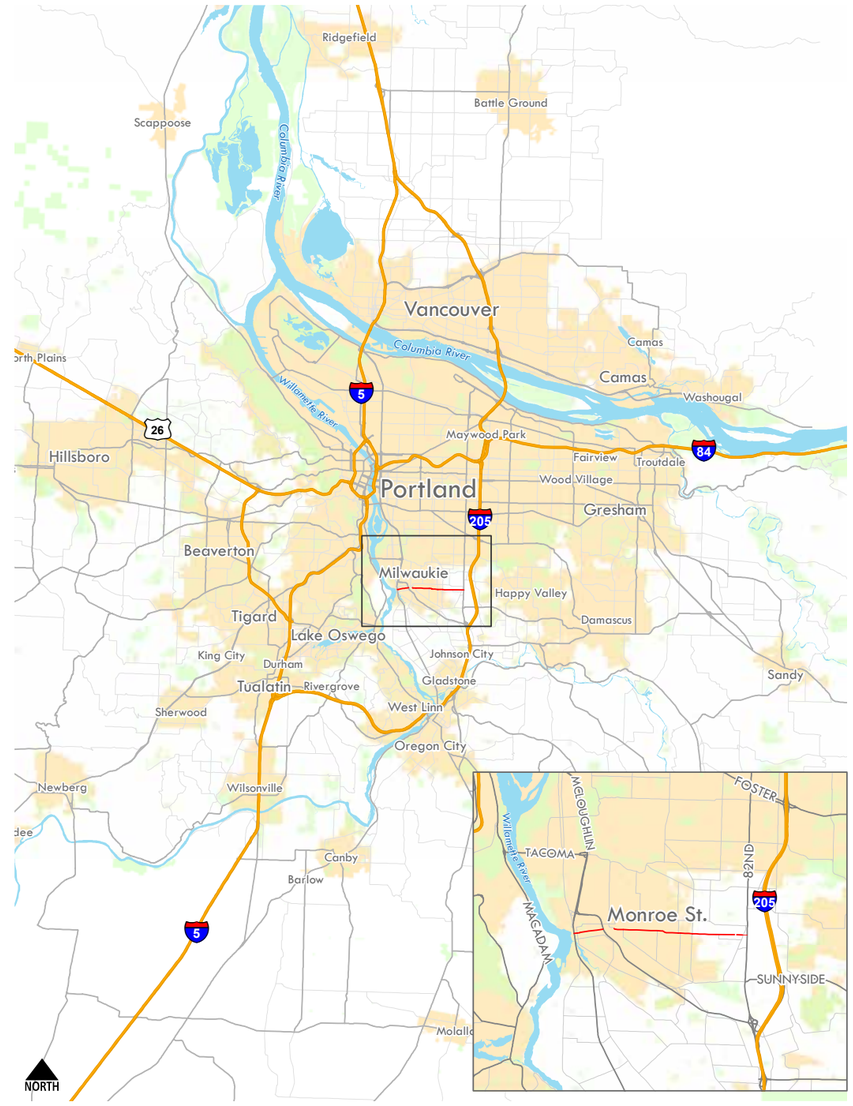

Figure 1.1 Project Vicinity Map

Shows location of Monroe Street in regional context.

This plan includes a proposed concept design for Monroe Street between Linwood Avenue and the I-205 Multi-Use Path that prioritizes safe pedestrian and bicycle connections along this critical corridor. The proposed concept design also places a strong emphasis on improving walking and bicycling conditions near Whitcomb Elementary School on Thompson Road.

Project Objectives

The goal of the Monroe Neighborhood Street Design project is to develop a design that improves safety and travel conditions for pedestrians and bicyclists while balancing neighborhood livability and the needs of vehicle traffic. Key project objectives are outlined below.

Increase Active Transportation Options to Improve Public Health

Creating active transportation options that are accessible and convenient for all users improves public health by promoting physical activity. Better, safer conditions encourage more short trips by walking and biking. Well-connected streets with safe pedestrian and bicycle facilities can promote a healthier, more active lifestyle for all members of the community.

Safety and Comfort on Different Types of Streets

Street design should create an environment that promotes safety, comfort, and access for all users. The recommended design takes into account differing conditions and contexts of each street. Though a street might change from block to block, the level of safety should remain consistent to ensure it is comfortable for all users.

Safe Routes to School Plan

The Safe Routes to School initiative improves safety for pedestrians and bicyclists, encouraging children to walk and bike to school. Safe Routes to School programs in Clackamas County schools can bring a wide range of benefits – including promoting physical activity among children and easing traffic congestion. For more information on the Safe Routes to School component of the *Monroe Neighborhood Street Design Plan*, refer to page 5 and Appendix B: Safe Routes to School Action Plan, Whitcomb Elementary School.

Connection to the Milwaukie Monroe Street Neighborhood Greenway Concept Plan

The *Monroe Street Neighborhood Greenway Concept Plan* is a City of Milwaukie plan to strengthen the neighborhood street character of Monroe Street in Milwaukie and provide safer, low-stress accommodations for pedestrians and bicyclists. The project area extends along Monroe Street from 21st Avenue in downtown Milwaukie to Linwood Avenue at the city's eastern boundary. Intended to reduce the speeds and volumes on Monroe Street in Milwaukie, the plan includes crossing improvements, stormwater treatment features such as chicanes and curb extensions, and partial diverters at OR 224, 42nd Avenue, and Linwood Avenue and Monroe Street. The plan was adopted by the Milwaukie City Council in 2015 and will be implemented over the next few years as funding becomes available.

The *Monroe Neighborhood Street Design Plan* project begins where the Milwaukie *Monroe Street Neighborhood Greenway Concept Plan* ends, creating the opportunity for Clackamas County to develop a low-stress route for east-west bicycle and pedestrian travel from the Willamette River to the I-205 Multi-Use Path and the Clackamas Town Center.

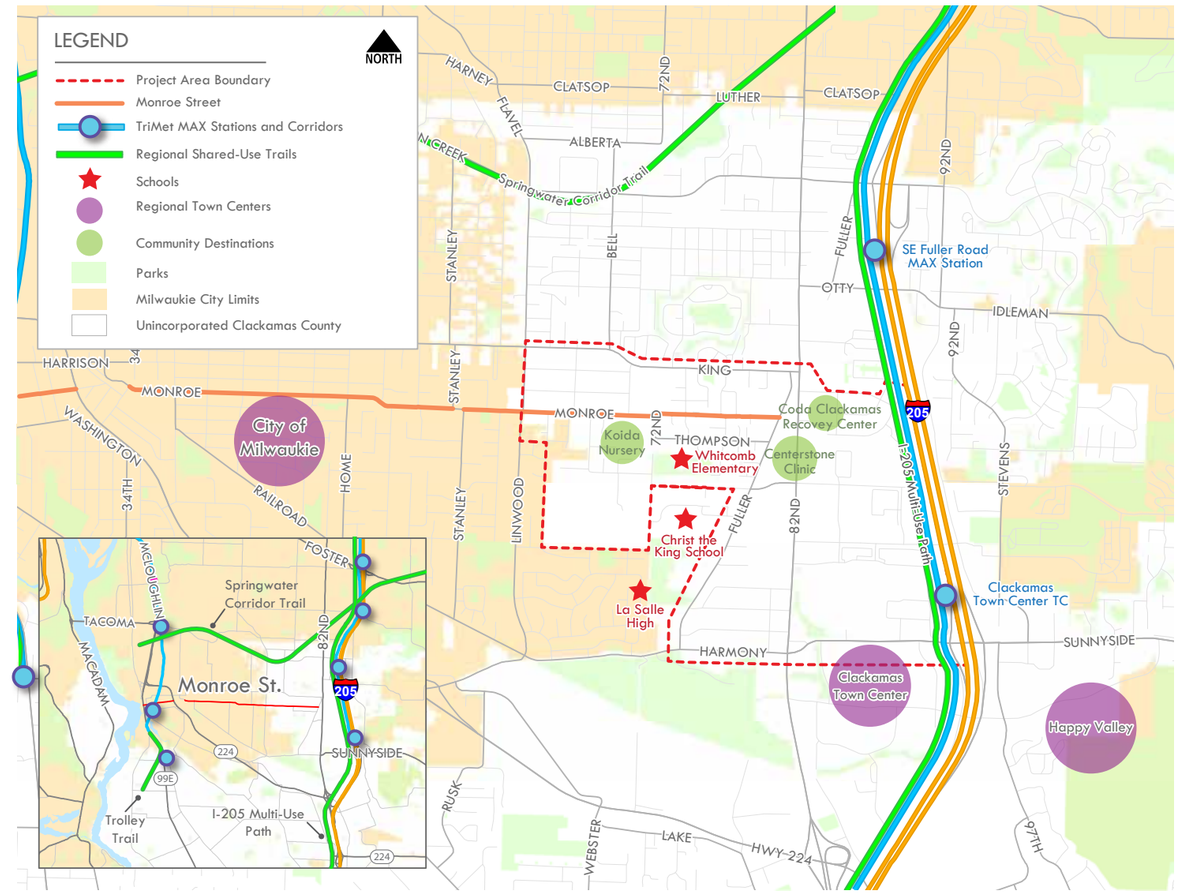

Figure 1.2 Destinations Map

Monroe Street will provide a safe pedestrian and bicycle connection between downtown Milwaukie and the I-205 Multi-Use Path, linking parks, schools, trails and light rail lines along the way.

2. Existing Conditions

Project Area Conditions

West of 82nd Avenue, the Monroe Street corridor includes Monroe Street, 72nd Avenue, Thompson Road, and a soon-to-be constructed section of Boyer Drive. East of 82nd Avenue, the corridor includes Boyer Drive, 85th Avenue, and Spencer Drive. Cross-sections and overall street character vary throughout the study area, including both low-traffic residential streets and busier collector roadways. Existing right-of-way ranges from 40 feet to 80 feet and, as a result, proposed design treatments vary throughout the project to address different contexts and needs.

Monroe Street itself has two separate functional classifications in the Clackamas County TSP. Between Linwood Avenue and 72nd Avenue, it is classified as a Collector street.[1] East of 72nd Avenue to Fuller Road, it is classified as a Connector.[2] This includes the discontinuous segment of Monroe Street east of 78th Avenue, referred to as the "Monroe Gap" throughout this plan.

Lack of Safe Pedestrian Facilities

Many streets in this area lack dedicated pedestrian facilities. For example, there are no existing sidewalks or shoulders on Monroe Street east of Linwood Avenue, so pedestrians must walk in the narrow, undefined shoulders along both sides of the street. Speeds are relatively high (averaging 25 to 35 miles per hour [mph]), making it unsafe to walk along Monroe Street and impossible to use a wheelchair. Conditions are similar on 72nd Avenue between Monroe Street and Thompson Road, with high speeds and no pedestrian facilities. The sidewalk network along Thompson Road is incomplete, with sidewalks only present along the south side of Thompson Road between 74th Avenue and Fuller Road. These conditions do not provide safe walking access to Whitcomb Elementary School. Sidewalk connections between Monroe Street and Thompson Road are nonexistent, and most of the corridor lacks curb ramp treatments that comply with the Americans with Disabilities Act (ADA).

Lack of Continuous Bicycle Infrastructure

Bicycle infrastructure is discontinuous throughout the Monroe Street and Thompson Road corridor. Currently, there are no bicycle facilities on Monroe Street or 72nd Avenue, so people riding bikes must share the road with fast-moving vehicles. In general, only more confident, experienced cyclists ride along Monroe Street and 72nd Avenue.

Cyclists seeking the safety of a bike lane must travel three blocks north to King Road, where speeds east of Linwood Avenue exceed 35 mph, creating an inhospitable bicycling environment for children, families, and less-experienced riders.

Bicycle lanes exist along Thompson Road, between 74th Avenue and Fuller Road, although fast-moving traffic and cars parked in bike lane make Thompson Road challenging for children or less experienced bicyclists.

When the planned and funded extension of Boyer Drive (continuing east from Monroe Street between Fuller Road and 82nd Avenue) is built, it will include sidewalks and cycle tracks, connecting Monroe Street to 82nd Avenue and destinations to the east.

Need for Stormwater Management

Community members identified stormwater runoff and management as a critical need in the project area. Currently, infrequent storm drains do not provide adequate drainage, resulting in localized flooding.

Figure 2.1 Aerial Overview Map

1. A Collector is defined in the County TSP as a "principal carrier within neighborhoods or single land use areas. Links neighborhoods with major activity centers, other neighborhoods, and arterials. Generally not for through traffic. Low to moderate volume; low to moderate speed."
2. A Connector "collects traffic from and distributes traffic to local streets within neighborhoods or industrial districts. Usually longer than local streets. Low traffic volumes (less than 1,500 vehicles per day) and speeds (85th percentile speeds less than 35mph). Primarily serves access and local circulation functions. Not for through traffic in urban areas."

Monroe Gap

Currently, there is an unimproved section of Monroe Street east of 78th Avenue, approximately 120 feet in length. Mature trees and vegetation currently block the 60-foot right-of-way from vehicle access between 78th Avenue and Fuller Road, effectively creating a "gap" in the Clackamas County street network. A narrow dirt path connects the right-of-way to Monroe Street at either end of the Gap. There are no sidewalks through this section; the existing path does not meet ADA standards and is accessible only to pedestrians and bicyclists who walk their bikes. Today, the Gap acts as a natural traffic diverter, directing motorists to Thompson Road one block south of Monroe Street in order to reach Fuller Road and destinations to the east.

Over the course of developing this plan, the project team considered two options for what became known as the Monroe Gap: improving it for pedestrians and bicycles only, or improving the street to Clackamas County local street standards, thereby making Monroe Street a continuous automobile route through the neighborhood.

This plan recommends that the Monroe Gap remain closed to automobile traffic, and is improved for bicycles and pedestrians only. The decision to keep the Monroe Gap closed to automobile traffic was strongly supported by the public, and will help maintain low volumes along an important active transportation route. For a detailed description of proposed Monroe Gap improvements, refer to Chapter 4—Section A, Segment 4.

For a more detailed description of the evaluation process that informed the decision to keep the Monroe Gap closed to automobile traffic, refer to Appendix C: Alternatives Analysis Report.

Figure 2.2 Monroe Gap

Vicinity map showing location of Monroe Gap.

Approaching the Monroe Gap from the east end of the unimproved segment. Photo: CH2M (2015)

Image shows the unimproved Monroe Gap, looking west. Photo: CH2M (2015)

Difficult Crossings for All Modes

Crossing major streets can be challenging for all modes of transportation within the project area. Community feedback indicated the intersection of Linwood Avenue and Monroe Street was a safety focus for those living in the area due to frequent crashes.

Further east, Fuller Road traffic volumes exceed 3,500 vehicles per day and 85th percentile speeds of 35 mph. A lack of midblock crosswalks or median refuge areas make crossing Fuller Road's 48-foot width difficult for pedestrians. 82nd Avenue carried nearly 30,000 vehicles per day in 2013. 82nd Avenue is 80 feet wide and has five lanes, which, in addition to numerous driveway access points, makes for difficult pedestrian crossing conditions. Marked crosswalks along these roads are located only at signalized intersections, which can be up to a quarter mile apart.

Neighborhood Livability Concerns

Monroe Street is primarily a Collector through the City of Milwaukie and Clackamas County and has high levels of through traffic, particularly during the afternoon peak period. Collector streets are intended as moderate-volume, moderate-speed streets that provide access and circulation within and between residential neighborhoods, commercial areas, and industrial areas.

Today, many motorists use Monroe Street to avoid congestion along Harrison Street and King Road, which can be heavy at 42nd Avenue and Linwood Avenue. Neighborhoods along Monroe Street have long expressed concerns regarding the speed of traffic on their street. Although Monroe Street has a speed limit of 25 mph east of Linwood Avenue, 85th percentile speeds are closer to 32 mph.

Appendix D, Existing Conditions and Needs Memorandum, contains a complete description of existing conditions throughout the project area.

Safe Routes to School: Whitcomb Elementary School

As part of the Monroe Plan, Clackamas County partnered with Whitcomb Elementary School to develop a Safe Routes to School (SRTS) Action Plan. The Action Plan used information gathered from travel assessments and student/parent surveys to develop recommended priority projects and activities for Whitcomb Elementary to promote safe walking and bicycling to school. Appendix B contains the Safe Routes to School Action Plan.

The SRTS planning process identified the following needed improvements:

- Marked crosswalks and signage in key locations, including the intersections of Fuller Road/Thompson Road, Fuller Road/Causey Avenue/Harmony Drive and Thompson Road/77th Avenue
- More continuous sidewalks on Thompson Road, including the north side between Fuller Road and 72nd Avenue where none exists now, and on the south side west of the school
- Safe pedestrian accommodation along 72nd Avenue between Monroe Street and Thompson Road, where the S-curve creates hazardous walking conditions in the absence of sidewalks
- Sidewalks along 74th Avenue between Monroe Street and Thompson Road, where students often walk in the street because vehicles are parked on both sides of the roadway
- Continue the practice of using adult crossing guards in the morning and afternoon
- Provide student bike parking at Whitcomb Elementary, as none currently exists
- Upgrade pedestrian access at Maplehurst Road and McEachron Avenue and develop walkway to school building from existing access gate.

Photo: City of Rexburg, ID

Photo: Safe Routes Partnership (2015)

3. Analyzing Project Alternatives

Overview of Route Alternatives

The *Monroe Neighborhood Street Design Plan* considered a range of alternative routes to provide a safe pedestrian and bicycle connection from the intersection of Monroe Street and Linwood Avenue to the I-205 Multi-Use Path. During early planning efforts, the project area was organized into several *route segments* (shown in Figure 3.1) in an effort to understand the opportunities and constraints at a high level of detail. Once the project needs, constraints, and opportunities associated with each of these shorter segments were analyzed, the project team, Technical Advisory Committee (TAC), and Project Advisory Committee (PAC) developed seven *route alternatives* to connect Linwood Avenue to the I-205 Multi-Use Path. The general alignment of each *route alternative* is listed below:

- **Alternative 1:** Monroe Street—Boyer Drive Extension—85th Avenue—Spencer Drive
- **Alternative 2:** Monroe Street—Fuller Road—Causey Avenue
- **Alternative 3:** Monroe Street—Maplehurst/Harmony Road—Causey Avenue
- **Alternative 4:** Monroe Street—Maplehurst/Harmony Road—Fuller Road—Boyer Drive Extension—85th Avenue—Spencer Drive
- **Alternative 5:** Monroe Street—Thompson Road—Fuller Road—Boyer Drive Extension—85th Avenue—Spencer Drive
- **Alternative 6:** Monroe Street—Thompson Road—Fuller Road—Causey Avenue
- **Alternative 7:** Monroe Street—Maplehurst/Harmony Road—Fuller Road—Monterey Avenue

In order to communicate potential trade-offs associated with each route alternative, cut-sheets summarized each route for the PAC, TAC, and project team. Summaries included potential alignment, design considerations, and Safe Routes to School benefits. Feedback was obtained on early design concepts as well, including bicycle and pedestrian facility design, stormwater management considerations, and potential improvements to the Monroe Gap.

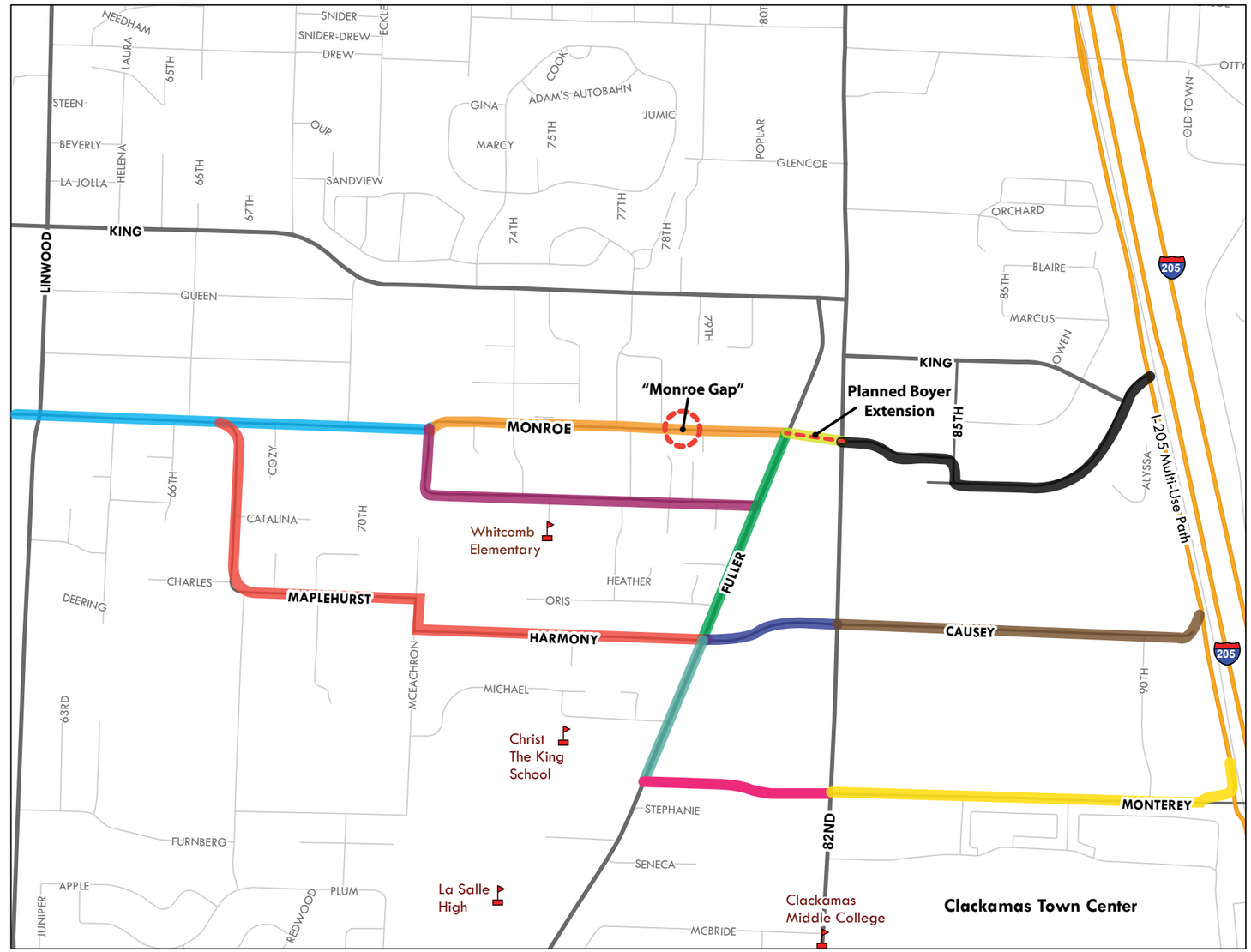

Figure 3.1 Route Segments Considered

Various combinations of the route segments shown in the map above were used to create seven distinct route alternatives. Route alternatives were then evaluated to determine the preferred route for the Monroe Neighborhood Street Design Plan.

Evaluation Criteria

In order to select a preferred route, alternatives were evaluated against project goals and objectives. Building from relevant state, regional, and local plans, criteria were developed to provide an evaluation framework for the selection of a preferred route. The project evaluation criteria defines that the preferred route alternative should seek to:

- Improve safety for all modes, with an emphasis on bicycle/pedestrian safety
- Support healthy and active communities
- Identify safe crossings and safe routes to school
- Provide neighborhood benefits and minimize negative impacts
- Identify options to address stormwater runoff from impervious surfaces
- Create an implementable project plan, which identifies potential funding sources over time

For a more detailed description of the evaluation criteria, refer to Appendix C: Alternatives Analysis Report.

Identifying the Preferred Alternative

Using the evaluation criteria, route alternatives were examined based on how well they supported project goals and objectives. As a method to help inform further discussion with the TAC, PAC, and project team, route alternatives were evaluated based on how well they supported project goals and objectives using a matrix approach (Figure 3.2).

Alternatives 1 and 5 emerged as the preferred routes, which comprise both Monroe Street and Thompson Road. Monroe Street ranked high, offering good connectivity to local and regional destinations and for its potential to realize Clackamas County TSP goal of creating a safe bicycle and pedestrian route. Thompson Road scored high because it serves as the main access road to Whitcomb Elementary.

The preferred route for the *Monroe Neighborhood Street Design Plan* is a hybrid of Alternatives 1 and 5, referred to throughout this plan as the Monroe—Thompson Corridor (Figure 3.3). The corridor is comprised of Monroe Street, Thompson Road, Boyer Drive, and Spencer Drive. For more information about the alternatives analysis process, refer to Appendix C.

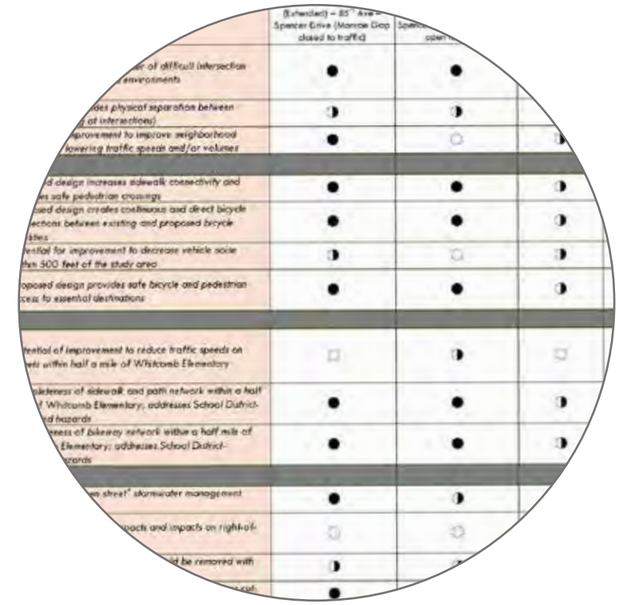

Figure 3.2 Alternatives Analysis Matrix

Indicates the extent to which route alternatives support project goals and objectives:

● *Fully support*

◑ *Neutral*

○ *Does not support*

Preferred Route: Monroe—Thompson Corridor

The preferred route for the *Monroe Neighborhood Street Design Plan* (Figure 3.3) will provide a safe, low-stress active transportation connection between Linwood Avenue and the I-205 Multi-Use Path. The route assumes that the Monroe Gap will be improved to allow bicycle and pedestrian access only. The route also assumes the completion of the Boyer Extension Project, which will provide a new multi-modal connection between Fuller Road and 82nd Avenue.

Given Safe Routes to School objectives, the preferred route includes connections along 72nd Avenue and Thompson Road, which serves as the frontage road for Whitcomb Elementary. East of 82nd Avenue, the preferred Monroe—Thompson Corridor includes Boyer Drive between 82nd and 85th Avenues, and links with the I-205 Multi-Use Path at Spencer Drive. The route will provide improved connections for westbound active transportation users traveling to downtown Milwaukie and Portland, as well as eastbound users traveling to Clackamas Town Center and the I-205 Multi-Use Path.

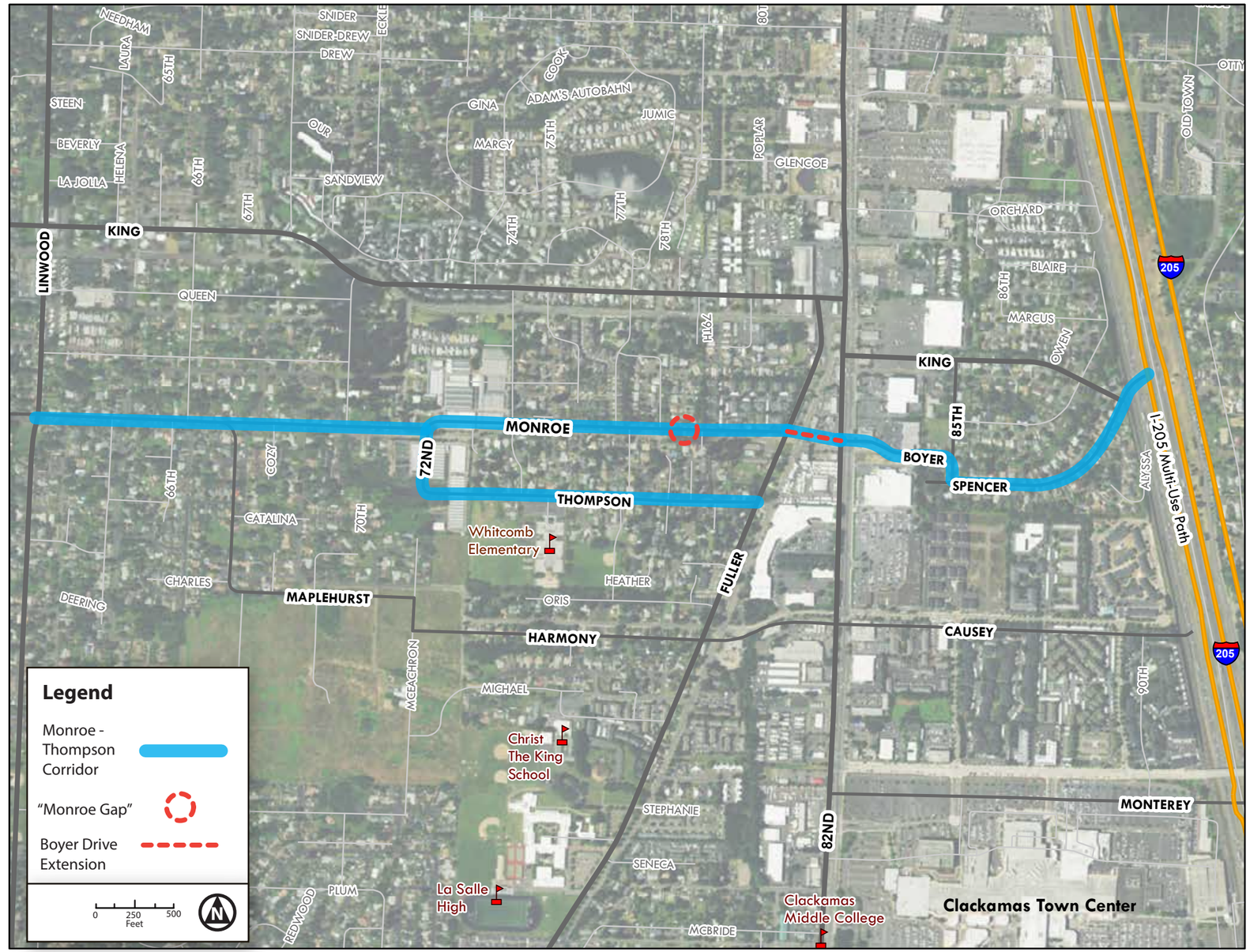

Figure 3.3 Monroe—Thompson Corridor

Map displays the preferred alignment for the Monroe—Thompson Corridor

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4. Monroe Neighborhood Street Design Plan

Designing the Route

The recommended design concept was developed iteratively based on feedback and discussion from the PAC, TAC, and general public. In February 2016, the project team presented a draft concept design to the public during Open House #1. The draft concept design was based on stakeholder input, analysis of the existing conditions, and project goals and objectives.

At Open House #1, the public was given the opportunity to provide feedback on key design considerations including (but not limited to) on-street parking, right-of-way impacts, speed control treatments, and stormwater management. Open House #2 allowed participants to comment on the draft plan.

Subsequent TAC and PAC meetings focused on revising the design to respond to comments received from the PAC, TAC, and general public. In two subsequent revision phases, the project team drew upon public feedback and TAC/PAC recommendations to refine the concept design. This final plan is the result of that revision process.

Example of bicycle wayfinding signage. City of Milwaukie (2012)

Major Design Components

Traffic calming treatments are included throughout the Monroe—Thompson Corridor, including speed cushions, signage, and intersection realignments. Between Linwood Avenue and Fuller Road, major components of the design include a curbed, grade-separated shared-use path along parts of Monroe Street. Bioswale and landscaping features are used to provide intermittent buffers between the shared-use path and the roadway while also providing stormwater management benefits.

The *Monroe Neighborhood Street Design Plan* recommends that the Monroe Gap east of 78th Avenue is improved for bicycle and pedestrian access only. The recommended design to the Monroe Street Gap is a 12-foot shared use path.

Major design components along Thompson Road between 72nd Avenue and Fuller Road include a mini-roundabout at the intersection of 72nd Avenue and Monroe Street, which would facilitate the transition of the Monroe Street shared-use path from the north side of Monroe Street to the south side of Thompson Road. To complete the bicycle and pedestrian network on both sides of Thompson Road, the design also includes a sidewalk and bike lane on the north side of Thompson Road, in addition to raised crosswalks and a pedestrian-activated rapid flashing beacon at Whitcomb Elementary School. To accommodate peak drop-off and pick-up times as well as overflow parking from the Whitcomb Elementary parking lot, on-street parking is maintained on the south side of Thompson Road between 72nd Avenue and 74th Avenue.

Bicycle wayfinding signage is recommended in locations where cyclists face a route-finding decision.

Stormwater Management

Neighborhood-scale stormwater management includes a range of treatments. **Bioswales** are typically oblong, gently sloping, landscaped depressions that capture and hold stormwater runoff, allowing special plants to absorb the water and keep it off of adjacent properties. **Pervious pavement** allows water to seep down through smooth, permeable surfaces used for walkways and driveways.

In addition to stormwater management benefits, bioswales can be utilized as "buffers," separating pedestrians and vehicles. Vegetated stormwater buffers along pedestrian facilities help slow traffic while providing appealing neighborhood landscaping.

The following sections describe the Monroe Neighborhood Street Design in more detail, including concept-level design plans and general cross-section drawings.

Example of chicanes in a neighborhood setting in Shoreline, WA.

Street Right-of-Way: Utility Requirements

The ultimate street right-of-way must include space for utilities, traffic control devices and information signage as determined in the construction design phase. This is in addition to the right-of-way shown for the pedestrian, bicycle and road improvements. As the improvements shown in this plan move toward final design and construction it may be determined that 2-3 feet of right-of-way for utilities and/or signage is needed in excess of the proposed cross sections depicted in Figure 4.10 – 4.23.

Example of a shared-use path in Washington County, OR. Photo: Clackamas County, OR.

3. Although the ***Monroe Street Neighborhood Street Design Plan*** recommends the shared-use path on the north side of Monroe Street, providing the shared-use path on the south side of Monroe Street was also determined as a feasible option during the design process. The final location of the shared-use path on the north or south side of Monroe Street is subject to change as the plan moves toward final design and construction.
4. All design features are subject to modification in final design and construction. Facility locations are representative only; final facility locations will consider factors such as parking, driveway locations, and property impacts.

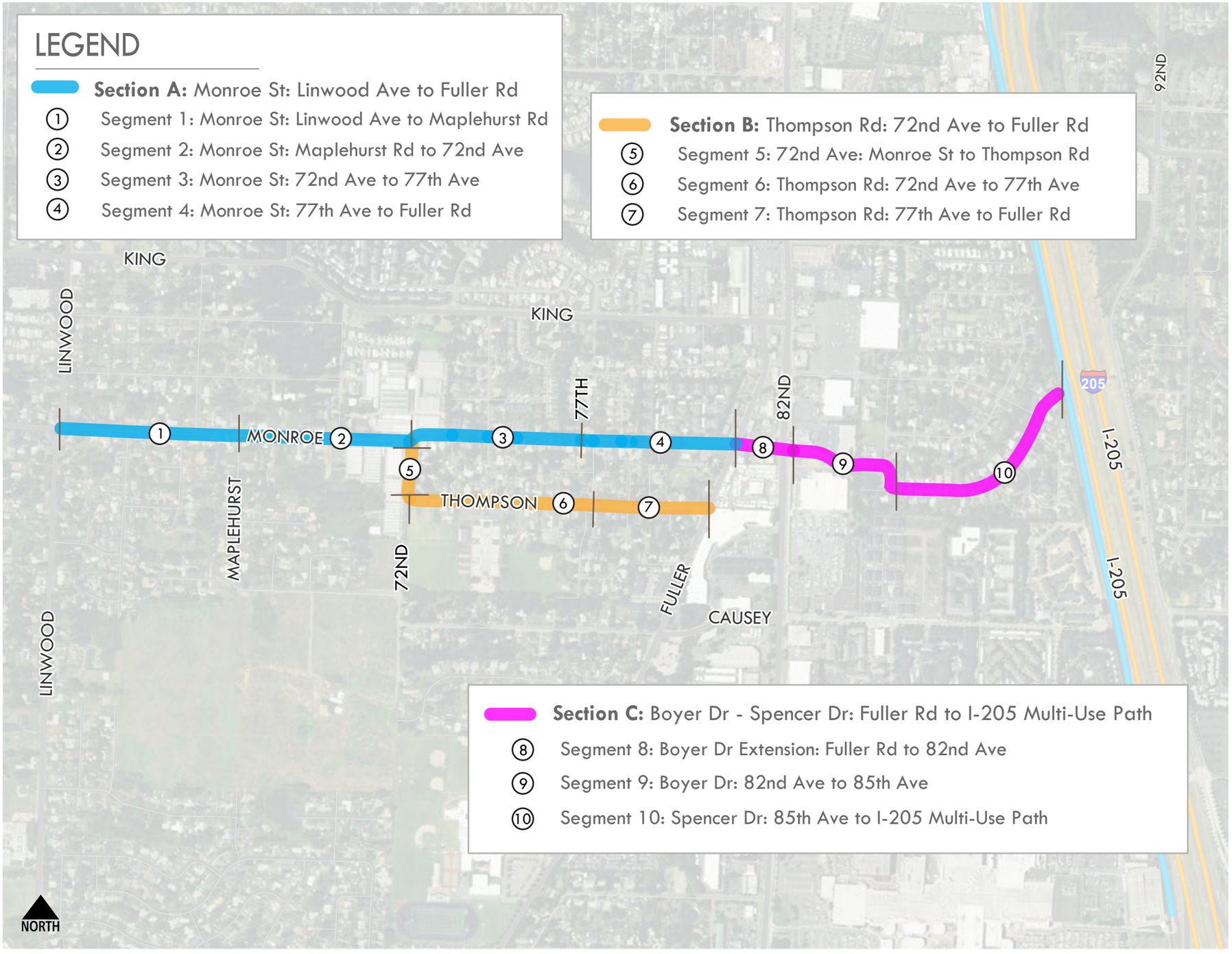


Figure 4.1 Monroe–Thompson Corridor Design Sections: Segments

For analysis purposes, plan recommendations have been organized into Sections A, B, and C.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 1: Monroe Street—Linwood Avenue to Maplehurst Road

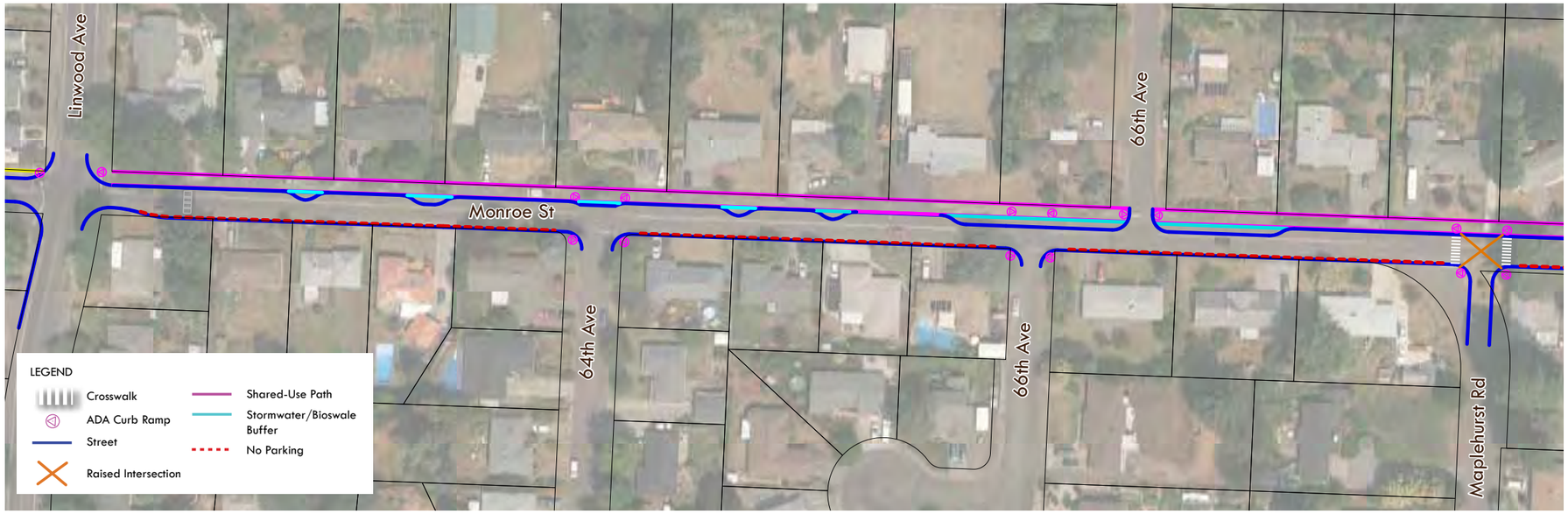


Figure 4.2 Recommended design for Monroe Street—Linwood Avenue to Maplehurst Road

Example of a raised intersection in a residential setting. Photo: Streets.mn (2015)

Monroe Street between Linwood Avenue and Maplehurst Road is relatively narrow, with a right-of-way of 40 feet, and currently does not provide sidewalks or bicycle facilities. Private properties abut the County roadway. The design for this segment of Monroe Street assumes the construction of a traffic diverter at Linwood Avenue as part of the City of Milwaukie's *Neighborhood Greenway Concept Design Plan*, which will prevent motorists from traveling east-west across Linwood Avenue. Bicyclists can continue straight through the intersection.

The major design component for this segment is a 12-foot shared-use path on the north side of Monroe Street, which is designed to provide adequate physical separation between bicycles, pedestrians, and motorists.[5] The shared-use path is grade separated and includes ADA-compliant curb ramps at intersections. The shared-use path also employs intermittent vegetated buffers to provide increased physical separation between active users and motorists, traffic calming, parking spaces within buffer inlets, and stormwater management benefits.

The plan recommends the removal of parking along the south side of Monroe Street. Speeding was noted as a major concern throughout this segment, and speed bumps are included at key locations. Speed bump locations are conceptual, but spacing must be close enough that speeding between them does not occur. The design also recommends a raised intersection at Monroe Street and Maplehurst Road. Raised intersections can help reinforce slow speeds and encourage motorists to yield to pedestrians at crosswalks (NACTO, 2015). Intersection realignment is also recommended at 64th Avenue, 66th Avenues, and Maplehurst Road in order to help slow fast-turning vehicles.

5. Although the ***Monroe Neighborhood Street Design Plan*** recommends the shared-use path on the north side of Monroe Street, providing the shared-use path on the south side of Monroe Street was also determined as a feasible option during the design process. The final location of the shared-use path on the north or south side of Monroe Street is subject to change as the plan moves toward final design and construction.

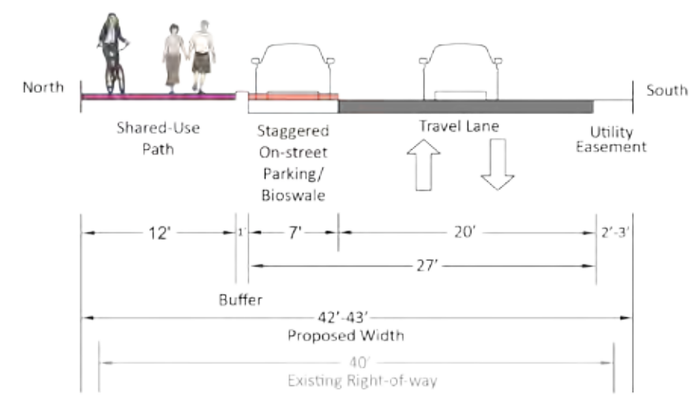


Figure 4.3 Proposed cross-section for Monroe Street, between Linwood Avenue and Maplehurst Road

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 2: Monroe Street—Maplehurst to 72nd Avenue

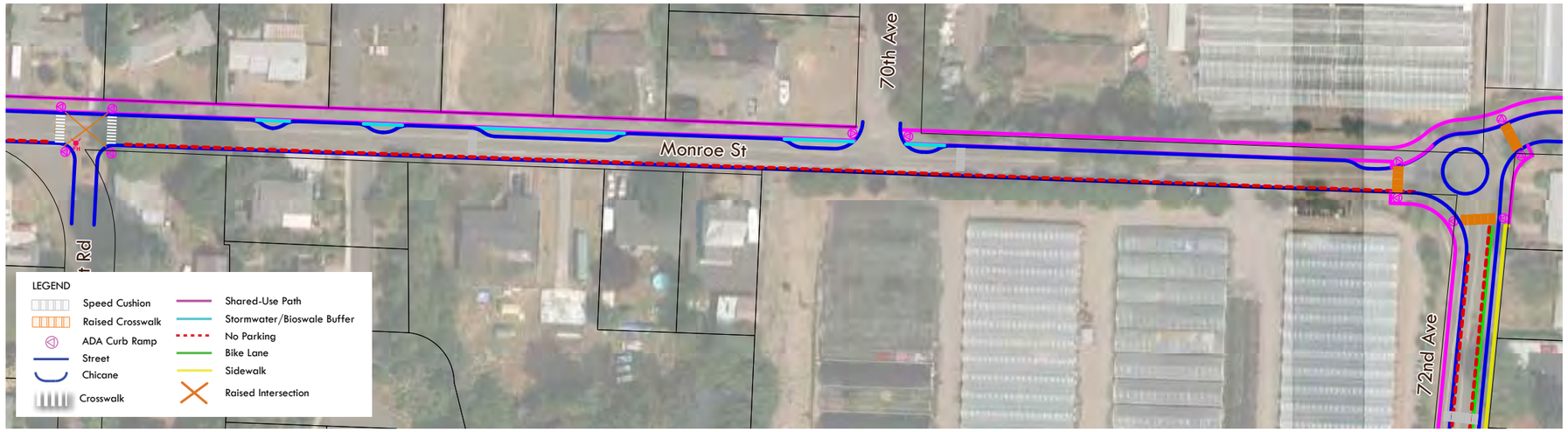


Figure 4.4 Recommended design for Monroe Street—Maplehurst to 72nd Avenue

Example of a neighborhood mini-roundabout with mountable curb in Lansing, Michigan. This design functions as a traffic calming element while preserving access for larger vehicles, such as school buses, delivery trucks, and emergency vehicles. Photo: Google Earth (2011)

The *Monroe Neighborhood Street Design Plan* recommends a continuation of the shared-use path along the north side of Monroe Street between Maplehurst Road and 72nd Avenue, complete with intermittent vegetated buffers and no parking on the south side of the street.

Special consideration was given to minimizing parking impacts near the Koida Nursery, located at the corner of Monroe Street and 72nd Avenue. Parking spaces on Monroe Street are provided along the north side of Monroe Street in the vicinity of the Koida Nursery in order to accommodate nursery employees and visitors.

Roundabout at 72nd Avenue

Neighbors in the area expressed concerns about speeding through the three-way intersection at Monroe Street and 72nd Avenue. This intersection is also difficult for bicyclists traveling east along Monroe Street, where a of lack of bicycle facilities, signage, and pavement markings make the intersection confusing and potentially dangerous given high automobile speeds. To address this challenge, realignment of the intersection to a "T" intersection was explored along with other traffic calming schemes.

Ultimately, the *Monroe Neighborhood Street Design Plan* recommends a mini-roundabout concept at this intersection, which was determined to be the best technical solution to reduce speeds through the intersection. The mini-roundabout concept is designed to accommodate the Monroe Street shared-use path and to provide a smooth transition to the bicycle facilities on Thompson Road. Raised crosswalks are also included at each of the three legs to provide safe bicycle and a pedestrian crossings while encouraging vehicles to slow down. The mini-roundabout configuration is intended to be negotiated at vehicle speeds of 15-20 mph. It is also designed with a mountable curb and is not landscaped so that larger vehicles such as school buses and emergency vehicles can still negotiate the intersection. The mini-roundabout would require some right-of-way acquisition at each corner, and would impact some of the mature trees and landscaping at the intersection. This treatment is designed to provide safer travel through the intersection for all modes.

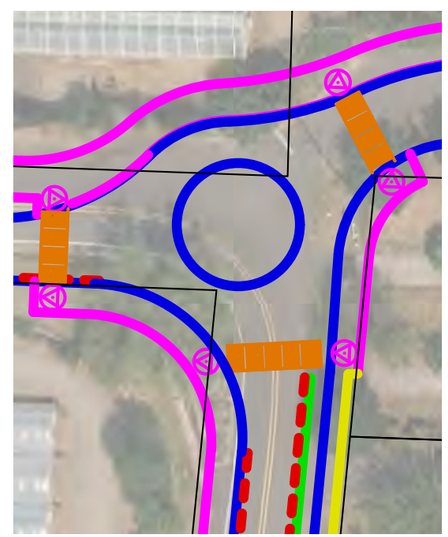


Figure 4.5 Enlarged recommended design for intersection

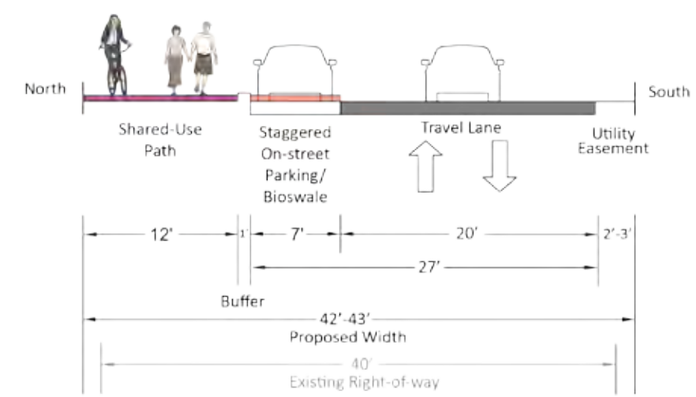


Figure 4.6 Proposed cross-section for Monroe Street, between Maplehurst Road and 72nd Avenue

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 3: Monroe Street—72nd Avenue to 77th Avenue

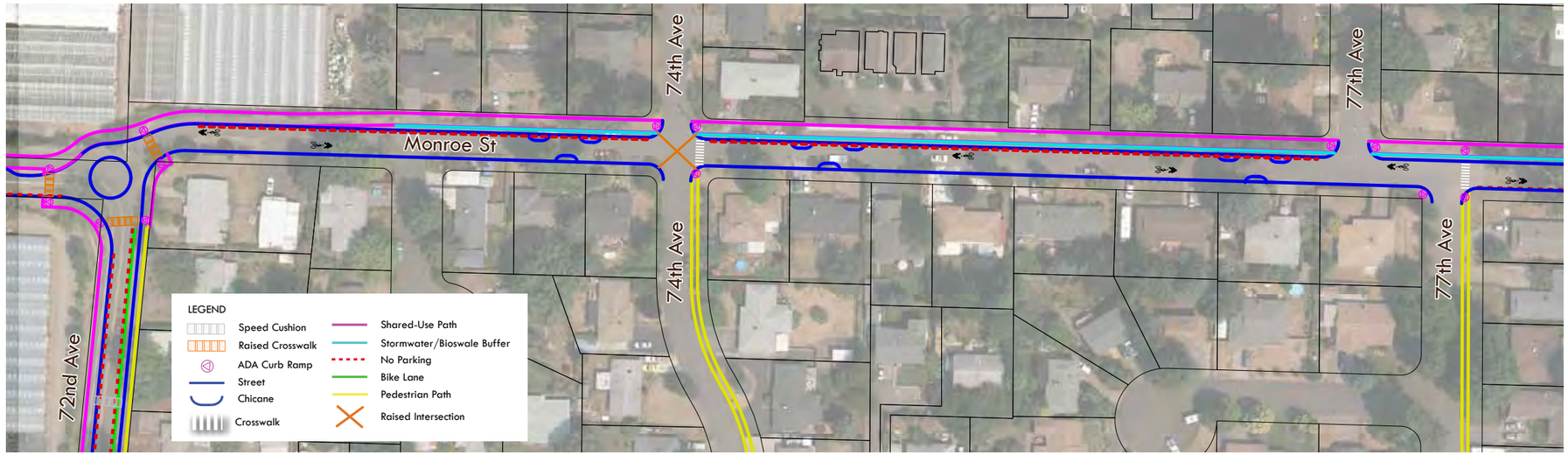


Figure 4.7 Recommended design for Monroe Street—72nd Avenue to 77th Avenue

74th Avenue looking north. Photo: CH2M (2015)

The *Monroe Neighborhood Street Design Plan* recommends the continuation of the path on the north side of Monroe Street between 72nd and 77th Avenues, complete with vegetated buffer space. The path in this segment is reduced from 12 feet to 10 feet. "Sharrow" pavement markings are shown on the street since traffic speeds and volumes are low. Children are likely to use the path rather than share the street with cars. On-street parking is maintained on the south side of Monroe between 72nd Avenue and 74th Avenue. East of 74th Avenue, parking is provided intermittently in key locations.

A raised intersection with crosswalk are recommended at Monroe Street and 74th Avenue. Chicanes are also proposed on both east and west legs of the Monroe Street and 74th Avenue intersection to slow traffic down. [6]

Pedestrian Network Improvements on 74th and 77th Avenues

74th and 77th Avenues serve as important north-south connections between Monroe Street and Thompson Road, particularly for kids and families traveling to and from Whitcomb Elementary School. To support Safe Routes to School objectives, the recommended design includes network improvements along 74th and 77th Avenues, including sidewalks on the east sides of these streets. Crosswalks and raised intersections are included at the intersections of these streets with Monroe Street and Thompson Road to improve pedestrian connections to Whitcomb Elementary.

Example of a standard "Sharrow" pavement marking, used to indicate a street environment shared by bicyclists and automobiles. Image: CH2M (2016).

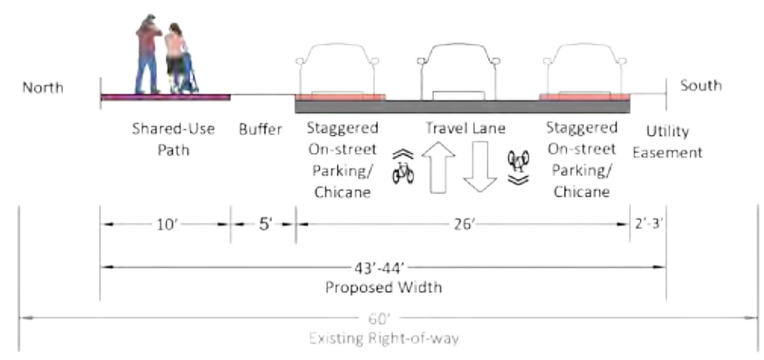


Figure 4.8 Proposed cross-section for Monroe Street, between 72nd Avenue and 77th Avenue

6 Locations of chicanes are conceptual, and are shown for illustrative purposes only. The precise location of chicanes will be determined during final design.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 4: Monroe Street—77th Avenue to Fuller Road

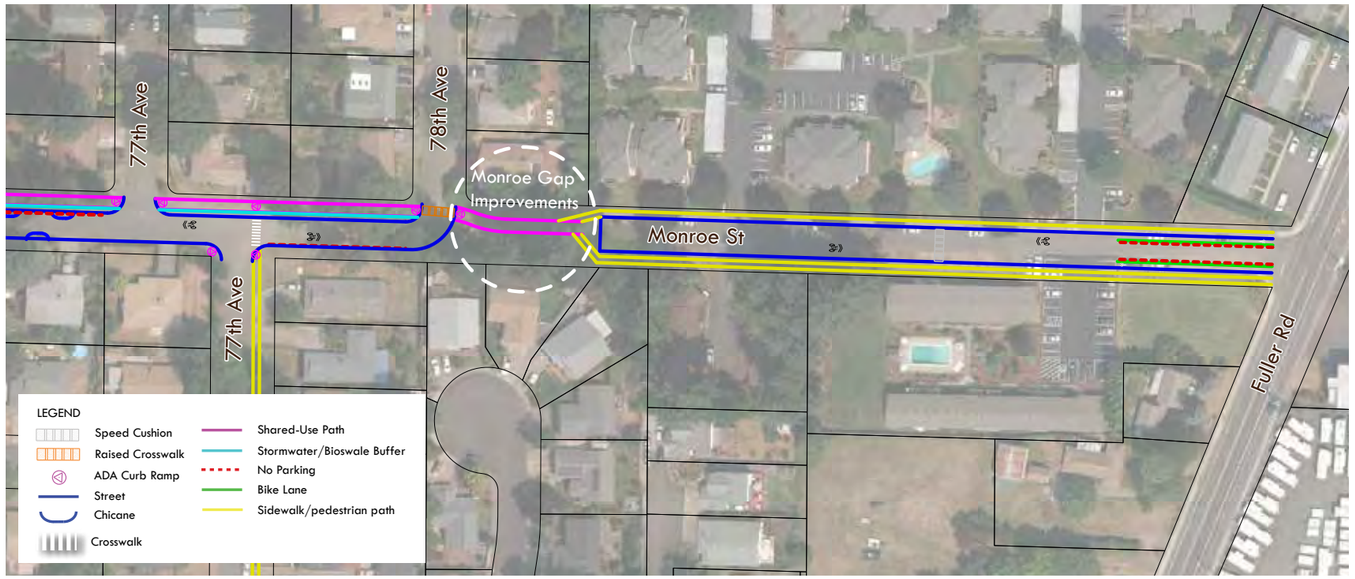


Figure 4.9 Recommended design for Monroe Street—77th Avenue to Fuller Road

The concept design for Monroe Street continues the shared-use path on the north side of Monroe Street to the current Monroe Gap just east of 78th Avenue. The Gap is improved for bicycle and pedestrian access only.

At the west end of the Gap, pedestrians and bicyclists will connect to the shared-use path via a raised crosswalk at 78th Avenue and Monroe Street. Bollards will prevent vehicles from attempting to drive through the Gap. See Section A, Segment 4 for more detailed information about proposed improvements to the Monroe Gap.

At the east end of the gap, the shared-use path transitions to sharrow pavement markings and parking on both sides of the street. There is currently a sub-standard sidewalk on the north side of Monroe Street east of the Gap. The plan recommends adding a 6 foot sidewalk with 5 foot buffer to the south side of the street to complete the pedestrian network in this area. In future stages of the project, the County may decide to further improve the network by updating the existing sidewalk to County standards.

Approximately 200 feet from Fuller Road, the recommended design along Monroe Street transitions from shared space and parking on both sides to bike lanes and no parking on both sides of the street, in an effort to match improvements planned as part of the Boyer Drive Extension project. Sidewalks are recommended on both sides of the street from the Gap to Fuller Road.

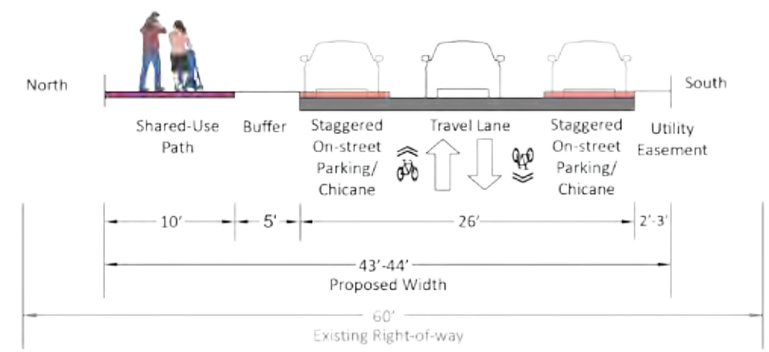


Figure 4.10 Proposed cross-section for Monroe Street, between 72nd Avenue and 78th Avenue (west of the Monroe Gap)

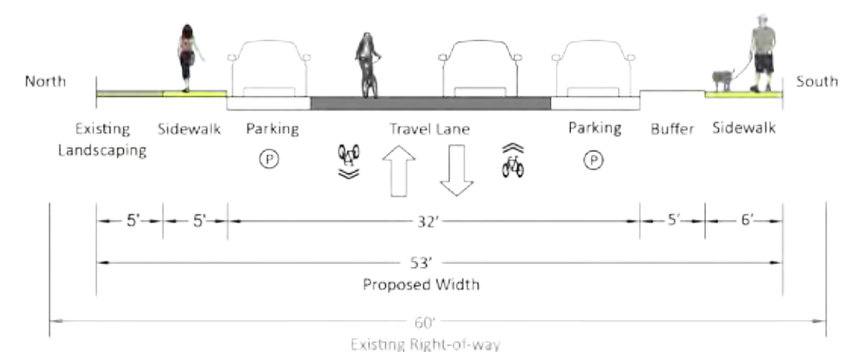


Figure 4.11 Proposed cross-section for Monroe Street, between 77th Avenue to Fuller Road (east of the Monroe Gap)

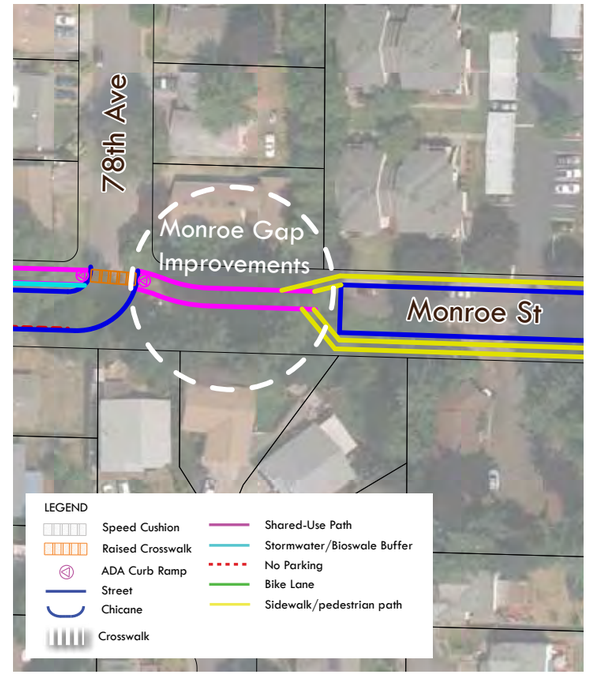
Approximately 200 feet before reaching Fuller Road, cross-section transitions to "no parking" and 6 foot bike lanes on both sides of the street, maintaining a 53' proposed cross-section width.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

The Monroe Gap

Figure 4.11 Conceptual rendering of Monroe Gap. Bollards prevent automobiles from driving through while preserving emergency vehicle access. The 12-foot path is bordered by natural landscaping on both sides.



Monroe Gap as it exists during the writing of this plan. Photo: CH2M (2015)

Monroe Gap Improvements

The *Monroe Neighborhood Street Design Plan* recommends that the Monroe Gap just east of 78th Avenue be improved to accommodate an enhanced bicycle and pedestrian-only connection to the I-205 Multi-Use Path and regional trail systems A 12-foot path follows the roadway centerline through the Gap itself.

Design considerations for improving the Monroe Gap could include guidelines for improving safety in public spaces, such as Crime Prevention Through Environmental Design (CPTED) principles.[7] 'Flexible' bollards that can be removed or lowered to allow emergency vehicle access will restrict vehicle access through the Gap. Alternative path treatments through the Gap should also be considered, including pervious pavement and stormwater management features. The County may also explore opportunities to engage community-based partners and residents to help landscape and maintain the Gap.

7. http://www.cpted.net/

Design Elements

Section B: Thompson Road—72nd Avenue to Fuller Road

Segment 5: 72nd Avenue—Monroe Street to Thompson Road

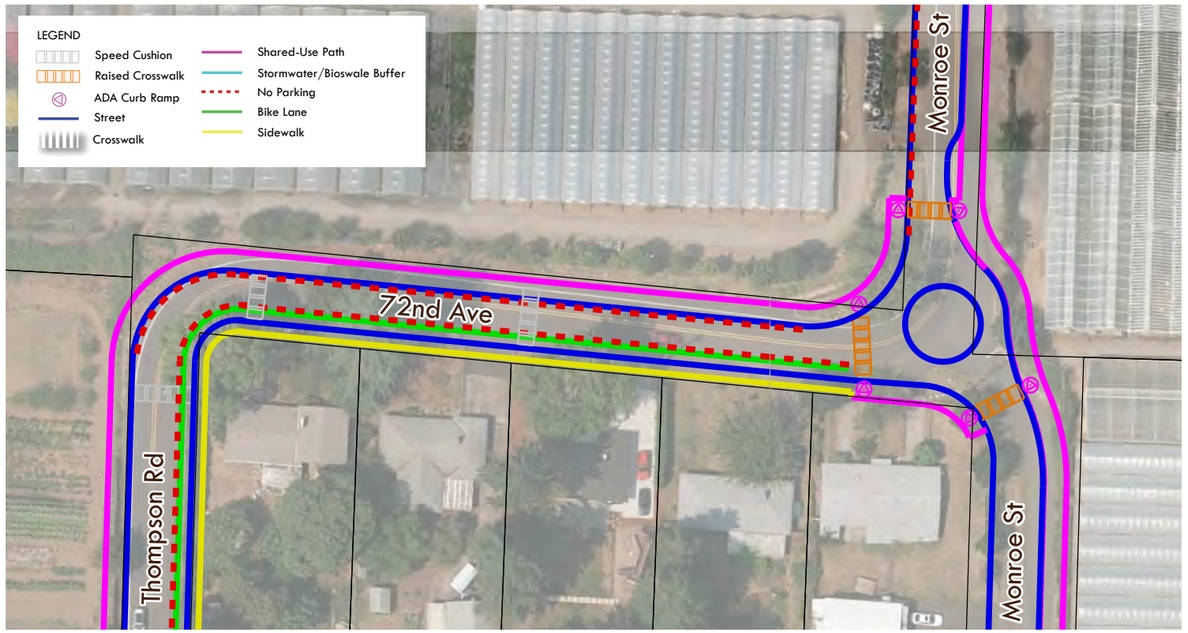


Figure 4.12 Recommended design for 72nd Avenue—Monroe Street to Thompson Road

72nd Avenue between Monroe Street and Thompson Road serves as an important transition between the Monroe Street shared-use path and the bicycle and pedestrian facilities along Thompson Road. Major design components along 72nd Avenue include an extended shared-use path on the west side. The shared-use path in this segment is 10 feet wide.

A sidewalk and conventional bike lane are recommended along the east side of 72nd Avenue, including ADA-accessible curb ramps at each leg of the 72nd Avenue intersection.

Speeding is a significant concern through this segment, and the proposed design recommends speed bumps in key locations. Although the final location of speed bumps will be determined during final design, the plan recommends one mid-block along 72nd Avenue as well as one at each end of the turn from 72nd Avenue to Thompson Road. Parking is eliminated throughout this transition area to minimize potential conflicts between active users and motorists.

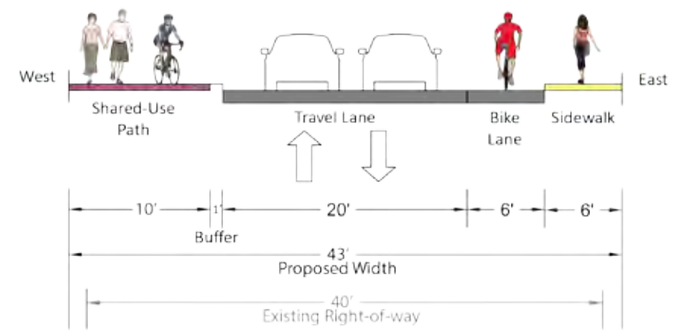


Figure 4.13 Proposed cross-section for 72nd Avenue, between Monroe Street and Thompson Road

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.

Design Elements

Section B: Thompson Road—72nd Avenue to Fuller Road

Segment 6: Thompson Road—72nd Avenue to 74th Avenue

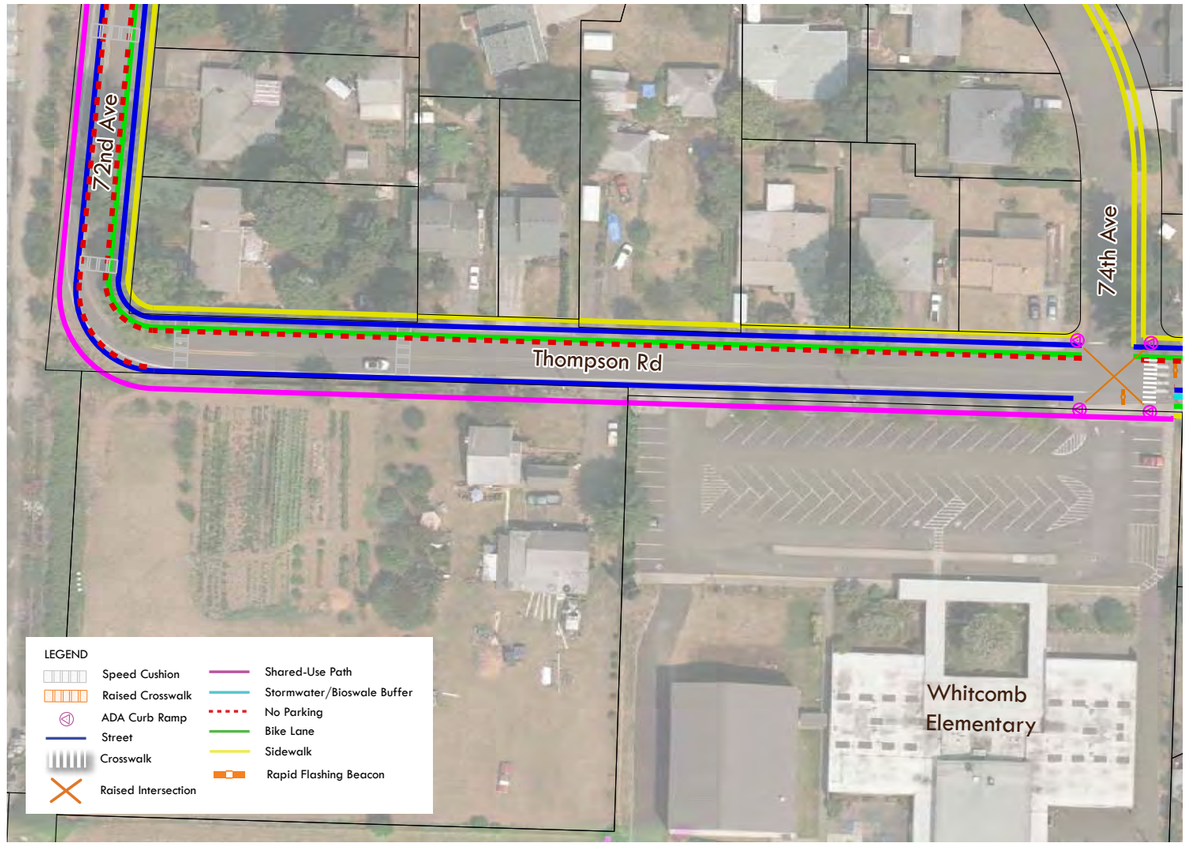


Figure 4.14 Recommended design for Thompson Road—72nd Avenue to 74th Avenue

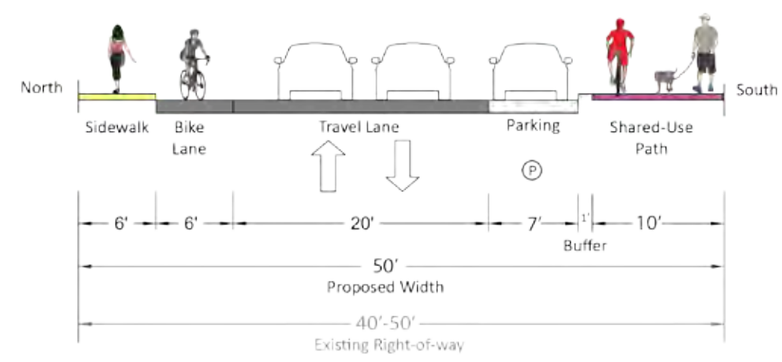
From a Safe Routes to School perspective, Thompson Road between 72nd Avenue and 74th Avenue is the most critical segment of the Monroe Neighborhood Street Design, as it serves as the main access to Whitcomb Elementary School during drop-off and pick-up times. Project stakeholders expressed strong support for improving this area for families and school-age children wishing to walk and bike to school. Speeding through this area is the major consideration, which led to a recommendation of a physical separation between active users and motorists.

Given these considerations, the recommended design for Thompson Road between 72nd Avenue and 74th Avenue includes a 10 foot shared-use path along the south side of Thompson Road, terminating at the eastern boundary of the school property. Parking is allowed in front of the school to accommodate student pick-up and drop-off. A raised intersection, crosswalk, and pedestrian-activated rectangular rapid-flashing beacon are proposed at the intersection of 74th Avenue and Thompson Road to make crossing safer. A sidewalk and bike lane are proposed on the north side of Thompson Road between 72nd Avenue and 74th Avenue to provide safe westbound bicycle access.

Example of a rapid-flashing beacon. Photo: City of Lincoln, NE Traffic Engineering

Figure 4.15 Proposed cross-section for Thompson Road, between 72nd Avenue and 74th Avenue

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.



Design Elements

Section B: Thompson Road—72nd Avenue to Fuller Road

Segment 7: Thompson Road—74th Avenue to Fuller Road

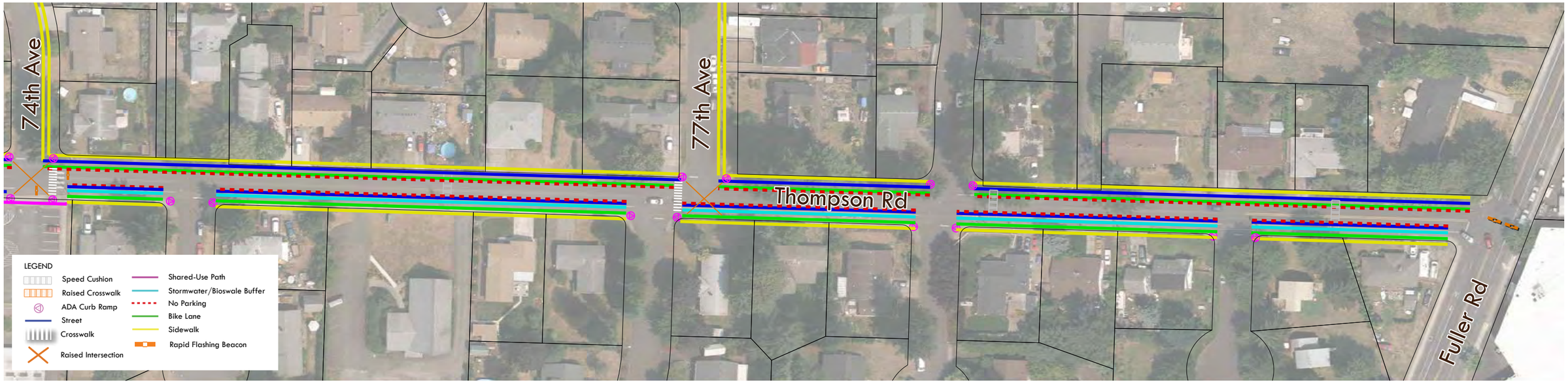


Figure 4.16 Recommended design for Thompson Road—74th Avenue to Fuller Road

The design for Thompson Road between 74th Avenue and Fuller Road recommends sidewalks, bicycle lanes, and no-parking on both sides of the street. The bicycle lane on the south side of Thomspon Road is additionally protected from vehicle traffic by a 5-foot vegetated buffer that will eliminate the possibility of vehicles stopping or parking in the bicycle lane.

A raised intersection, marked crossing, and pedestrian-activated rectangular rapid-flashing beacon are proposed at the intersection of Thompson Road and 77th Avenue to provide a safer neighborhood connection for people walking to Whitcomb Elementary School. Speed bumps are also proposed at key locations throughout this segment to reduce speeding near the school.

A rapid-flashing beacon is recommended at the intersection of Thompson Road and Fuller Road to improve safety for pedestrians and bicyclists accessing Clackamas Town Center, the I-205 Multi-Use Path, and other regional destinations. This will also facilitate safe access to the existing bicycle lanes on Fuller Road.

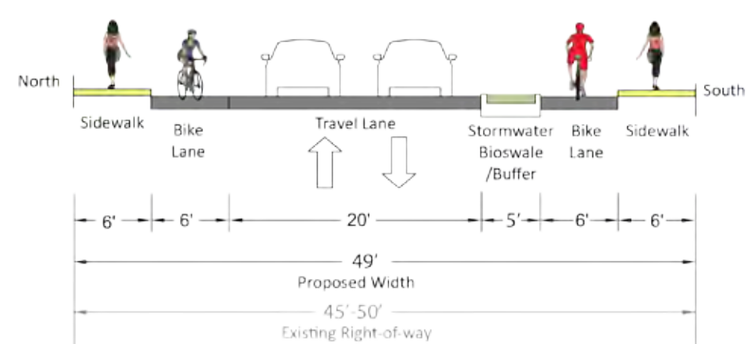


Figure 4.17 Proposed cross-section for Thompson Road, between 74th Avenue and Fuller Road

Design Elements

Section C: Boyer Drive to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

Segment 8: Boyer Drive Extension—Fuller Road to 82nd Avenue

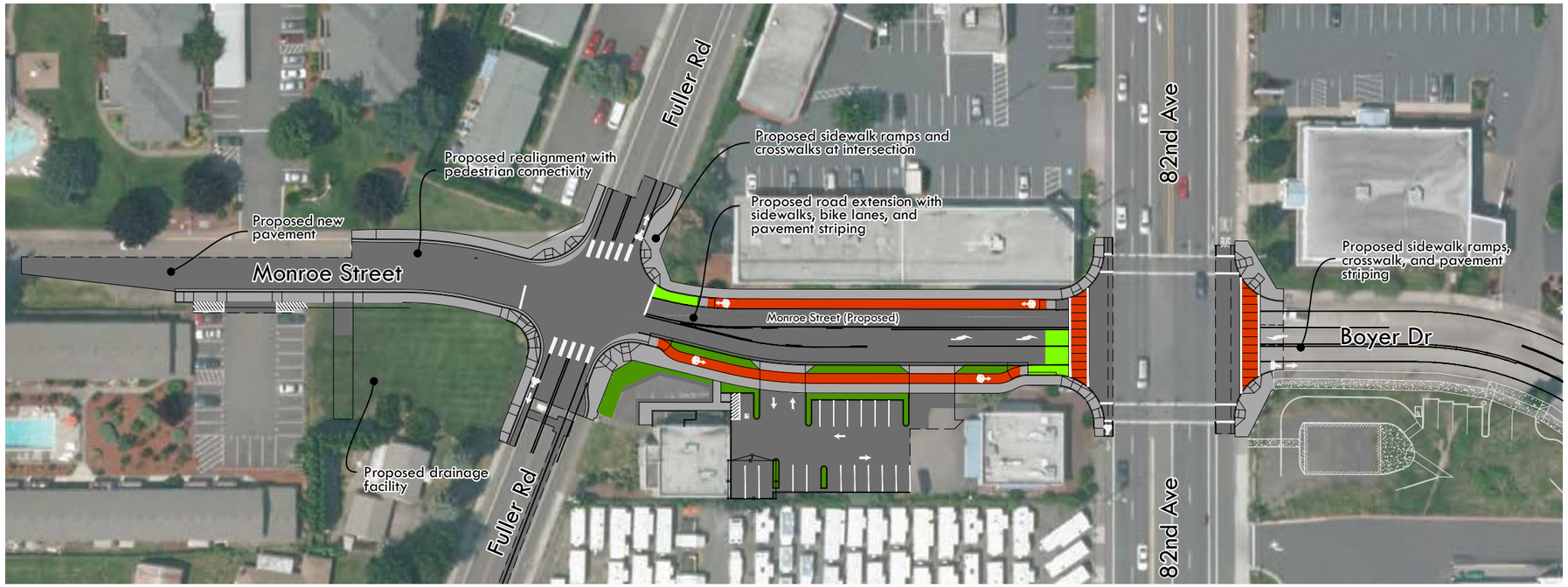


Figure 4.18 Design for Boyer Drive Extension—Fuller Road to 82nd Avenue

Conceptual rendering showing a bicycle box at a signalized intersection with a bicycle lane approach. Credit: NACTO (2015)

The Clackamas Town Center area has few streets connecting neighborhoods west of 82nd Avenue to the many services available in the area. This puts an extra burden on existing roads such as Harmony Road, Causey Avenue and King Road.

To improve connectivity for residents going to and coming from the Town Center area, Clackamas County is extending Boyer Drive from 82nd Avenue to Fuller Road. Improvements will include a new two-lane road with sidewalks, landscaping, lighting, storm drainage facilities, and a new signal at the Fuller Road/82nd Avenue intersection. The Fuller Road/King Road intersection will be modified to only allow right-in and right-out traffic movement.

The Boyer Drive project will also include a separated cycle track between Fuller Road and 82nd Avenue, providing a safe and comfortable connection for active transportation users from Monroe Street to Spencer Drive and ultimately the I-205 Multi-Use Path. Design is schedulded to be completed in winter 2016, and construction beginning in spring 2017.

The Boyer Drive Extension Project will also include a "bike box," a designated bicycle-only area just ahead of the vehicle stop line at the intersection of Boyer Drive and 82nd Avenue. Bike boxes are designed to increase safety for riders crossing high-traffic signalized intersections. A green-painted bike lane runs to the right of queued cars, widening to a lane-width "box" at the actual intersection. This allows bicyclists to move to the head of a line of vehicles stopped for a red light, making them visible to drivers and allowing them to clear the intersection safely before vehicles begin turning right. Bike boxes increase safety and predictability for everyone using the intersection – including drivers - and minimize the potential for "right-hook" collisions where a right-turning car collides with a bicyclist heading straight through the intersection. The bike boxes proposed as part of the Boyer Drive Extension Project will be the first in Clackamas County.

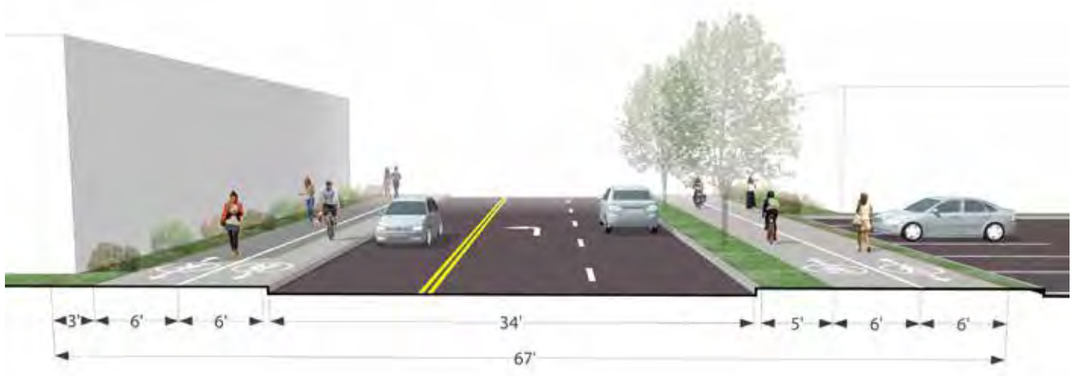
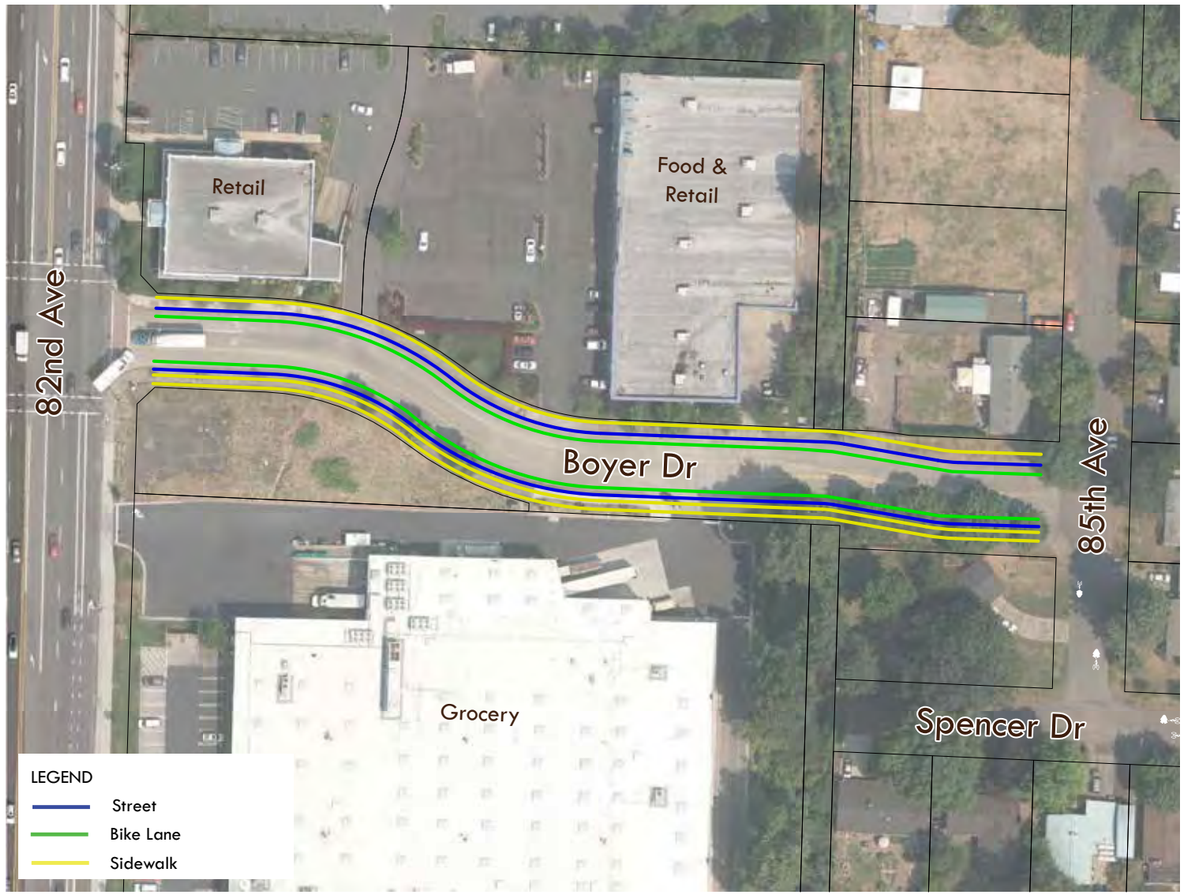


Figure 4.19 Cross-section for Boyer Drive Extension, between Fuller Road to 82nd Avenue

Design Elements

Section C: Boyer Drive to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

Segment 9: Boyer Drive — 82nd Avenue to 85th Avenue



The segment of Boyer Drive between 82nd and 85th Avenues will provide an important transition between the improvements planned as part of the Boyer Extension Project and the Monroe Neighborhood Street Design Plan.

The plan for this segment recommends continuous bike lanes and sidewalks along both sides of the Boyer Drive to improve connections to these destinations for pedestrians and bicyclists. Upon reaching 85th Avenue, bike lanes on both sides of the street transition to shared-space along 85th Avenue and Spencer Drive.

Recommended improvements along this segment are designed to help minimize conflicts between active users and vehicle traffic while providing a continuous bicycle and pedestrian connection between Linwood Avenue and the I-205 corridor.

Figure 4.20 Recommended design for Boyer Drive—82nd Avenue to 85th Avenue

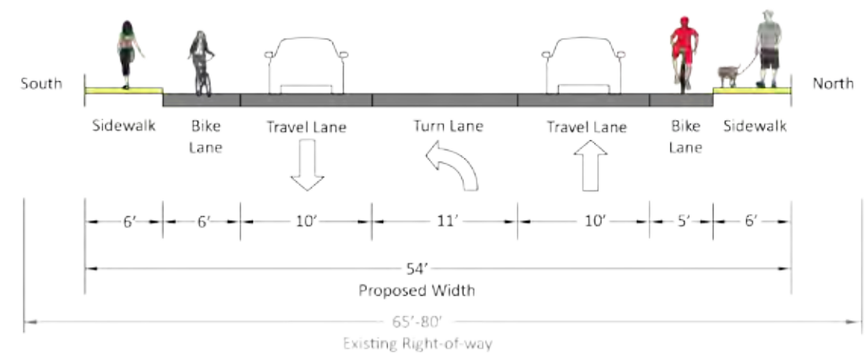


Figure 4.21 Proposed cross-section for Boyer Drive, between 82nd Avenue and 85th Avenue

Design Elements

Section C: Recommended Design for Boyer Drive to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

Segment 10: Boyer Drive to 85th Avenue to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

The easternmost portion of the Monroe—Thompson Corridor connects 85th Avenue to the I-205 Multi-Use Path. It travels along Spencer Drive, a relatively low-speed, low-volume residential street. Few changes are needed to provide safe pedestrian and bicycle accommodations, but sharrow pavement markings are proposed throughout this segment to encourage safe shared use. Bicycle wayfinding signage is recommended at intersections where bicyclists are faced with a decision, such as 85th Avenue at Spencer Drive, and Boyer Drive at 85th Avenue. Special "gateway" wayfinding signage is recommended at the I-205 Multi-Use Path access at the end of Spencer Drive.

Figure 4.22 Recommended design for Boyer Drive—82nd Avenue to I-205 Multi-Use Path

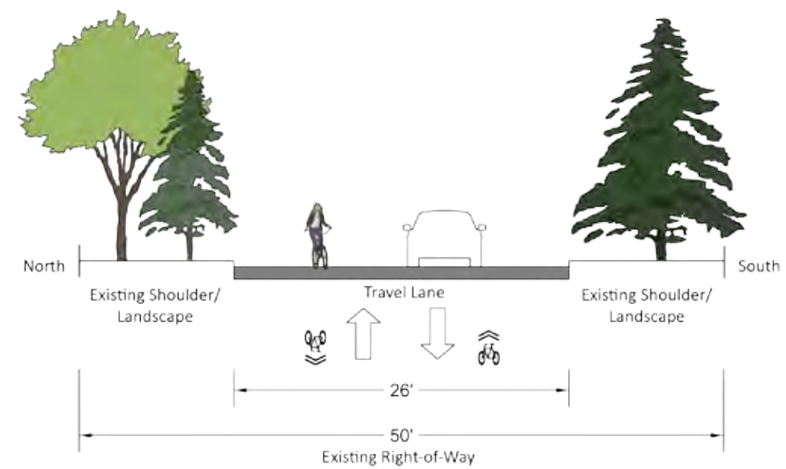


Figure 4.23 Proposed cross-section for Boyer Drive, between 82nd Avenue and the I-205 Multi-Use Path

Gateway Considerations for the I-205 Multi-Use Path Connection

Stretching through five cities and 15 neighborhoods, the I-205 Multi-Use Path runs 16.5 miles and parallels the I-205 freeway from NE Marine Drive in Portland to SE 82nd Drive in Gladstone. The I-205 corridor, which now includes TriMet's MAX Green Line, transports thousands of Oregonians each day, north and south, via rail, car, bike and foot. The I-205 Multi-Use Path is used extensively by bicyclists, pedestrians and transit users.

Bicyclists and pedestrians can currently access the I-205 Multi-Use Path at the eastern terminus of Spencer Drive. With the exception of two small signs ("No Motor Vehicles" and "Bike Route"), the I-205 access at Spencer Drive currently lacks facility signage. The existing access also has limited sight distance due to landscaping. Given the local and regional significance of the I-205 corridor, wayfinding signage is recommended to improve this connection.

Signage for users entering Spencer Drive from the I-205 Multi-Use Path could provide directions to destinations north and south of Spencer Drive, such as Clackmas Town Center and the SE Fuller Road MAX Station.

Gateway treatments can range from simple signage upgrades to more elaborate installations, including the use of large welcome signs, textured pavements, and pavement markings. Gateway treatments and signage in this location need to be coordinated and approved by the Oregon Department of Transportation.

Example of a neighborhood gateway treatment in Madison, Wisconsin. Actual gateway signage will be required to meet applicable Oregon Revised Statutes pertaining to signage along highways. Photo: Bay Creek Neighbors Association (2015).

I-205 Multi-Use Path access from Spencer Drive as it appears today

Looking north along the I-205 Multi-Use Path from Spencer Drive access

5. Creating the Monroe Neighborhood Street Design Plan

One of the objectives of the *Monroe Neighborhood Street Design Plan* was to conduct an open planning process that considers guidance and input from the general public, direct stakeholders, affected regional jurisdictions, and local businesses. To meet this objective, local advisory committees were chartered to provide community and technical guidance throughout the planning process. Brief descriptions of these advisory committees are provided below.

Project Advisory Committee (PAC)

The PAC is an advisory group of neighborhood representatives brought together to provide suggestions, raise important issues, and help meet the project objectives of the *Monroe Neighborhood Street Design Plan*. The PAC was composed of Monroe Street, Thompson Road, and Spencer Drive residents, neighborhood business owners, Whitcomb Elementary School representatives, and other community stakeholders.

The PAC met six times over the course of the project and engaged in a variety of activities, including an initial site visit of the project area to observe the existing conditions of the neighborhood, as well as group discussions, surveys, and design exercises. The PAC provided important guidance on the project evaluation criteria, helped refine route alternatives, and provided feedback on draft designs.

Technical Advisory Committee (TAC)

The TAC was chartered to provide expertise and guidance on the technical aspects of the project, and to ensure the development of a technically sound concept design that conforms to all applicable plans, policies, and Clackamas County roadway engineering standards. Over six meetings, the TAC helped inform decisions related to traffic engineering, roadway configurations, and bicycle and pedestrian facility design. The TAC included expertise from a variety of technical perspectives:

- Clackamas County Development Agency
- County Engineering and Planning divisions
- City of Milwaukie; ODOT
- County Water Environment Services; Clackamas County Fire District #1
- Safe Routes to School National Partnership
- Regional pedestrian and bicycle advocacy groups including the Bicycle Transportation Alliance and Oregon Walks.

Public Open Houses and Outreach

Two public open houses were held during the course of the project to give members of the general public an opportunity to provide input on draft *Monroe Neighborhood Street Design Plan* concept designs. Over 75 people attended each open house, attracting a broad cross-section of neighbors and stakeholders at each meeting. The open houses were publicized through a variety of means, including mailings to residents, press releases, distribution of meeting notices, email blasts, social media, and postings to the Monroe Neighborhood Street Design website (http://www.monroestreetplan.org).

Members of the public were encouraged to raise community issues, to discuss potential trade-offs associated with design concepts, and to weigh-in on potential solutions. Community members provided their feedback via surveys, comment cards, and informal discussion with project team members.

An online open house was also held in conjunction with Open House #1, which helped garner additional feedback from the community. The online open house offered similar methods of collecting community feedback, including detailed survey questions and general comment forms related to specific segments along the corridor.

The recommended Monroe Neighborhood Street Design was informed by public feedback on key elements of the design, including the importance of on-street parking, the appropriate level of investment along the Monroe—Thompson Corridor, and the decision to keep the Monroe Gap closed to automobiles. Community insight helped the project team understand the complexity of these issues, and develop solutions that responded to those concerns.

Photo taken during Open House #1. Photo: CH2M (2016)

6. Implementation and Funding

Concept-level Cost Estimates

Planning level costs for implementing the Monroe Street Neighborhood Street Design Plan are described in Appendix F.

Possible Funding Sources

Implementation of the Monroe Neighborhood Street Design Plan will require an opportunistic funding approach, potentially including funds from regional, state, and local sources. The costs associated with project elements range from relatively inexpensive treatments such paint and signage, to more significant investments such as sidewalk improvements and shared-use pathways. The funding strategy should seek to match specific elements to appropriate funding sources, including (but not necessarily limited to) the following:

ODOT STIP Enhance Funds

ODOT's Statewide Transportation Enhancement Improvement Program (STIP) Enhance program funds projects that enhance, expand, or improve the transportation system. The Enhance program reflects ODOT's goal to support multimodal investments in the statewide transportation system, including bicycle and pedestrian improvements. The selection process to receive STIP funding is competitive, as state and local agencies can apply for projects that are both on and off the ODOT highway system. The Oregon Transportation Commission selects STIP funding recipients based on local Area Commission on Transportation (ACT) recommendations.

ODOT Quick-Fix Program

This ODOT-administered program could be an appropriate funding source for crossing safety improvements at Fuller Road and 82nd Avenue.

ODOT ADA Funds

Beginning in 2015, the ODOT Highway Division has funding available to improve missing or substandard Americans with Disabilities (ADA) facilities on or adjacent to ODOT-owned roadways. This could potentially fund ADA ramps and crossing improvements on or adjacent to 82nd Avenue.

Metro MTIP/Regional Flexible Funds

Metro allocates federal Regional Flexible Funds through the Metropolitan Transportation Improvement Program (MTIP) on a four-year cycle. Funding is allocated to projects throughout the Portland Metro Region via a competitive application process. The next round of Regional Flexible Funds (RFF) proposals is due in late August, 2016. The Monroe Neighborhood Street Design could be submitted for funding at that time, either as a standalone project or in combination with the Monroe Street Neighborhood Greenway project in Milwaukie. In general, joint applications for projects of regional significance are especially strong in the RFF process. Key criteria for the 2016 round of applications include making conditions safer and more comfortable for walking and bicycling; and equity considerations.

In addition to the RFF application process, the Monroe Neighborhood Street Design project could be eligible for Metro funds to support project development in advance of a potential new regional funding source. This set-aside is intended to help projects of regional importance – including those that benefit walking and bicycling – be prepared to take advantage of new regional funding should it become available.

Clackamas County Road Fund

The County Road Fund is made up of revenue received through the Oregon State Highway Trust Fund from state gas tax, weight-mile tax, vehicle registration fees (VRF) and vehicle title fees. These funds are distributed to the County based on allocation schedules set out in state law. The Oregon Constitution and Oregon Revised Statutes (ORS) require that the Oregon State Highway Trust Fund revenue be used "...for the construction reconstruction, improvement, repair, maintenance, operation and use of public highways, roads, streets..." (including a mandatory minimum 1% annual expenditure on bicycle and pedestrian facilities). Road fund money is often used as the local contribution (match) for projects funded by federal, state and other local funding programs. The County Road Fund also includes federal funds from the Secure Rural Schools program.

Clackamas County Development Agency

SE Monroe Street, SE 72nd Avenue and a portion of SE Thompson Road west of Whitcomb Elementary are within the North Clackamas Revitalization Area (NCRA) urban renewal district. Roadway improvements are a priority of the NCRA Plan and funding for construction on these segments could come from the Clackamas County Development Agency. Approval of funding for individual projects is at the discretion of the Development Agency Board.

Implementing the Plan

The *Monroe Neighborhood Street Design Plan* articulates a vision for a low-stress pedestrian and bicycle connection that creates a safe street environment for neighbors and people traveling through the area. Achieving this vision will require the following:

Ongoing Community-Based Support

Community support will be necessary for the *Monroe Neighborhood Street Design Plan* to become a reality. The PAC, local businesses, and the general public provided critical local insight and support for the project, helping to identify tradeoffs and develop solutions to community issues.

Committed County Leadership

To become a reality, the *Monroe Neighborhood Street Design Plan* will need ongoing, committed support from Clackamas County leaders including the County Department of Transportation and Development and the Clackamas County Development Agency, as well as fire and school district representatives.

Additional Analysis

The *Monroe Neighborhood Street Design Plan* includes a detailed concept for Monroe Street and Thompson Road. However, several project elements will need to be developed and designed in greater detail, including bioswale buffers, chicanes, and stormwater treatments. In order to complete final engineering, additional stormwater analysis and property surveys will be required to determine the exact location and dimensions of stormwater treatment elements.

Additional survey work will be required to determine the exact placement of bicycle and pedestrian facilities, including signage, ADA curb ramps, and pavement treatments. Right of way and encroachment issues will need to be addressed.

Final engineering will need to be completed to determine the exact location and dimensions of specific project elements.

7. List of Appendices (included in a separate volume)

A. Policy Framework Memorandum

B. Safe Routes to School Action Plan, Whitcomb Elementary School

C. Alternatives Analysis Report

D. Existing Conditions and Needs Memorandum

E. Traffic Summary

F. Planning Level Costs