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SOLUTION DEVELOPMENT

DATE: July 11th, 2024

TO: Project Management Team

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SUBJECT: Monmouth Transportation System Plan Project #24328-000
Memorandum #4: Solution Development

INTRODUCTION

This memorandum provides a summary of the proposed transportation projects and recommended transportation standards to mitigate the needs and deficiencies through the 2045 Horizon Year, as denoted in the previous Existing and Future Conditions memorandums.[1] The following topics are included:

- Transportation Standards, Recommendations, and Policies
  - Functional classifications, street standards, mobility standards, access spacing, and TIA guidelines
- Transportation System Improvement Projects
  - Street extension, intersection improvement, ped/bike improvement, transit upgrade, and urban upgrade projects
  - Detailed descriptions for projects warranting further explanation
- Horizon Year Transportation Operations
  - Discussion of traffic signal warrants along OR 99W
  - Future forecast intersection operations with intersection improvements
- Implementation Measures
  - Neighborhood traffic calming
  - Electric vehicle recommendations
- Next Steps
  - Brief review of the upcoming public engagement and subsequent memorandums

[1] Existing Transportation System Conditions, DKS Associates, January 2024; Future Transportation System Conditions, DKS Associates, January 2024.

TRANSPORTATION STANDARDS, RECOMMENDATIONS, AND POLICIES

This section provides a list of recommended changes to the current transportation standards which should be adopted as part of the Transportation System Plan (TSP) update. Monmouth applies transportation standards to the construction of new transportation facilities and to the operation of all facilities to ensure the system functions as intended and investments are used efficiently. These standards enable consistent actions that reflect the goals of the City for a safe and efficient future transportation system.

A review of the pertinent transportation standards is provided below. These standards are currently documented in the current TSP,[2] Public Works Design Standards,[3] and City Code.[4] Polk County and ODOT standards are also referenced throughout to provide context for how they interact with one another.

STREET FUNCTIONAL CLASSIFICATION

Street functional classification is an important tool for managing the street network. The functional classification system recognizes that individual streets do not act independently of one another but instead form a network that works together to serve travel needs on both local and regional levels. By designating the management and design requirements for each street classification, a hierarchal system is established to support a network of streets that perform as desired. The functional classification can help establish the level of maintenance, how traffic is controlled at intersections, standards for street reconstruction or improvements, and the level of access and development activity that is allowed.

The proposed functional classification system for new and existing streets in the City of Monmouth is shown on Figure 1. Similarly, Table 1 notes proposed changes to existing functional classifications as well as recommended functional classifications for significant future street connections. The recommended changes in classifications are to support future transportation system growth and manage internal connectivity for the City. The future streets (dashed lines) are conceptual and may deviate slightly based on geographical restraints, development, etc. as they are constructed. The future streets are listed as projects in the project list section later in the memorandum.

Classifications shown for Polk County roads on the map reflect the City's desired function for those facilities. Polk County policy is to apply respective city functional classifications, as well as accompanying city street standards, to Polk County facilities within city Urban Growth Boundaries (UGBs).[5] Similarly, the section of 16th Street between Ash Creek and Talmadge Road, which is under City of Independence jurisdiction, reflects the City of Monmouth's desired function between its two sections of the street. ODOT, however, maintains jurisdiction over state highways even within the city UGB and their prescribed functional classification is shown.

[2] Transportation System Plan Update, City of Monmouth, May 2009.

[3] Design Standards and Standard Plans, Department of Public Works, City of Monmouth, January 2008.

[4] City Code, City of Monmouth, Passed December 2023, https://www.codepublishing.com/OR/Monmouth/.

[5] Road Network and Standard – Chapter 5: Road Plan, Transportation Systems Plan, Polk County, December 2009.

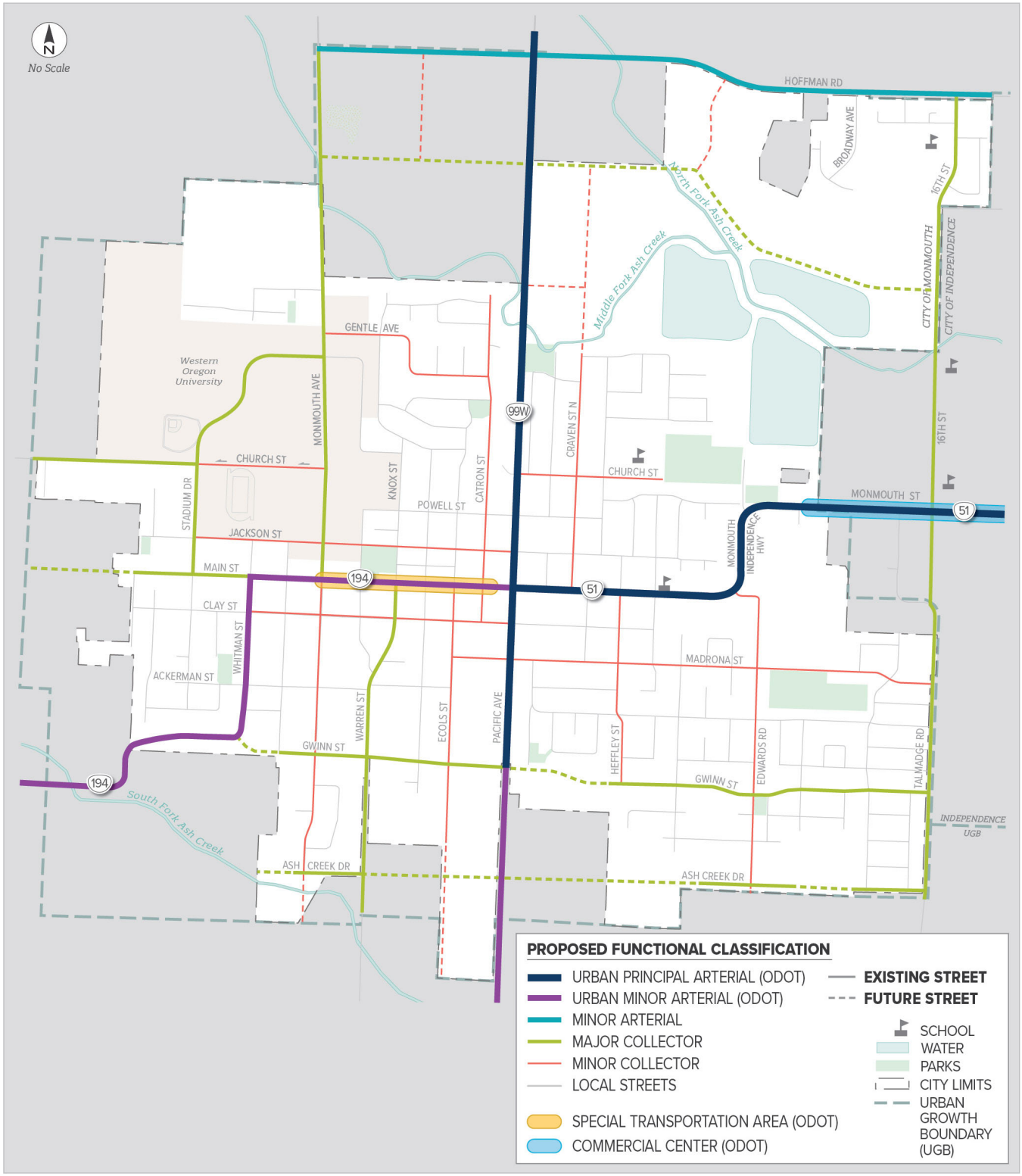


FIGURE 1: PROPOSED STREET FUNCTIONAL CLASSIFICATION SYSTEM

TABLE 1: PROPOSED STREET FUNCTIONAL CLASSIFICATION CHANGES

STREET (EXTENTS)	EXISTING FUNCTIONAL CLASSIFICATION	PROPOSED FUNCTIONAL CLASSIFICATION
CHURCH STREET (WESTERN UGB LIMITS TO STADIUM DR)	Minor Collector	Major Collector
KNOX STREET (MAIN ST TO WARREN ST)	Minor Collector	Major Collector
WARREN STREET (KNOX ST TO SOUTHERN UGB LIMITS)	Minor Collector	Major Collector
MONMOUTH AVENUE (MAIN ST TO SOUTHERN UGB)	Major Collector	Minor Collector
ECOLS STREET (MAIN ST TO CLAY ST)	Local	Minor Collector
CHURCH STREET (CRAVEN ST TO MONMOUTH ELEMENTARY)	Local	Minor Collector
HEFFLEY STREET (MAIN ST TO GWINN ST)	Local	Minor Collector
CRAVEN ST (MAIN ST TO MADRONA ST)	Minor Collector	Local
HOGAN RD (OR51 TO EXTENTS)	Major Collector	Local
NORTHERN UGB E-W CONNECTOR (RIDDLE RD TO 16TH ST)	-	Major Collector
NORTHERN UGB INTERNAL CONNECTORS	-	Minor Collector

STREET STANDARDS

Street geometric cross-section design standards for City of Monmouth streets, including pedestrian and bicyclist facilities, are currently listed in both the 2009 TSP[6] and the Public Works Design Standards.[7] The standards in the TSP take precedence over those in the Public Works Design Standards, per present practice by the City. The cross-section design standards govern street design for both City-owned and Polk County-owned facilities within the UGB as Polk County policy is to apply respective city street standards to County facilities within UGBs for street upgrades and new construction.[8] Construction details and specific design standards for the street system are prescribed in the Public Works Design Standards. Design standards for ODOT facilities are generally found in the Highway Design Manual.[9]

It is recommended that the street geometric cross-section design standards be updated to simplify the standards, harmonize discrepancies between the TSP and Design Standards, mirror changes to the functional classifications, and reflect current best practices in street design. Recommended design standards per functional classification are noted in Table 2 and displayed in Figure 2, Figure 3, Figure 4, and Figure 5.

For any new street, re-development, or urban upgrade within the Monmouth UGB, the developer or controlling municipality is required to bring the street or adjacent right-of-way up to current standards, including any sidewalk infill. In addition, any of these projects are encouraged to incorporate current national best practices for bicycle and pedestrian facilities.

TABLE 2: STREET GEOMETRIC CROSS-SECTION DESIGN - STANDARD WIDTHS

FUNCTIONAL CLASSIFICATION	RIGHT-OF-WAY	CURB-TO-CURB	TRAVEL LANE	PARKING	BICYCLE LANE [A]	PLANTING STRIP [B]	SIDEWALK	PROPERTY LINE BUFFER
MINOR ARTERIAL	80′	50′	11′ [C]	N/A	8′	7.5′	7′	0.5′
MAJOR COLLECTOR	60′	36′	11′	N/A	7′	5.5′	6′	0.5′
MINOR COLLECTOR [D]	60′	36′	11′	7′	N/A	5.5′	6′	0.5′
LOCAL [D]	56′	32′	9′	7′	N/A	5.5′	6′	0.5′

[A] Bicycle lane width includes a 2′ buffer with an accompanying 5′ or 6′ travel lane

[B] Planting strip width includes the width of the curb (typically 6″ wide)

[C] The travel lane width for the center turn lane/median is 12′

[D] Lane line pavement markings are not present on Minor Collector and Local streets

[6] Table 7-2, Transportation System Plan Update, City of Monmouth, May 2009.

[7] Standard Plan No. 318A, Typical Street Sections, Design Standards and Standard Plans, Department of Public Works, City of Monmouth, January 2008.

[8] Road Network and Standard – Chapter 5: Road Plan, Transportation Systems Plan, Polk County, December 2009.

[9] Highway Design Manual, Oregon Department of Transportation, March 2024.

The Public Works Director shall have authority to allow deviations from these street standards as prescribed below. Deviations are not to be the norm but may be allowed in specific cases in which geographical restraints, site concerns, property development, or available right-of-way merit alternate conditions. The following items note important considerations when assessing the need for a deviation:

- On-street parking may be allowed for Major Collectors, if determined necessary. If implemented, the street right-of-way width should be increased to accommodate the parking and improved bicycle facilities should be provided to mitigate safety concerns from the mixing of vehicular parking and bicycles. On-street parking may be restricted for any functional classification.
- Planting strips should be a minimum of five feet wide on Minor Arterials, Major Collectors, and Minor Collectors, and at least four feet wide on Local streets. Planting strips may be omitted on Local streets that do not provide connections to other Local streets.
- Local street curb-to-curb width (32') may be decreased to implement a skinny/narrow street. Parking may be restricted to one side (25' curb-to-curb) or the vehicular lanes may be designed as a queuing travel way (28' curb-to-curb). Remaining right-of-way may be reallocated as additional planting strip width. Skinny/narrow streets should only be used for Local streets that do not provide important connections to other Local streets.
- Redevelopment of a property may allow other deviations to the standards to match adjacent properties if redevelopment of the broader area is not likely. This includes "in-kind" replacement of sidewalk along short property frontages to match adjacent existing sidewalk.

Along with the street standards, the following assumptions and best practices are presumed as integral to the implementation of the desired cross-sections:

- Sidewalks are to be constructed half a foot from the property line/edge of public right-of-way, with excess or lack of right-of-way influencing the planting strip width.
- Street designs are encouraged to incorporate current national best practices for designing bicycle and pedestrian facilities.
- Curb extensions, while not required, are encouraged for Minor Collector street intersections where parking is present to shorten pedestrian crossing distances. Curb extensions on Local street intersections may also be implemented.
- Trees, shrubs, or other elements in the planting strip are prescribed by the City but are maintained by the adjacent property owner. Elements are to be context-sensitive to the land use of adjacent properties and the functional classification of the street.

The primary changes to the recommended updates of the cross-section designs from the previous standards are noted below for easier reference:

- No standards are provided for ODOT facilities, though recommendations are given for a few specific projects in the projects section below based on community desires.
- Unique standards for Ash Creek Drive specifically have been removed as the City has forgone implementing the previously developed cross-section.
- Right-of-way width was increased for the Minor Arterial classification and decreased for the Local street classification.
- Public Works Director discretion for on-street parking on Minor Arterials is removed.
- Planting strips are added for all functional classifications.

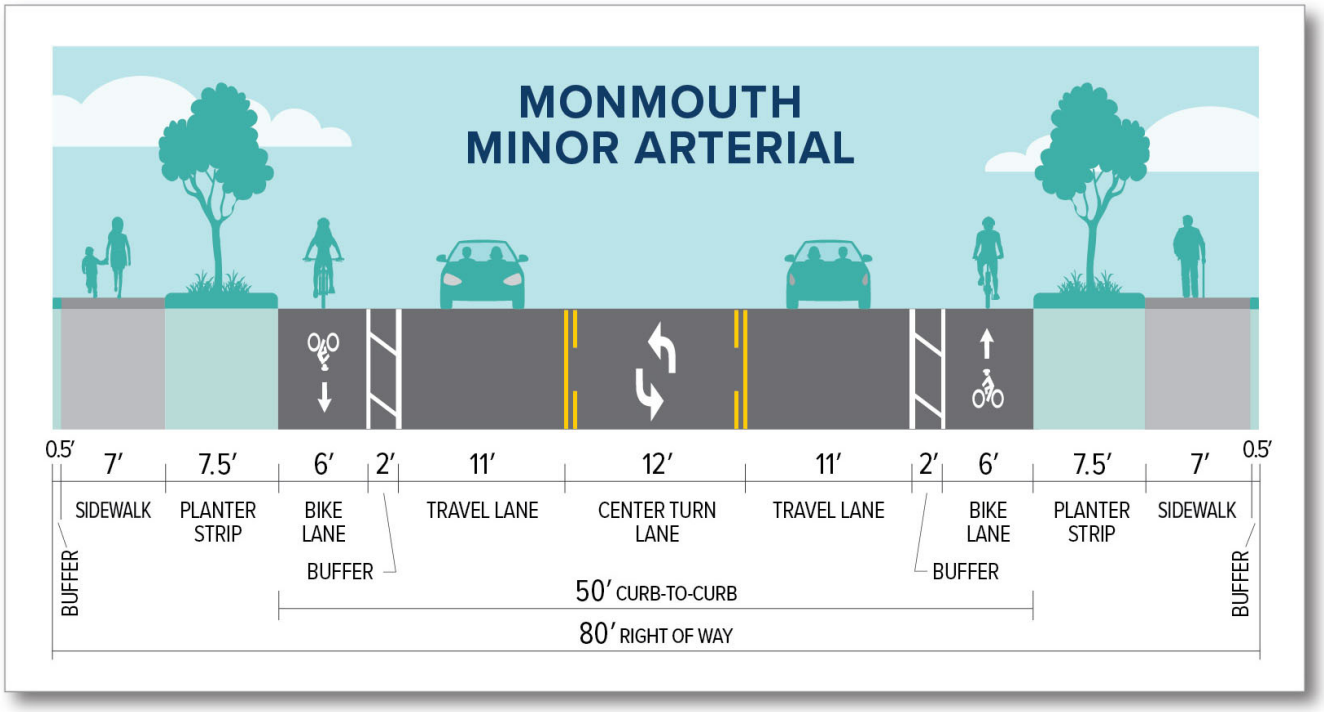


FIGURE 2: MINOR ARTERIAL STANDARD CROSS-SECTION

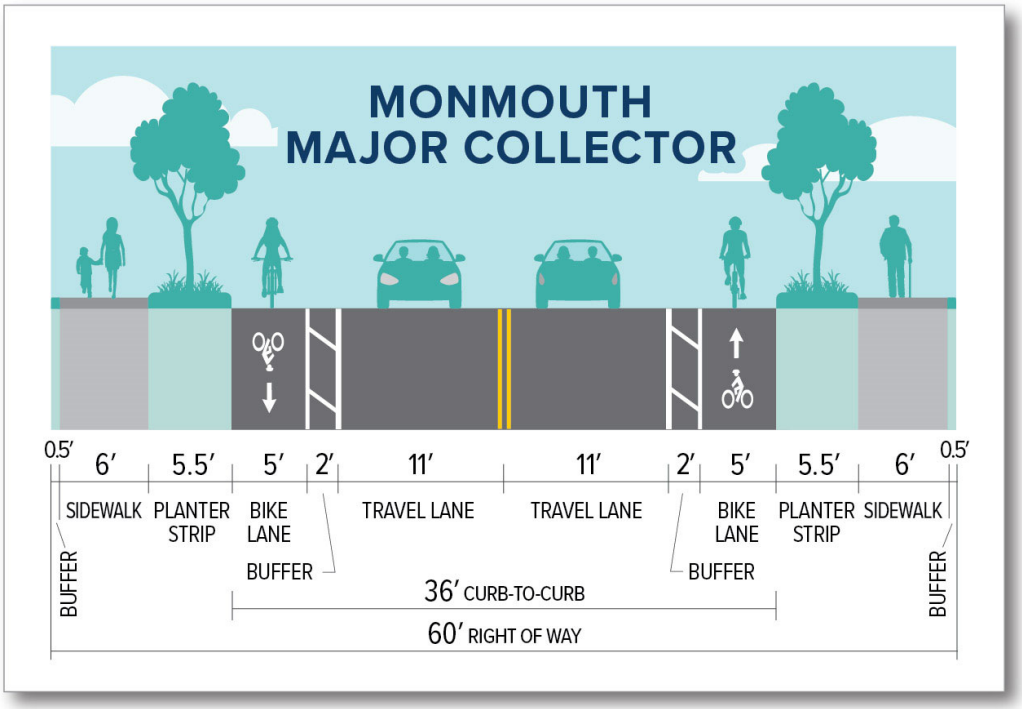


FIGURE 3: MAJOR COLLECTOR STANDARD CROSS-SECTION

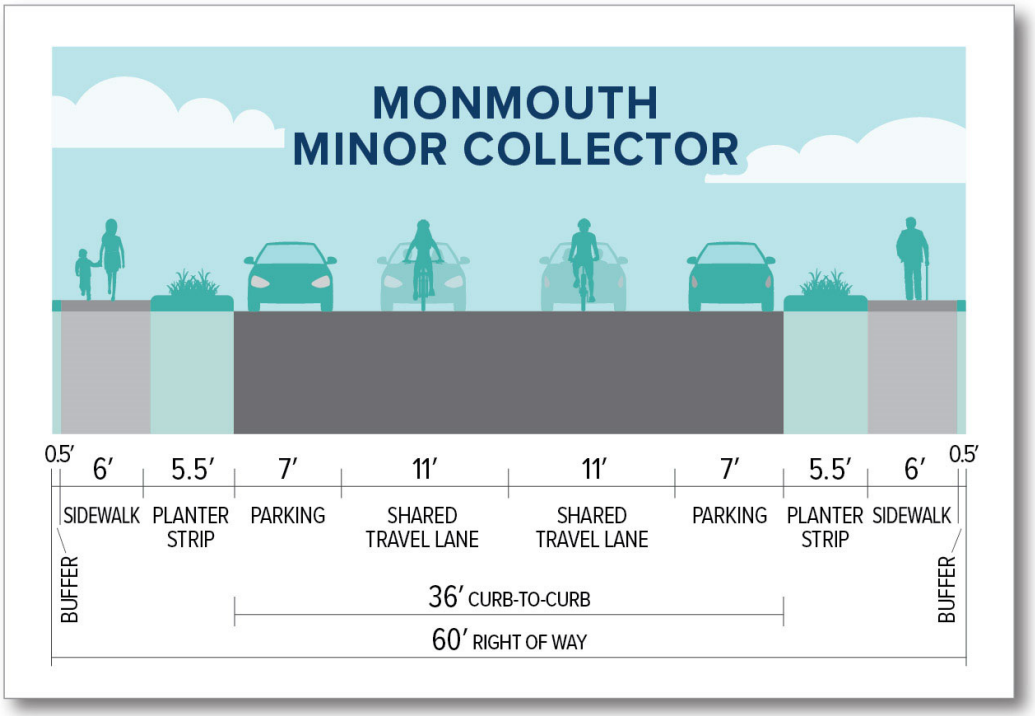


FIGURE 4: MINOR COLLECTOR STANDARD CROSS-SECTION

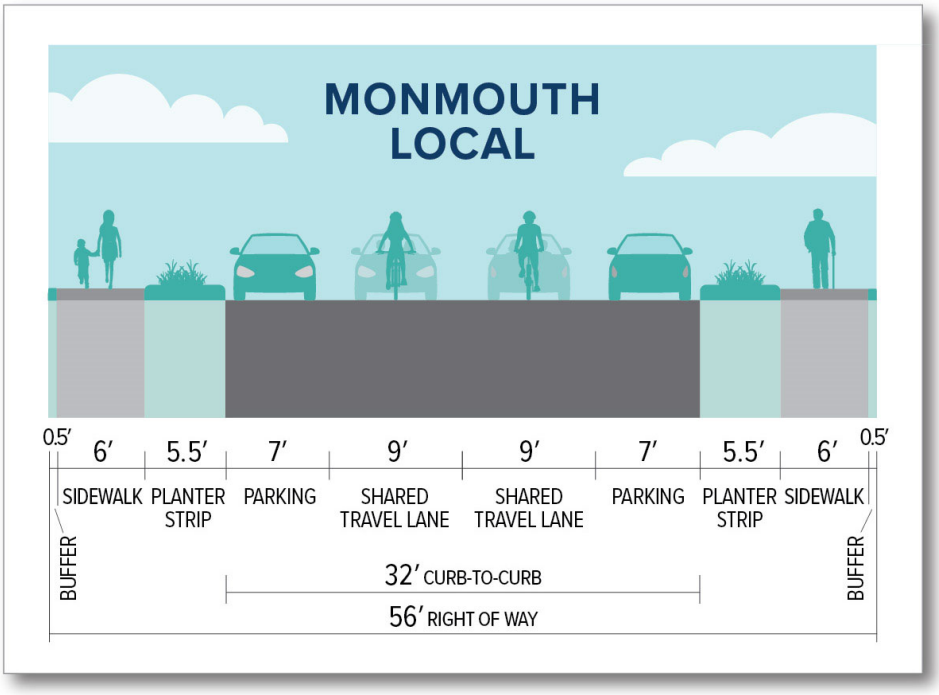


FIGURE 5: LOCAL STANDARD CROSS-SECTION

MOBILITY STANDARDS

Mobility standards are the thresholds set by an agency for the maximum amount of motor vehicle congestion that is acceptable for a given street intersection. Adopted mobility standards can be used to prioritize investment decisions and help the City ensure that transportation facilities are improved in a timely manner to support new growth.

The City of Monmouth does not currently have established mobility standards.[10] The current 2009 TSP does suggest that LOS D or better is considered acceptable for signalized intersections and LOS E or better is considered acceptable for unsignalized intersections.[11] It is recommended that formal mobility standards be adopted. Related, Polk County requires that all intersections shall operate at a Level of Service (LOS) of C or better with a volume-to-capacity ratio of 0.85 or less.[12] However, the County also states that if a County intersection is within a city UGB, the intersection must also meet the operating standards of that city if they exist.

It is recommended that the City adopt mobility standards as presented in Table 3, which includes both a volume-to-capacity and Level of Service standard, as the standard for typical AM and PM peak hour conditions.[13] These recommended standards are similar to the nearby jurisdictions of Salem, Independence, Dallas, and Corvallis.

TABLE 3: RECOMMENDED CITY OF MONMOUTH MOBILITY STANDARDS

TRAFFIC CONTROL TYPE	STANDARD
TRAFFIC SIGNAL [A]	v/c ≤ 0.90, LOS D
ALL-WAY STOP & ROUNDABOUT [B]	v/c ≤ 0.85, LOS D
TWO-WAY STOP [C]	v/c ≤ 0.85, LOS E

[A] For a **traffic signal** intersection, v/c shall be the total volume-to-capacity for the whole intersection and delay (and LOS) shall be an average delay for the whole intersection.
[B] For a **roundabout and all-way stop** intersection, v/c shall be the worst lane volume-to-capacity across all lanes of the whole intersection and delay (and LOS) shall be an average delay for the whole intersection.
[C] For a **two-way stop** intersection, v/c and delay (and LOS) shall be the worst lane delay and worst volume-to-capacity across all lanes for the whole intersection.

[10] 2009 Transportation System Plan, 2008 Public Works Design Standards and Standard Plans, and 2023 City Code were all consulted.

[11] Year 2008 Transportation Conditions, Section 4, Transportation System Plan, City of Monmouth, May 2009.

[12] Methodologies and Analysis Parameters, Transportation Impact Analysis, Road Standards, Department of Public Works Road Standards, Adopted 1998.

[13] The results from Future 2045 Baseline Traffic Operations scenario (meaning no substantial transportation improvements are made through the year 2045) analysis from Memorandum #3 would not be impacted by implementing these new standards.

The ODOT v/c mobility targets are prescribed in the Oregon Highway Plan (OHP) and are based on the highway category, location, and posted speeds.[14] All ODOT study intersections are inside the UGB but outside of a Metropolitan Planning Organization (MPO). OR 99W is a Freight Route Regional Highway and OR 51/OR 194 is a District Highway. OR 194 from Monmouth Avenue to Catron Street is designated as a Special Transportation Area (STA). The resulting mobility targets range from 0.85 to 1.00, and can be found in Table 6 of the OHP.

ACCESS SPACING STANDARDS

Access management is a broad set of techniques that balance the need to provide efficient and safe travel with the ability to allow access to individual destinations. Appropriate access management standards and techniques can reduce congestion and crash rates and may lessen the need for construction of additional street capacity. One primary access management tool is the execution of access spacing standards, which provide required minimum distances between access points on public streets.

A simple Access Management Plan is found in the current Monmouth TSP, documenting standards and adjustments for access spacing and access management measures for city streets based on functional classification.[15] These same access spacing standards are repeated in the Monmouth City Code.[16] Table 4 presents recommended updates to the minimum access spacing standards for the City of Monmouth. These new standards are based on guidance provided in the Transportation Research Board (TRB) Access Management Manual,[17] which incorporates speed limits, assumed stopping distances, and current access spacing. Standards have been developed per functional classification and are split between public intersections and private accesses. Standards are measured centerline to centerline and are measured combined with both sides of the street.

New street connections, new access points, or redeveloping properties must comply with these standards to the extent practical, as determined by the City. During any site development, adequate sight distance should always be confirmed through a sight distance assessment for the best solution. However, the available sight distance or other site-specific concerns may warrant adjusted access spacing, whether that be an increase or decrease in the distance. These adjustments to the access spacing standards may be allowed at the discretion of the Public Works Director. As the opportunity arises through redevelopment, accesses not complying with these standards should incorporate strategies such as shared access points, access restrictions (through the use of a median or channelization islands), or closure/consolidation of unnecessary access points, as feasible.

[14] Table 6, Policy 1F, Oregon Highway Plan, Oregon Department of Transportation, 1999.

[15] Access Management Plan, Section 7, Transportation System Plan, City of Monmouth, Adopted May 2009.

[16] Street Standards, Chapter 18.150: Transportation Improvements, Monmouth City Code, Passed June 2023.

[17] Access Management Manual, Second Edition, Transportation Research Board, 2014.

TABLE 4: PROPOSED ACCESS SPACING STANDARD UPDATES[A]

FUNCTIONAL CLASSIFICATION	MINIMUM SPACING (BETWEEN PUBLIC INTERSECTIONS)	MINIMUM SPACING (BETWEEN PRIVATE ACCESSES)
MINOR ARTERIAL	500 ft	250 ft
MAJOR COLLECTOR	400 ft	200 ft
MINOR COLLECTOR	300 ft	150 ft
LOCAL	200 ft	100 ft

[A] Adjustments to access spacing standards may be allowed at the discretion of the Public Works Director; Minimum spacing between is measured from centerline to centerline; Minimum spacing is measured combined with both sides of the street.

Access spacing standards for Polk County are found in their Department of Public Works Road Standards, but it similarly states that roads within an adopted UGB should be under the access spacing standard of the respective city.[18] ODOT access spacing standards are found in the Oregon Highway Plan (OHP) and are based on OHP highway classification, annual average daily traffic volume, and posted speed.[19] The access spacing standards and accompanying notes relevant to highways in Monmouth are currently found in Table 13, Table 15, and Table 16 in the OHP. OR 99W is a Freight Route Regional Highway with an annual average daily traffic (AADT) volume greater than 5,000 and posted speeds ranging from 30 miles per hour (mph) to 55mph. OR 51/OR 194 is a District Highway with AADT volumes both greater than and less than 5,000 depending on the location and posted speeds ranging from 20mph to 55mph.

TRANSPORTATION IMPACT ANALYSIS (TIA) STANDARDS

The development review process is designed to manage growth in a responsible and sustainable manner. By assessing the transportation impacts associated with land use proposals and requiring that adequate facilities be in place to accommodate those impacts, the City of Monmouth can better maintain a safe and efficient transportation system concurrently with new development, diffusing the cost of system expansion. This is a process to apply conditions to land use proposals to minimize impacts to safety and operations on City transportation facilities. Transportation Impact Analysis (TIA) standards, which prescribe when a TIA is required, the guidelines for what must be included, and the conditions for approval, are currently documented in the Monmouth City Code section *18.150.030 Traffic impact analysis standards*.[20] Two broader recommended changes are proposed for the existing TIA standards, which would need to be amended into the city code.

[18] Access To A County Road, Section VI, Department of Public Works Road Standards, Polk County, July 1998.

[19] Access Management Standards, Appendix C, Oregon Highway Plan, Oregon Department of Transportation, 1999.

[20] Chapter 18.150: Transportation Improvements, Monmouth City Code, Passed June 2023.

- It is recommended that sections *(4) Traffic Impact Analysis Requirements*, *(5) Approval Criteria*, and *(7) Conditions of Approval* be updated to better quantify safety as a measure to be studied and mitigated. This could include an investigation into the last five years of ODOT crash data history at the study intersections and required mitigations for any intersections over the critical crash rate for the facility type.
- It is recommended that section *(4) Traffic Impact Analysis Requirements* be updated to include more specific criteria for the required elements of the TIA and the level of effort expected. While a preapplication conference can still be a good idea to verify that all parties are on the same page for the necessary analysis and documentation, the standard elements should be documented. This could include existing conditions documentation, operational analysis scenarios (i.e. existing, year-of-opening background, year-of-opening build [including both AM and PM peak hour analysis]), safety analysis, and site plan review.

ODOT TIA guidelines are found in their Development Review Guidelines[21] and Polk County TIA standards are found in their Department of Public Works Road Standards.[22] Generally, if a new development has primary access on a State or County-owned facility, or if the development generates a prescribed significant amount of additional traffic onto a State or County-owned facility, respective State and County guidelines must be followed in addition to City of Monmouth guidelines.

[21] Guidelines are currently being revised by ODOT; similar guidelines can be found in OAR 734-051-3030.

[22] Transportation Impact Analysis, Section X, Department of Public Works Road Standards, Polk County, July 1998.

TRANSPORTATION SYSTEM IMPROVEMENT PROJECTS

This section documents the proposed transportation projects for the Monmouth TSP to improve the deficiencies and needs previously identified through the 2045 Horizon Year. Projects warranting further explanation are described in more detail. Intersection operations for the prescribed intersection capacity upgrades are also discussed.

PROJECT LIST

The proposed solutions were developed by assessing the transportation system needs and identifying potential projects that would address each need. Figure 6 provides an overview map of all projects and the project list can be found in the appendix.

The projects are grouped into five categories:

- Street Extension (EX): Projects that construct a new street connection in the City of Monmouth to provide internal and/or external connectivity for vehicles, bikes, and pedestrians. These projects are not typically initiated by the City themselves, but guide for future street expansions as development occurs by outside sources.
- Intersection Improvement (IN): Projects that specifically upgrade intersections to meet future mobility standards and/or provide safer operations, supporting safe and efficient intersections for all modes of travel.
- Ped/Bike Improvement (PB): Projects that deliver connections, provide crossings, and improve mobility specifically for people walking and biking. Sidewalk infill, enhanced pedestrian crossings, and lane striping are all included in this category.
- Transit Upgrade (TR): Projects that improve the infrastructure and operations for transit systems and transit users, including transit stop upgrades or new transit stop locations. These projects necessitate coordination between multiple agencies.
- Urban Upgrade (UU): Projects that holistically upgrade streets to meet applicable street cross-section standards, creating a network that is accessible for all modes of traffic. This typically involves upgrades for the entire right-of-way, and not just pavement curb-to-curb.

Alongside each project, the following information is provided:

- Description: A short explanation of the project's location, scope, and relevant information. If further explanatory information is necessary, it is noted in the description and then documented later in the memo.
- Sponsoring Agency(ies): The expected primary source of planning and funding for implementation purposes, although such designations do not create any obligation for funding.

As the project list is refined in subsequent memorandums, each project will also be assigned a planning-level cost estimate, evaluation rating, and priority rating. Each project will also have a list of associated projects that are related or geographically neighboring.

See the accompanying Excel file for the Project List

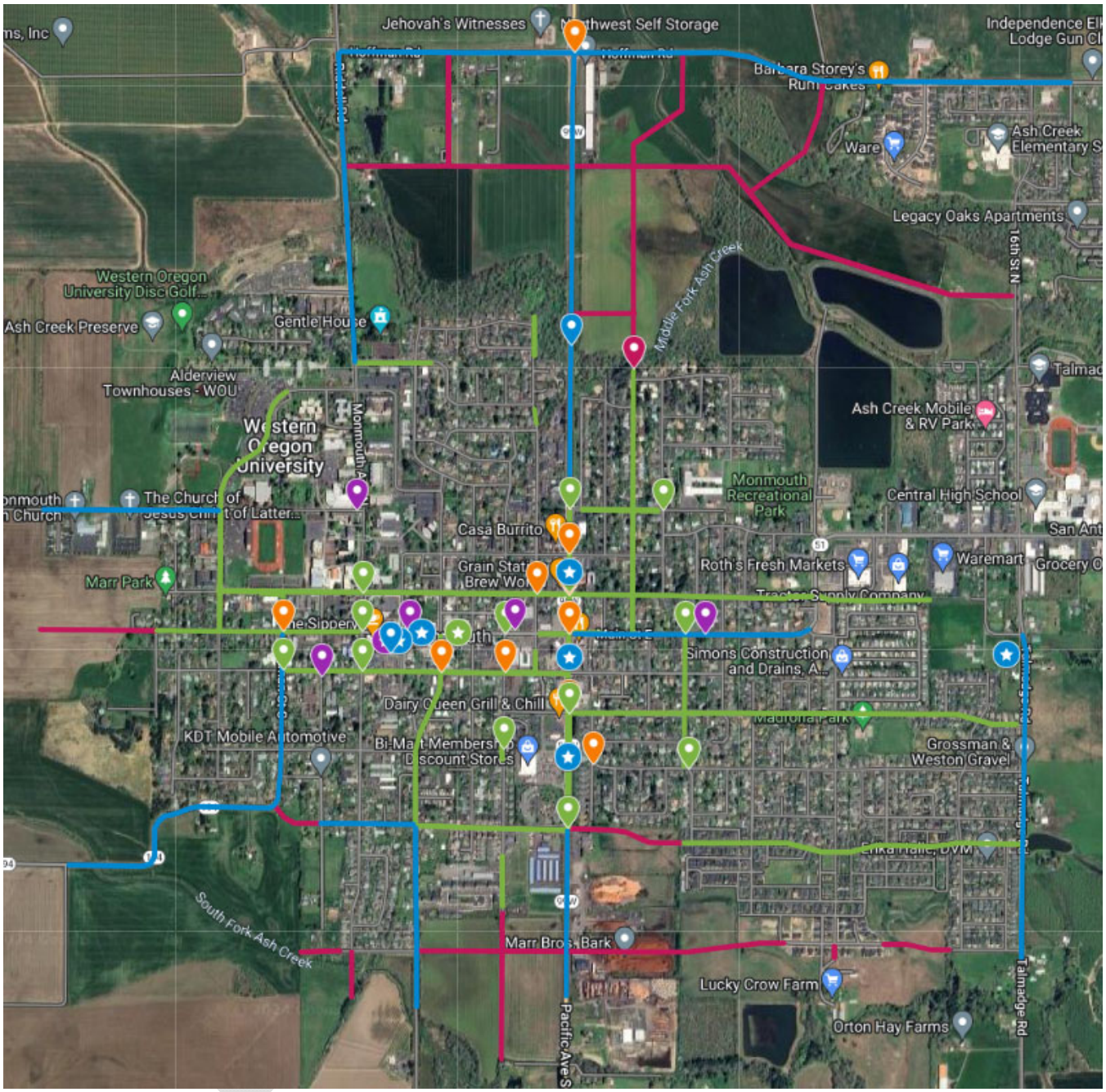


FIGURE 6: MONMOUTH TSP PROJECT MAP

DETAILED PROJECT EXPLANATIONS

Projects requiring more explanation are detailed below. The descriptions are meant to help convey ideas and plans for how the projects should be implemented in the future.

STUDIES, MONITORING, AND COORDINATION

Proposed projects for the Monmouth TSP include a range of avenues and approaches to further explore specific concerns not within the scope of a large-scale transportation system plan.

Monmouth-Independence Street Expansion Coordination (UU-10)

The City of Monmouth desires to create the best transportation system connections between the cities of Monmouth and Independence for all users, and the City recognizes the partnership needed to help make it happen. This coordination effort addresses how streets between the cities will connect, primarily on Talmadge Road to the south of OR 51 and 16th Street to the north of OR 51. Currently, the only east-west connections between Monmouth and Independence are OR 51 and Hoffman Road.

In the northern UGB extents of Monmouth, a new east-west Major Collector street is proposed which would connect with 16th Street between Marigold Drive and Talmadge Middle School. Due to wetland concerns and property lines, it is unlikely that a connection could be made at Marigold Drive.

Towards the south along Talmadge Road, Monmouth has already built out their street network towards the east up to the UGB limits between Monmouth and Independence. However, it is recommended that Monmouth and Independence work closely together to provide a seamless transition between cities on any future connections to ensure street connections are made that match desired travel patterns and functional classifications.

OR 99W Studies (UU-07, UU-08, UU-09)

OR 99W is a primary transportation route that runs through the center of Monmouth, servicing both local residents and pass-through regional traffic. Three studies have been identified to continue to monitor and enhance the corridor for the community.

A proposed Speed Study (UU-07) would identify opportunities to lower the speed limit on OR 99W at the north and south ends of the corridor as vehicles are entering the city. This could also help to address the high prevalence of northbound rear-end crashes in the southern half of the city where the speed limit drops from 45 mph to 30 mph just south of Madrona Street. A related solution is to consider installing speed feedback signs for traffic entering the city.

A proposed Access Management Study (UU-08) would investigate options to modify access points along OR 99W to improve safety and mobility for all users. This is especially critical for the area north of Main Street where there are four public intersections and 16 private driveways within 1,200 feet. This work could impact the Intersection Operations Monitoring effort described below.

A proposed Intersection Operations Monitoring effort (UU-09) would include a regular cycle of traffic data collection along OR 99W (i.e. once every five years) to monitor the operations of the

intersections within the UGB limits, with a focus on the stop-controlled intersections. As discussed in further detail in the future operations section below, none of the stop-controlled intersections along OR 99W are expected to meet traffic signal warrants in the horizon year and feasible mitigations would not significantly reduce delay on the minor street approaches. This effort would seek to understand the shifts in travel patterns between intersections as delays and queuing increase over time. This work could impact the Access Management Study described above.

ODOT INFRASTRUCTURE PROJECTS

Two sections of highway within Monmouth are of primary concern for improvement as they lack the presence of complete pedestrian and bicyclist facilities.

UU-01: Main St (OR 51) Urban Upgrade

Main Street (OR 51) from OR 99W to Edwards Road lacks adequate multimodal facilities for a high-volume urban highway corridor. East of Heffley Street, sidewalk is absent from the south side of the street and pedestrian facilities on the north side of the street consist of a skinny asphalt path that is not easily accessible. With an urban context best categorized as Urban Mix per the ODOT Highway Design Manual (ODOT),[23] pedestrians, bicyclists, and transit users have the highest modal consideration.[24] Recommended design treatments, therefore, include lane narrowing, landscape strips, and enhanced bicyclist/pedestrian facilities.

Due to the existing limited right-of-way of approximately 67’ for the 2,500’ long corridor, the recommended facility cross-section presented in Figure 7 includes buffered bicycle lanes, landscape strips between the bicycle lane and sidewalk, and a center turn lane. Besides providing better turning opportunities along the corridor for the multiple public streets and private driveways, opportunities exist for providing pedestrian refuge islands at key intersections. Primary design challenges include a vertical curve near the intersection of Heffley Street and the existing transverse grade differences between the vehicular travel lanes and sidewalks/unimproved areas east of Heffley Street.

UU-02: Whitman St (OR 194) Urban Upgrade

Whitman Street (OR 194) from Main Street to just south of McDonald Lane is an unimproved urban residential street with no bicycle lanes, no curb and gutter, and multiple areas without sidewalk. With an urban context best categorized as a Residential Corridor per the ODOT Highway Design Manual (ODOT),[25] recommended design treatments include lane narrowing, landscape strips, and enhanced bicyclist/pedestrian facilities.

With an existing right-of-way of approximately 66’ for the 1,750’ long corridor, the recommended facility cross-section presented in Figure 8 includes buffered bicycle lanes and landscape strips between the bicycle lane and sidewalk.

[23] Table 200-5, Part 200: Geometric Design and Context, Highway Design Manual, Oregon Department of Transportation, March 2024.

[24] Table 200-6, Part 200: Geometric Design and Context, Highway Design Manual, Oregon Department of Transportation, March 2024.

[25] Table 200-5, Part 200: Geometric Design and Context, Highway Design Manual, Oregon Department of Transportation, March 2024.

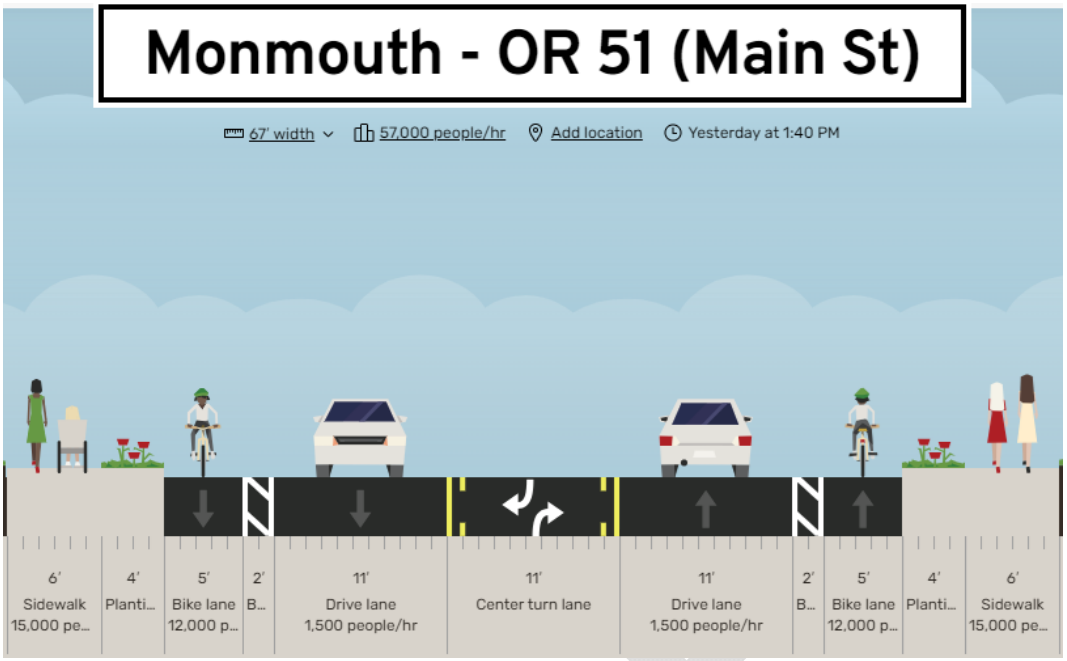


FIGURE 7: MAIN ST (OR 51) RECOMMENDED CROSS-SECTION (OR 99W TO EDWARDS RD)

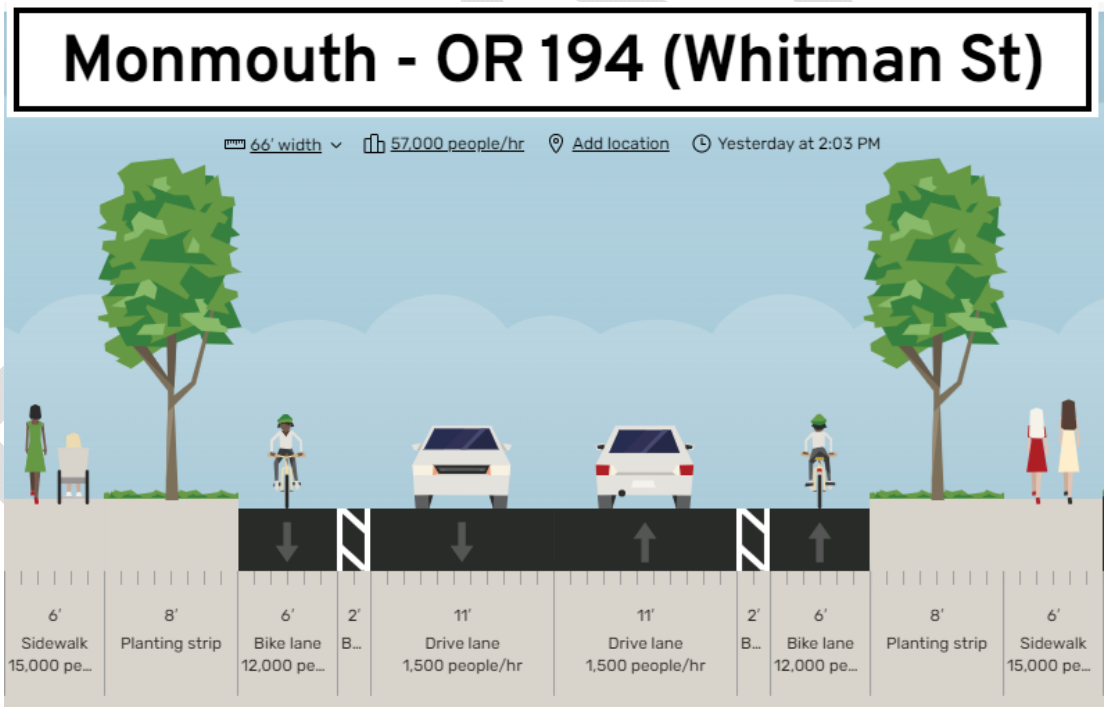


FIGURE 8: WHITMAN ST (OR 194) RECOMMENDED CROSS-SECTION (MAIN ST TO MCDONALD LN)

STREET EXTENSIONS

As the City grows and develops, a plan for new streets and street extensions is proposed to help create a connected network. Four key areas and projects are discussed below. The street extensions consider three primary factors in how the streets are laid out and how they should be implemented. The review also considered the 2018 Monmouth Residential Buildable Land Inventory and Monmouth Zoning Map.

- Streams, Wetlands, and other Geographical Features: The Ash Creek forks and associated wetlands are significant barriers to the transportation system, either disallowing development or making it infeasible to try to develop. This issue is described in the 2018 Local Wetland Inventory.
- Key Stakeholders in Developable Land: Connected to the above considerations, development of parcels within the UGB is partly contingent on how property owners want to develop their land. The City recognizes the land trusts and businesses that currently occupy these areas.
- City of Monmouth & Central School District Land: The City's wastewater lagoons pose barriers in the northeast quadrant of the City, and it is infeasible to consider moving them. The school district owns all land abutting the west side of 16th Street.

New Northern Major Collector (EX-01, EX-02)

A new east-west Major Collector is recommended on the north side of Monmouth between Hoffman Road and Middle Fork Ash Creek. The street would tentatively extend east from Riddle Road between major property lines. Once across OR 99W, the street would hug the northeast side of North Fork Ash Creek and the lagoons, connecting to 16th Street. This alignment would still cross over wetland areas, but with as minimal impact as possible for this alignment. It would also be recommended for Independence to consider extending the street to Gun Club Road in the west. Connecting to Marigold Drive is currently considered infeasible due to the wetlands south of Ash Creek Elementary School.

Craven Street Extension (EX-04, EX-05, EX-06)

The Craven Street extension is the only major north-south connection being recommended, and it would provide an alternative neighborhood connection between Hoffman Road and Main Street. As a Minor Collector, the street would not be designed for cut-through traffic. The primary obstacle for the extension is a bridge crossing of Middle Fork Ash Creek just north of where Craven Street currently terminates. If the extension is implemented, a new intersection with OR 99W is recommended to provide some more local connectivity.

Gwinn Street Extension (EX-09, EX-10)

The Gwinn Street extension would provide a full east-west connection through the southern neighborhoods of the City. The extension consists of two projects, one connecting the eastern extents of the corridor with OR 99W and another connecting the western extents of the corridor with Whitman Street (OR 194). As these connections are made, the respective sections should be updated to Major Collector standards per the associated projects. With the connection to Whitman Street (OR 194), specifically, discussions with ODOT will need to be employed to determine the best approach for a three-leg intersection on a curve.

Ash Creek Drive Extension (EX-11)

The Ash Creek Drive extension would provide a major east-west connection through the southern neighborhoods of the City, similar to Gwinn Street. The corridor is currently constructed as three separate sections (off Warren Street, Edwards Road, and Talmadge Road). While designated as a Major Collector, Ash Creek Drive can be designed as a minor collector until a connection to OR 99W is made. However, adequate right-of-way and consensus decisions should be made to limit any future modifications necessary to update the street.

BIKEWAY IMPLEMENTATION

Recommended projects on Jackson Street, Clay Street, and Madrona Street will create a safe and connected set of east-west bikeways through the City of Monmouth. Solutions to support general implementation can be found in the *Neighborhood Traffic Calming Measures* section below, but location-specific projects are discussed in this section.

With all projects, signage and striping is recommended to help users understand the priority that bikes are given on a street. Wayfinding signage can also help to create a sense of belonging and significance. Consider both vertical and horizontal deflection at regular intervals along the corridor. Speed cushions are especially beneficial for bikeways since the cutouts for emergency vehicles can also be used by bicyclists. While solutions should be applied cohesively across the City to create a user understanding of the bikeways, certain areas could warrant special treatments.

Jackson St Bikeway Implementation (PB-08, PB-09)

Jackson Street from Stadium Drive to Killen Court passes near Western Oregon University and it is the only full east-west connection north of Main Street in the City. This corridor also connects to the proposed multi-use path connections at the eastern end of Jackson Street. Outside of projects already identified along the corridor, raised crosswalks or a higher prevalence of curb extensions could be implemented along Jackson Street near the downtown area and University where pedestrian activity is higher.

Clay St Bikeway Implementation (PB-10)

Clay Street from Whitman Street to OR 99W is a location of concern for many residents in Monmouth, as many report of unsafe speeds and cut-through traffic. The corridor connects OR 194 and OR 99W as a pseudo-alternate route around the Main Street downtown corridor. Planting strips are generally present on Clay Street west of Knox Street and generally absent east of Knox Street. Outside of projects already identified along the corridor, chokers and chicanes could be implemented on the east end of the corridor where driveways are less prevalent and there are no street trees to help create a visual cue.

Madrona St Bikeway Implementation (PB-11)

Madrona Street from OR 99W to Talmadge Road services the largest neighborhood in the City and it is currently the primary east-west connection from the neighborhood to OR 99W and beyond outside of Main Street. There are no planting strips along the corridor, and it is comprised entirely of private residences. Outside of projects already identified along the corridor, chokers and chicanes could be implemented all along the corridor to create horizontal cues and provide some buffer space between the pavement and sidewalk in specific locations.

HORIZON YEAR TRANSPORTATION OPERATIONS

Only intersections along OR 99W were previously identified as being operationally deficient in the 2045 Horizon Year. The operations results and accompanying discussion with mitigations and revisions are described below for those intersections. It is understood that any traffic control changes will need to be formally analyzed through the Intersection Control Evaluation (ICE) process before any project implementation can occur.

While the 16th Street/Hoffman Road intersection was shown to exceed Polk County operating standards in the previous analysis, once the City of Monmouth adopts their own mobility standards and the UGB limits extend over the intersection, the intersection will meet the mobility standards being recommended for the City.

MITIGATIONS & REVISIONS ALONG OR 99W

There are eight public street intersections along OR 99W in Monmouth, including two signalized intersections and six minor stop-controlled intersections. Intersection improvements at the two traffic signals consist primarily of adding turn lanes and changing the phasing and cycle length of each signal.

To begin the stop-controlled mitigation assessment, ODOT Preliminary Traffic Signal Warrants were calculated for all stop-controlled intersections based on forecast volumes. In 2045, half of the stop-controlled intersections exceed their mobility target and all of them experience high side-street delay. However, it was determined that none of the intersections are expected to meet the MUTCD 8-hour vehicular volume warrant (for which the ODOT preliminary warrants are based on). While the minor street volumes are not excessively high, the mainline volume of OR 99W is high enough that gaps to enter the highway off the minor street are minimal.

In lieu of a traffic signal, other traffic control modifications were assessed. For two of the three stop-controlled intersections not meeting mobility targets, adding a dedicated left-turn lane on the worst minor approach helps to meet targets. However, side-street delays are still high at all locations.

A revision to the traffic operations at the intersections along OR 99W to incorporate two-stage minor street left-turns from the existing center-turn lane was investigated in Synchro, discussed with the City of Monmouth, and observed in the field. If two-stage left-turns at minor streets are integrated into the analysis, all stop-controlled intersections are forecast to meet mobility targets. Per observations and Monmouth staff experience, the center-turn lane has not traditionally been used by vehicles to make a two-stage left-turn at public street intersections (it is more common at private business driveways). Part of this is because vehicles on the highway also use the center turn lane to make major street left-turns. However, it is expected that usage will increase and that people will be willing to take smaller gaps in traffic to make their turning movements as traffic volumes increase. This change was incorporated into the mitigated and revised analysis below.

HORIZON YEAR TRAFFIC OPERATIONS - MITIGATED & REVISED

Future forecast 2045 traffic operations at all study intersections along OR 99W, with mitigations and revisions included, were determined for the AM and PM peak hours based on the Highway Capacity Manual (HCM) 6th Edition methodology for intersections.[26] The results were then compared with the proposed mobility standards. Table 5 lists the calculated v/c ratio, delay, and LOS of each study intersection. As shown, with the prescribed intersection projects and the revised analysis parameters, all study intersections are expected to meet ODOT mobility targets in the Future 2045 Horizon Year.

TABLE 5: FUTURE 2045 INTERSECTION OPERATIONS – MITIGATED & REVISED

INTERSECTION		MOBILITY STANDARD	AM PEAK HOUR			PM PEAK HOUR		
			V/C RATIO	DELAY (SECS)	LOS	V/C RATIO	DELAY (SECS)	LOS
TRAFFIC SIGNAL								
1	OR 99W/ HOFFMAN RD	v/c ≤ 0.85	0.74	26.2	C	0.80	34.9	C
5	OR 99W/ MAIN ST	v/c ≤ 0.90	0.75	25.4	C	0.90	33.1	E
TWO-WAY STOP-CONTROL								
2	OR 99W/ CHURCH ST	v/c ≤ 0.90	0.39 (WB)	24.9	A/C	0.25 (WB)	22.1	A/C
3	OR 99W/ POWELL ST	v/c ≤ 0.90	0.37 (EBL)	28.8	A/E	0.34 (EBTR)	20.1	B/C
4	OR 99W/ JACKSON ST	v/c ≤ 0.90	0.24 (WB)	21.5	A/C	0.31 (EBTR)	20.3	A/C
6	OR 99W/ CLAY ST	v/c ≤ 0.90	0.13 (EBL)	25.1	A/D	0.23 (EBTR)	17.4	A/C
7	OR 99W/ MADRONA ST	v/c ≤ 0.90	0.28 (WBL)	27.5	A/D	0.27 (WBTR)	19.4	B/C
8	OR 99W/ GWINN ST	v/c ≤ 0.85	0.43 (EB)	26.1	A/D	0.32 (EB)	24.1	A/C

[26] Highway Capacity Manual, 6th Edition, Transportation Research Board, 2016.

IMPLEMENTATION MEASURES

To assist the City of Monmouth with implementation efforts of certain projects, additional information has been researched and compiled for Neighborhood Traffic Calming Measures and Electric Vehicles as described below.

NEIGHBORHOOD TRAFFIC CALMING MEASURES

Neighborhood traffic calming measures focus on reducing travel speeds and vehicle volumes on neighborhood streets, creating a safer transportation system in areas that are intended to prioritize pedestrians and bicyclists alongside vehicles.

A toolbox of traffic calming measures is located in the appendix. The measures include an array of solutions that have been demonstrated to reduce vehicle speeds and volumes on neighborhood streets. A description of each measure, the type of deflection, category of street the measure can be applied to, and the location along a street block for which the measure applies is given.

The subsequent memo will contain the refined toolbox, guidelines for citizen-led procedures, and traffic calming implementation strategies.

ELECTRIC VEHICLES

Electric vehicles (EVs) are now very familiar to the public and have proliferated as production costs have declined. The City should consider strategies to promote growth in the public charging infrastructure. At present there is one publicly available charging station in Monmouth, located at the Dairy Queen restaurant south of the OR 99W/Madrona Street intersection.

Funding opportunities exist for EV charging stations at the state and federal levels. ODOT currently features the Community Charging Rebates (CCR) Program, which provides cash incentives for public and private entities to install level 2 EV charging in parking areas and near multi-unit dwellings.[27] At the federal level, the Infrastructure Investment and Jobs Act passed in 2021 provides $52 million over five years to ODOT for Oregon EV charging infrastructure investments. The funding comes from the National EV Infrastructure (NEVI) program,[28] which has specific requirements for how funds can be used and requires stakeholder engagement to determine charging needs.

[27] Community Charging Rebates Program, ODOT, https://www.oregon.gov/odot/climate/Pages/communitychargingrebates.aspx.

[28] National Electric Vehicle Infrastructure Formula Program, US Department of Energy, https://afdc.energy.gov/laws/12744.

NEXT STEPS

This memorandum will be presented to the Project Advisory Committee (PAC Meeting #3), Planning Commission and City Council (Work Sessions Round #1), and the general public (Public Event #2) in Summer 2024. Feedback will guide any revisions to this memo and then the process for the Project Selection and Implementation deliverable (Memo #5) in the Summer. Additional materials that will be incorporated into Memo #5 include planning-level project cost estimates and historical/projected transportation funding. The memo will create a financially constrained project list, prioritizing project implementation and providing a realistic goal for what can be implemented over the next 20 years.

A Memorandum of Understanding (MOU) between the City of Monmouth, City of Independence, Polk County, and Oregon Department of Transportation will also be pursued for relevant transportation facilities to identify regional network improvements and coordinated approaches to grant or legislative funding opportunities.

APPENDIX

CONTENTS

APPENDIX A: PROJECT LIST

Monmouth TSP Project List

Project ID	Project Name	Sponsoring Agency(ies)	Description
EX-01	Northern Major Collector (West) Street Extension	City, Developers	Construct a new east-west street connection from Riddle Road to OR 99W in the northwest quadrant of the city that is built to applicable street standards, connecting with the other connection across OR 99W (see associated projects). General alignment is proposed based on existing information, but no specific location is identified.
EX-02	Northern Major Collector (East) Street Extension	City, Developers	Construct a new east-west street connection from OR 99W to 16th Street in the northeast quadrant of the city that is built to applicable street standards, connecting with the other connection across OR 99W (see associated projects). General alignment is proposed based on existing information, but no specific location is identified.
EX-03	NW Quadrant Connector Street Extension	City, Developers	Construct a new street connection from the new western east-west street connection to Hoffman Road that is built to applicable street standards. Project is only applicable if the east-west connection is implemented (see associated projects).
EX-04	Craven St Street Extension	City, Developers	Extend Craven Street from Olive Way to the new Major Collector street, creating a connection that is built to applicable street standards. A bridge (see associated projects) will need to be constructed over Middle Fork Ash Creek.
EX-05	Craven St Ash Creek Bridge Extension	City, Developers	Construct a bridge across Middle Fork Ash Creek along Craven Street that is built to applicable street standards. Project is only necessary if Craven Street is extended to the north (see associated projects).
EX-06	Craven St-OR 99W Connector Street Extension	City, Developers	Construct a new street connection from OR 99W to Craven Street north of Ash Creek that is built to applicable street standards. Project is only applicable if Craven Street is extended to the north (see associated projects).
EX-07	Northeast Quadrant Connector Street Extension	City, Developers	Construct a new street connection from the new east portion of the east-west Major Collector street connection to Hoffman Road that is built to applicable street standards. Project is only applicable if the east-west connection is implemented (see associated projects).
EX-08	Main St Street Extension	City, Developers	Extend Main Street from Butler Road to the western UGB extents, built to applicable street standards.
EX-09	Gwinn St (West) Street Extension	City, Developers	Extend Gwinn Street from College Street to Whitman Street, creating a connection that is built to applicable street standards.
EX-10	Gwinn St (East) Street Extension	City, Developers	Extend and connect Gwinn Street from OR 99W to Heffley Street, creating a connection that is built to applicable street standards.
EX-11	Ash Creek Dr Street Extension	City, Developers	Extend and connect the three existing sections of Ash Creek Drive, creating one street connection from the western city limits to the eastern UGB limits that is built to applicable street standards.
EX-12	Monmouth Ave Street Extension	City, Developers	Extend Monmouth Avenue from Ash Creek Drive to the southern UGB extents, built to applicable street standards.
EX-13	Ecols St Street Extension	City, Developers	Extend Ecols Street from the existing terminus south of Gwinn Street to the southern UGB extents, built to applicable street standards.
EX-14	Edwards Rd Street Extension	City, Developers	Extend Edwards Road from Ash Creek Drive to the southern UGB extents, built to applicable street standards.
IN-01	OR 99W/Hoffman Rd Intersection Improvement	ODOT	Construct intersection improvements for the intersection of OR 99W and Hoffman Road, including increasing the northbound right-turn lane length, increasing the cycle length, and adding flashing beacons to the advance signal warning signs.
IN-02	OR 99W/Main St Intersection Improvement	ODOT	Construct intersection improvements for the intersection of OR 99W and Main Street, including adding a right-turn lane on each approach, adding green bicycle paint, and increasing the cycle length. Include bicycle lanes along the Main Street approaches.
IN-03	OR 99W/Powell St Intersection Improvement	ODOT	Construct intersection improvements for the intersection of OR 99W and Powell Street, including adding a dedicated left-turn lane on the eastbound approach.
IN-04	OR 99W/Jackson St Intersection Improvement	ODOT	Construct intersection improvements for the intersection of OR 99W and Jackson Street, including adding a dedicated left-turn lane on the eastbound approach.

Project ID	Project Name	Sponsoring Agency(ies)	Description
IN-05	OR 99W/Madrona St Intersection Improvement	ODOT	Construct intersection improvements for the intersection of OR 99W and Madrona Street, including adding a dedicated left-turn lane on the westbound approach.
IN-06	Main St/Whitman St Intersection Improvement	ODOT	Construct intersection improvements for the intersection of Main Street and Whitman Street, including implementing a full all-way stop and providing safer crossing opportunities for bicyclists and pedestrians.
IN-07	Clay St/Knox St Intersection Improvement	City	Construct intersection improvements for the intersection of Clay Street and Knox Street, including implementing an all-way stop and providing safer crossing opportunities for bicyclists and pedestrians. Consider curb extensions.
IN-08	Clay St/Ecols St Intersection Improvement	City	Construct intersection improvements for the intersection of Clay Street and Ecols Street, including implementing an all-way stop and providing safer crossing opportunities for bicyclists and pedestrians. Consider curb extensions.
IN-09	Jackson St/Catron St Intersection Improvement	City	Construct intersection improvements for the intersection of Jackson Street and Catron Street, including implementing stop-control safety upgrades and providing safer crossing opportunities for bicyclists and pedestrians. Consider curb extensions.
IN-10	Bentley St/Southgate Dr Intersection Improvement	City	Construct intersection improvements for the intersection of Bentley Street and Southgate Drive, including implementing 90 degree T-intersection with stop-control on Bentley Street.
PB-01	OR 99W Multimodal Improvement	ODOT	Improve the bicycle lanes on OR 99W from Church Street to Gwinn Street by adding a striped buffer between the vehicle and bicycle travel lanes.
PB-02	OR 99W/Church St Ped Crossing	ODOT	Install an enhanced pedestrian crossing along the north leg of OR 99W at Church Street. Consider an RRFB or other high-visibility improvement with a pedestrian refuge island in the center turn lane.
PB-03	OR 99W/Jackson St Ped Crossing	ODOT	Install an enhanced pedestrian crossing along the north leg of OR 99W at Jackson Street. Consider high-visibility improvements with a pedestrian refuge island in the center turn lane.
PB-04	OR 99W/Madrona St Ped Crossing	ODOT	Install an enhanced pedestrian crossing along the south leg of OR 99W at Madrona Street. Consider an RRFB or other high-visibility improvement with a pedestrian refuge island in the center turn lane.
PB-05	OR 99W/Gwinn St Ped Crossing	ODOT	Install an enhanced pedestrian crossing along the north or south leg of OR 99W at Gwinn Street, once the Gwinn St (East) Street Extension is constructed. Consider an RRFB or other high-visibility improvement with a pedestrian refuge island in the center turn lane.
PB-06	OR 99W Sidewalk Infill	ODOT	Install sidewalk not present on the east side of OR 99W between Madrona Street and Gwinn Street (approximately 1,100 total linear feet).
PB-07	Downtown Crosswalk Compliance Study	City, ODOT	Conduct a crosswalk compliance study of the six public intersections in the downtown area from Monmouth Avenue to Catron Street, investigating where further visual cues and safety improvements could be implemented. Consider in-street pedestrian crossings signs at locations with the worst compliance.
PB-08	Jackson St (West) Bikeway Implementation	City	Implement measures to facilitate a neighborhood bikeway on Jackson Street from Stadium Drive to OR 99W that prioritizes safer travel and recreation for all users. See the TSP for information on how to implement.
PB-09	Jackson St (East) Bikeway Implementation	City	Implement measures to facilitate a neighborhood bikeway on Jackson Street from OR 99W to Killen Court that prioritizes safer travel and recreation for all users. See the TSP for information on how to implement.
PB-10	Clay St Bikeway Implementation	City	Implement measures to facilitate a neighborhood bikeway on Clay Street from Whitman Street to OR 99W that prioritizes safer travel and recreation for all users. See the TSP for information on how to implement.
PB-11	Madrona St Bikeway Implementation	City	Implement measures to facilitate a neighborhood bikeway on Madrona Street from OR 99W to Talmadge Road that prioritizes safer travel and recreation for all users. See the TSP for information on how to implement.
PB-12	Jackson St Multi-use Path	City	Create a mutli-use path connection between the eastern terminus of Jackson Street and OR 51. The multi-use path should connect with the enhanced crossing of OR 51 just to the north.
PB-13	Independence Multi-Use Path Connection	City, Independence	Create a mutli-use path connection between OR 51 and the eastern UGB limits. Encourage cooperation with Independence to connect to 16th Street and then E Street.

Project ID	Project Name	Sponsoring Agency(ies)	Description
PB-14	Catron St Sidewalk Infill	City	Install sidewalk not present on the east side of Catron St between Suzana Avenue and the northern terminus (approximately 500 total linear feet).
PB-15	Gentle Ave Multimodal Improvement	City	Upgrade Gentle Avenue to applicable street standards from Monmouth Avenue to just east of Knox Street. Install sidewalk on the south side (approximately 700 total linear feet) and implement parallel parking. Consider adding bicycle lanes if extra space is available from the removal of the head-in parking.
PB-16	Stadium Dr Sidewalk Infill	City, WOU	Install sidewalk not present on both sides of Stadium Drive between Monmouth Avenue and Church Street (approximately 1,200 total linear feet).
PB-17	Stadium Dr Multimodal Improvement	City, WOU	Upgrade Stadium Drive to applicable street standards from Church Street to Main Street by removing parking and adding bicycle lanes as well as adding approximately 500 linear feet of sidewalk. Improve pedestrian curb ramps at all corners of Church Street/Stadium Drive.
PB-18	Monmouth Ave/Jackson St Ped Crossing	City	Implement intersection crosswalk visbility improvements at the intersection of Monmouth Avenue and Jackson Street by upgrading crosswalk markings on all four intersection approaches. Consider curb extension on the north side of Jackson Street.
PB-19	Jackson St Sidewalk Infill	City	Install sidewalk not present on the south side of Jackson Street between Whitman Street and Stadium Drive (approximately 200 total linear feet).
PB-20	Whitman St Sidewalk Infill	City	Install sidewalk not present on the west side of Whitman Street between Jackson Street and Main Street (approximately 350 total linear feet).
PB-21	Main St (City) Multimodal Improvement	City	Upgrade Main Street to applicable street standards from Whitman Street to the western terminus by removing parking and adding bicycle lanes. Improve pedestrian curb ramps at all corners of Main Street/Stadium Drive.
PB-22	Main St (Downtown) Multimodal Improvement	ODOT	Install bicycle lanes and remove parking on Main Street from Whitman Street to Monmouth Avenue.
PB-23	Main St/Monmouth Ave Ped Crossing	ODOT	Construct a curb extension on the northeast corner for the north leg crossing of the Main Street and Monmouth Avenue intersection, then add enhanced crosswalk striping to the north leg to match the other three crosswalks.
PB-24	Main St/Ecols St Ped Crossing	ODOT	Construct curb extensions at all four corners of the Main Street and Ecols Street intersection.
PB-25	Main St (West) Multimodal Improvement	ODOT	Install bicycle lanes on Main Street between OR 99W and Catron Street.
PB-26	Main St (East) Multimodal Improvement	ODOT	Install a bicycle lane on the north side of Main Street between OR 99W and High Street, complementing the bicycle lane already present on the south side.
PB-27	Clay St/Whitman St Ped Crossing	ODOT	Install an enhanced pedestrian crossing along the north or south leg of Whitman St at Clay Street.
PB-28	Clay St/Monmouth Ave Ped Crossing	City	Construct curb extensions at all four corners of the Monmouth Avenue and Clay Street intersection. Stripe the legs that have the most pedestrian traffic with enhanced crosswalk markings.
PB-29	Clay St-Catron St Sidewalk Infill	City	Install sidewalk not present on the north side of Clay Street between Ecols Street and Catron Street, and on the west side of Catron Street between Main Street and Clay Street (approximately 450 total linear feet).
PB-30	Knox St Multimodal Improvement	City	Upgrade the single corridor of Knox Street from Main Street to Ackerman Street and Warren Street from Ackerman Street to Gwinn Street to applicable street standards by removing parking and adding bicycle lanes. Parallel parking may be able to be accomodated on the single block between Main Street and Clay Street, if desired.
PB-31	Ecols St/Ackerman St Ped Crossing	City	Install an enhanced pedestrian crossing of Ecols Street just south of Ackerman Street for a safer crossing that connects with the commercial development rear access sidewalk to the west.
PB-32	Ecols St (North) Sidewalk Infill	City	Install sidewalk not present on the west side of Ecols Street just south of Ackerman Street (approximately 100 total linear feet).

Project ID	Project Name	Sponsoring Agency(ies)	Description
PB-33	Ecols St (South) Sidewalk Infill	City	Install sidewalk not present on the east side of Ecols Street between Gwinn Street and the southern terminus (approximately 500 total linear feet).
PB-34	Gwinn St (West) Multimodal Improvement	City	Upgrade Gwinn Street to applicable street standards from OR 99W to Warren Street by removing parking and adding bicycle lanes. In addition, install sidewalk in areas not present (approximately 400 total linear feet).
PB-35	Gwinn St (East) Multimodal Improvement	City	Upgrade Gwinn Street to applicable street standards from Heffley Street to Talmadge Road by removing parking and adding bicycle lanes. In addition, install sidewalk along the southwest corner of Edwards Road/Gwinn Street (approximately 200 total linear feet).
PB-36	Heffley St/Bentley St Ped Crossing	City	Improve pedestrian crossing opportunities at the Heffley Street/Bentley Street intersection by tightening curbs, updating curb ramps, and adding marked crossings.
PB-37	Heffley St Sidewalk Infill	City	Install sidewalk not present on both sides of Heffley Street between Main Street and Bentley Street (approximately 1,200 total linear feet).
PB-38	Main St/Heffley St Ped Crossing	ODOT	Install an enhanced pedestrian crossing along the west leg of OR 51 (Main St) at Heffley Street. Consider an RRFB and other high-visibility improvement like improved crosswalk markings with adequate advance warning signs due to the hill.
PB-39	Craven St Sidewalk Infill	City	Install sidewalk not present on both sides of Craven Street North between Main Street and the Middle Fork Ash Creek (approximately 3,000 total linear feet).
PB-40	Church St Sidewalk Infill	City	Install sidewalk not present on the south side of Church Street between High Street and Sacre Lane (approximately 400 total linear feet).
PB-41	Church St/Sacre Ln Ped Crossing	City, Central School District	Install curb extension at all four corners of the intersection of Church Street and Sacre Lane, then implement intersection crosswalk visbility improvements on all four intersection approaches.
TR-01	Trolley Monitoring & Support Study	City, MI Trolley, Independence	Monitor the Monmouth-Independence Trolley operations, collecting ridership data to determine any desirable modifications to the service.
TR-02	University Transit Stop Relocation	City, MI Trolley	Relocate the transit stop on Jackson Street near Monmouth Avenue to a more central location on the Western Oregon University campus, possibly either on Church Street or Stadium Drive. Project would require a slight rerouting of the trolley path.
TR-03	College St Transit Stops	City, Cherriots	Add concrete waiting platforms for both transit stops on College Street at Clay Street.
TR-04	Downtown WB Transit Stop	City, MI Trolley	Implement a new MI Trolley stop in the downtown Monmouth area near the intersection of Main Street and Warren Street. If curbspace is an issue, consider an in-lane stop.
TR-05	Catron St Transit Stop	City, MI Trolley, Cherriots	Relocate the existing westbound Catron Street transit stop to the west about 100 feet, removing the parking on the north side of Main Street. Once relocated, stripe bus only areas for both stops on the north and south side and then add lane lines to help transition vehicles.
TR-06	Heffley St-Atwater St Transit Stops	City, MI Trolley, Cherriots	Pursue avenues to bring the existing transit stops at Heffley Street and Atwater Street directly onto Main Street, providing a direct path for both the MI Trolley and Cherriots. Efforts should coincide with any urban upgrades to Main Street.
UU-01	Main St (OR 51) Urban Upgrade	ODOT	Upgrade Main Street (OR 51) to urban street standards from OR 99W to Edwards Road, implementing a center turn lane and enhanced pedestrian and bicycle facilities. See a proposed cross-section in the TSP body.
UU-02	Whitman St (OR 194) Urban Upgrade	ODOT	Upgrade Whitman Street (OR 194) to urban street standards from Main Street to the proposed connection with Gwinn Street (approximately 500 feet south of Ackerman Street), implementing enhanced pedestrian and bicycle facilities. See a proposed cross-section in the TSP body.
UU-03	Monmouth Hwy (OR 194) Urban Upgrade	ODOT	Upgrade Monmouth Highway (OR 194) to applicable urban highway street standards from the proposed connection with Gwinn Street (approximately 500 feet south of Ackerman Street) to the western UGB limits.
UU-04	OR 99W Ash Creek Bridge Replacement	ODOT	Replace the Ash Creek Bridge on OR 99W, accomodating the desired urban highway street standard for the highway.

Project ID	Project Name	Sponsoring Agency(ies)	Description
UU-05	OR 99W (North) Urban Upgrade	ODOT	Upgrade OR 99W to applicable urban highway street standards from Church Street to the northern UGB limits.
UU-06	OR 99W (South) Urban Upgrade	ODOT	Upgrade OR 99W to applicable urban highway street standards from Gwinn Street to the southern UGB limits.
UU-07	OR 99W Speed Study	City, ODOT	Conduct a speed study of OR 99W within the UGB, investigating if the speed limit can be decreased along the approaches into the more urban environment. Consider installing speed feedback signs where appropriate.
UU-08	OR 99W Access Management Study	City, ODOT	Conduct an access management study of OR 99W between Church Street and Gwinn Street, investigating if access points can be mitigated to create a safer and more mobile transportation environment for vehicles and vulnerable street users. The study should include a few blocks both to the west and east of OR 99W on Main Street due to impacts at the traffic signal.
UU-09	OR 99W Intersection Operations Monitoring	City, ODOT	Monitor the changes in traffic volumes at key intersections along OR 99W, investigating shifts in traffic patterns, the use of the center turn lane, and highway volumes increases that could warrant futher intersection improvements.
UU-10	Monmouth-Independence Street Expansion Coordination	City, Independence, Polk County	Coordinate with the City of Indepndence and Polk County to implement the best transportation connections between the adjoining cities, both for full streets and multi-use paths.
UU-11	Downtown Parking Study	City	Conduct a parking study in the downtown area that explores parking needs and a variety of parking management solutions, as laid out in the Downtown Plan.
UU-12	EV Adoption Monitoring	City	Monitor the adoption of electric vehicles in the City of Monmouth and nationally to help make decisions on implementing additional electric vehicle infrastructure.
UU-13	City Hall EV Charger	City	Add an electric vehicle charging station that is open to the public in the parking lot at Monmouth City Hall.
UU-14	Hoffman Rd Urban Upgrade	City, Polk County	Upgrade Hoffman Road to applicable street standards from Riddle Road to the eastern UGB limits.
UU-15	Riddle Rd Urban Upgrade	City, Polk County	Upgrade Riddle Road to applicable street standards from Hoffman Road to Gentle Avenue.
UU-16	Church St Urban Upgrade	City	Upgrade Church Street to applicable street standards from Stadium Drive to the western UGB limits.
UU-17	Gwinn St Urban Upgrade	City	Upgrade Gwinn Street to applicable street standards from College Street to Warren Street.
UU-18	Warren St Urban Upgrade	City, Polk County	Upgrade Warren Street to applicable street standards from Gwinn Street to the southern UGB limits.
UU-19	Talmadge Rd Urban Upgrade	City, Independence, Polk County	Upgrade Talmadge Road to applicable street standards from the northern UGB limits to the southern UGB limits.

APPENDIX B: NEIGHBORHOOD TRAFFIC CALMING MEASURES

Neighborhood Traffic Calming Measures - City of Monmouth

DKS

Goal: Reduce vehicle speeds and volumes on neighborhood streets to increase multimodel safety and activity

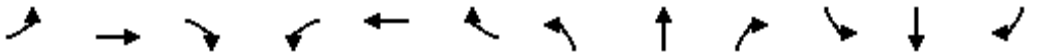
#	Measure	Description	Deflection Type	Street Type	Block Location	Primary Design Parameters	Expected Speed Reduction	Expected Volume Reduction
1	**Signage (Statutory, Warning, Guide, etc)**	Communicates with street users to regulate and warn about upcoming features	-	Local, Minor Collector, Major Collector	Midblock, Intersection	- Consider quantity of existing nearby signage to avoid "sign pollution"	-	-
2	**Speed Feedback Radar Signs**	Directs a driver's attention to the posted speed limit and digitally displays the vehicle's speed on a message board	-	Local, Minor Collector, Major Collector	Midblock, Intersection	- Speed reductions are typically only maintained through short distances	Moderate	Minor
3	**Reduced Speed Limit**	Reduce the statuatory posted speed limit by 5 mph	-	Local, Minor Collector, Major Collector	Midblock, Intersection	- 85th percentile speed on study street must be at least 5 mph above posted speed - Measure must be implented in partnership with enforcement	Moderate	-
4	**Crosswalk Visibility Upgrades**	Heighten crosswalk visibility by striping unmarked crosswalks, updating the striping, and/or adding warning signage	-	Local, Minor Collector, Major Collector	Midblock, Intersection	- Consider quantity of existing nearby crosswalk marking and signage to avoid "crosswalk pollution"	Minor	-
5	**Speed Hump**	A raised and rounded area of street pavement approximately 3 inches in height that extends across the travelway	Vertical	Local	Midblock	- Not appropriate for emergency routes, street posted 30 mph or more, or grades greater than 8 percent	Significant	Moderate
6	**Speed Cushion**	Similar to speed humps, but includes gaps to allow for the expedient passing of emergency vehicles	Vertical	Local, Minor Collector, Major Collector	Midblock	- Can be used on emergency routes - Not appropriate for streets 30 mph or more or grades greater than 8 percent	Significant	Moderate
7	**Speed Table**	Similar to speed humps, but it has a longer longitudinal flat top (typically 10') to accommodate the wheelbase of a vehicle	Vertical	Local, Minor Collector, Major Collector	Midblock	- Not appropriate for emergency routes, street posted 30 mph or more, or grades greater than 8 percent	Significant	Moderate
8	**Raised Crosswalk**	A raised area of street pavement with a marked crosswalk on top (basically a speed table with a crosswalk)	Vertical	Local, Minor Collector, Major Collector	Midblock, Intersection	- Can be used on emergency routes - Not appropriate for streets 30 mph or more or grades greater than 8 percent	Significant	Moderate
9	**Raised Intersection**	A raised, flat area covering an entire intersection, including the crosswalks	Vertical	Local, Minor Collector, Major Collector	Intersection	- Can be used on emergency routes - Not appropriate for streets 30 mph or more or grades greater than 8 percent	Significant	Moderate
10	**Curb Extension/ Bulbout**	Extending the corner curb toward the center of the street to narrow the street and decrease pedestrian crossing distances	Horizontal	Local, Minor Collector	Intersection	- Must not inhibit bicycle travel - Vehicle turning radius needs to be considered	Moderate	Minor
11	**Median/Pedestrian Refuge Island**	Raised island placed in the center of a street to separate opposing traffic and narrow the street, sometimes paired with a crosswalk	Horizontal	Local, Minor Collector, Major Collector	Midblock, Intersection	- Vehicle turning radius needs to be considered at intersections - Provides pedestrians opportunity to cross one travel direction at a time	Moderate	Minor
12	**Choker**	Use of curb lines to narrow the street by removing parking, sometimes creating a marked pedestrian crossing	Horizontal	Local, Minor Collector	Midblock	- Consider implementing alongside a raised crosswalk	Minor	-
13	**Chicane/Lateral Shift**	Channelization that realigns the straight path of a street to create a curvilinear path	Horizontal	Local, Minor Collector, Major Collector	Midblock	- Best for speed limits 35 mph or less - Consider impacts to driveways	Minor	-
14	**Traffic Circle/ Center Island**	A round island in the middle of an intersection around which traffic circulates	Horizontal	Local	Intersection	- Best for speed limits 35 mph or less - Must consider appropriate stop or yield-control - Vehicle turning radius needs to be considered	Minor	-
15	**Diagonal Diverter**	Channelization that restricts all through-movements at an intersection, with bicycle cut-throughs, either allowing all right turns or creating two intersections	Reroute	Local, Minor Collector, Major Collector	Intersection	- Not appropriate for transit or emergency routes	-	Significant
16	**Median Barrier Diverter**	Median barrier extending through an intersection, with bicycle cut-throughs, allowing only vehicle right turns on and off the street with the barrier	Reroute	Local, Minor Collector, Major Collector	Intersection	- Not appropriate for transit or emergency routes	-	Significant
17	**Closure**	Full or half closure of a street at an intersection, with bicycle cut-throughs	Reroute	Local, Minor Collector, Major Collector	Intersection	- Not appropriate for transit or emergency routes	Minor	Significant

APPENDIX C: INTERSECTION OPERATIONS REPORTS

Inputs in yellow

Summary Table

ID	Software/Method	Intersection	Control Type	LOS	Delay	V/C Ratio
1	Synchro HCM 6th Signal	OR 99W & Hoffman Rd	Signal	C	26.2	0.74
5	Synchro HCM 6th Signal	OR 99W & Main St	Signal	C	25.4	0.75



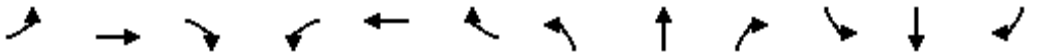
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	105	30	155	105	210	20	580	125	115	545	30
Future Volume (veh/h)	80	105	30	155	105	210	20	580	125	115	545	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1695	1627	1736	1736	1709	1750	1614	1723	1723	1614	1750
Adj Flow Rate, veh/h	89	117	24	172	117	167	22	644	61	128	606	19
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	4	9	1	1	3	0	10	2	2	10	0
Cap, veh/h	199	378	77	323	179	255	39	749	676	157	866	794
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.02	0.46	0.46	0.10	0.54	0.54
Sat Flow, veh/h	1009	1365	280	1158	647	923	1667	1614	1457	1641	1614	1480
Grp Volume(v), veh/h	89	0	141	172	0	284	22	644	61	128	606	19
Grp Sat Flow(s),veh/h/ln	1009	0	1645	1158	0	1570	1667	1614	1457	1641	1614	1480
Q Serve(g_s), s	7.6	0.0	6.0	12.3	0.0	14.2	1.2	31.6	2.1	6.8	24.8	0.5
Cycle Q Clear(g_c), s	21.8	0.0	6.0	18.3	0.0	14.2	1.2	31.6	2.1	6.8	24.8	0.5
Prop In Lane	1.00		0.17	1.00		0.59	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	199	0	455	323	0	434	39	749	676	157	866	794
V/C Ratio(X)	0.45	0.00	0.31	0.53	0.00	0.65	0.56	0.86	0.09	0.81	0.70	0.02
Avail Cap(c_a), veh/h	352	0	704	498	0	672	122	1163	1050	249	1290	1184
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.0	0.0	25.4	32.6	0.0	28.4	42.9	21.2	13.3	39.4	15.3	9.7
Incr Delay (d2), s/veh	1.2	0.0	0.3	1.0	0.0	1.2	8.9	5.2	0.1	8.3	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	2.3	3.4	0.0	5.3	0.6	12.2	0.7	3.1	8.7	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.1	0.0	25.7	33.7	0.0	29.6	51.8	26.4	13.4	47.7	16.8	9.7
LnGrp LOS	D	A	C	C	A	C	D	C	B	D	B	A
Approach Vol, veh/h		230			456			727			753	
Approach Delay, s/veh		30.9			31.1			26.1			21.8	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.6	52.6		29.6	13.0	46.2		29.6				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	6.5	71.0		38.0	13.5	64.0		38.0				
Max Q Clear Time (g_c+I1), s	3.2	26.8		20.3	8.8	33.6		23.8				
Green Ext Time (p_c), s	0.0	7.3		1.9	0.1	7.6		0.8				

Intersection Summary			
HCM 6th Ctrl Delay		26.2	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	105	30	155	105	210	20	580	125	115	545	30
Future Volume (vph)	80	105	30	155	105	210	20	580	125	115	545	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0		5.0	5.0		4.5	5.0	5.0	4.5	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.90		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1610		1646	1539		1662	1591	1458	1630	1591	1453
Flt Permitted	0.25	1.00		0.61	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	423	1610		1054	1539		1662	1591	1458	1630	1591	1453
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	89	117	33	172	117	233	22	644	139	128	606	33
RTOR Reduction (vph)	0	8	0	0	59	0	0	0	70	0	0	13
Lane Group Flow (vph)	89	142	0	172	291	0	22	644	69	128	606	20
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	4%	9%	1%	1%	3%	0%	10%	2%	2%	10%	0%
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4					6			2
Actuated Green, G (s)	24.4	24.4		24.4	24.4		2.0	49.9	49.9	12.2	60.1	60.1
Effective Green, g (s)	24.4	24.4		24.4	24.4		2.0	49.9	49.9	12.2	60.1	60.1
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.02	0.49	0.49	0.12	0.60	0.60
Clearance Time (s)	5.0	5.0		5.0	5.0		4.5	5.0	5.0	4.5	5.0	5.0
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.0	4.0	2.5	4.0	4.0
Lane Grp Cap (vph)	102	388		254	371		32	786	720	196	946	864
v/s Ratio Prot		0.09			0.19		0.01	c0.40		c0.08	0.38	
v/s Ratio Perm	c0.21			0.16					0.05			0.01
v/c Ratio	0.87	0.37		0.68	0.78		0.69	0.82	0.10	0.65	0.64	0.02
Uniform Delay, d1	36.8	31.9		34.7	35.8		49.2	21.7	13.6	42.4	13.4	8.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	50.5	0.4		6.4	10.0		43.8	7.0	0.1	6.8	1.7	0.0
Delay (s)	87.3	32.3		41.1	45.9		93.0	28.7	13.6	49.2	15.0	8.4
Level of Service	F	C		D	D		F	C	B	D	B	A
Approach Delay (s)		52.8			44.3			27.9			20.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	101.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	30	1	70	1	675	110	40	685	1
Future Vol, veh/h	1	1	1	30	1	70	1	675	110	40	685	1
Conflicting Peds, #/hr	0	0	0	0	0	0	6	0	0	0	0	6
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	2	0	8	0	0	9	0
Mvmt Flow	1	1	1	33	1	78	1	750	122	44	761	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1709	1730	768	1664	1669	811	768	0	0	872	0	0
Stage 1	856	856	-	813	813	-	-	-	-	-	-	-
Stage 2	853	874	-	851	856	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.22	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.318	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	73	89	405	78	97	379	855	-	-	782	-	-
Stage 1	355	377	-	375	395	-	-	-	-	-	-	-
Stage 2	357	370	-	358	377	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	53	80	403	71	87	379	850	-	-	782	-	-
Mov Cap-2 Maneuver	53	80	-	190	205	-	-	-	-	-	-	-
Stage 1	353	338	-	375	395	-	-	-	-	-	-	-
Stage 2	283	370	-	321	338	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	47	24.9	0	0.5
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	850	-	-	89	291	782	-	-
HCM Lane V/C Ratio	0.001	-	-	0.037	0.386	0.057	-	-
HCM Control Delay (s)	9.2	-	-	47	24.9	9.9	0	-
HCM Lane LOS	A	-	-	E	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.7	0.2	-	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	10	85	5	5	10	55	740	10	10	660	35
Future Vol, veh/h	55	10	85	5	5	10	55	740	10	10	660	35
Conflicting Peds, #/hr	3	0	0	0	0	3	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	3	0	0	0	2	8	0	11	9	0
Mvmt Flow	61	11	94	6	6	11	61	822	11	11	733	39

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1737	1732	754	1778	1746	832	773	0	0	834	0	0
Stage 1	776	776	-	951	951	-	-	-	-	-	-	-
Stage 2	961	956	-	827	795	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.23	7.1	6.5	6.2	4.12	-	-	4.21	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.327	3.5	4	3.3	2.218	-	-	2.299	-	-
Pot Cap-1 Maneuver	69	89	407	65	87	372	842	-	-	762	-	-
Stage 1	393	410	-	315	341	-	-	-	-	-	-	-
Stage 2	311	339	-	369	402	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 61	81	407	45	79	371	841	-	-	761	-	-
Mov Cap-2 Maneuver	166	194	-	132	184	-	-	-	-	-	-	-
Stage 1	364	404	-	292	316	-	-	-	-	-	-	-
Stage 2	274	314	-	272	396	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.1	23.5	0.7	0.1
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	841	-	-	166	365	217	761	-	-
HCM Lane V/C Ratio	0.073	-	-	0.368	0.289	0.102	0.015	-	-
HCM Control Delay (s)	9.6	-	-	38.8	18.8	23.5	9.8	-	-
HCM Lane LOS	A	-	-	E	C	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1.6	1.2	0.3	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

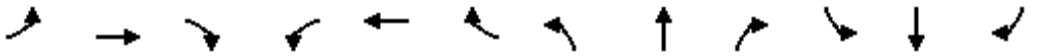
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	5	30	10	10	45	15	745	15	40	660	40
Future Vol, veh/h	25	5	30	10	10	45	15	745	15	40	660	40
Conflicting Peds, #/hr	0	0	1	1	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	4	0	14	3	8	8	0	0	9	3
Mvmt Flow	27	5	32	11	11	48	16	801	16	43	710	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1690	1668	734	1678	1681	809	754	0	0	817	0	0
Stage 1	819	819	-	841	841	-	-	-	-	-	-	-
Stage 2	871	849	-	837	840	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.24	7.1	6.64	6.23	4.18	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.64	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.64	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.336	3.5	4.126	3.327	2.272	-	-	2.2	-	-
Pot Cap-1 Maneuver	75	97	417	76	89	379	830	-	-	820	-	-
Stage 1	372	392	-	362	364	-	-	-	-	-	-	-
Stage 2	349	380	-	364	364	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	59	90	416	65	83	379	829	-	-	820	-	-
Mov Cap-2 Maneuver	160	200	-	177	194	-	-	-	-	-	-	-
Stage 1	365	371	-	355	357	-	-	-	-	-	-	-
Stage 2	290	373	-	313	345	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.8	21.5	0.2	0.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	829	-	-	160	360	287	820	-	-
HCM Lane V/C Ratio	0.019	-	-	0.168	0.105	0.244	0.052	-	-
HCM Control Delay (s)	9.4	-	-	32	16.2	21.5	9.6	-	-
HCM Lane LOS	A	-	-	D	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	0.3	0.9	0.2	-	-



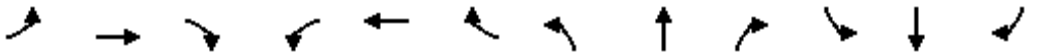
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	195	210	30	175	185	90	30	490	55	110	550	40
Future Volume (veh/h)	195	210	30	175	185	90	30	490	55	110	550	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1695	1627	1695	1668	1709	1641	1600	1627	1709	1614	1750
Adj Flow Rate, veh/h	205	221	5	184	195	15	32	516	23	116	579	19
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	4	9	4	6	3	8	11	9	3	10	0
Cap, veh/h	349	288	231	325	267	229	237	669	563	299	721	662
Arrive On Green	0.13	0.17	0.17	0.12	0.16	0.16	0.03	0.42	0.42	0.06	0.45	0.45
Sat Flow, veh/h	1641	1695	1363	1615	1668	1430	1563	1600	1345	1628	1614	1481
Grp Volume(v), veh/h	205	221	5	184	195	15	32	516	23	116	579	19
Grp Sat Flow(s),veh/h/ln	1641	1695	1363	1615	1668	1430	1563	1600	1345	1628	1614	1481
Q Serve(g_s), s	8.2	10.1	0.2	7.5	9.0	0.7	0.9	22.4	0.8	3.2	25.1	0.6
Cycle Q Clear(g_c), s	8.2	10.1	0.2	7.5	9.0	0.7	0.9	22.4	0.8	3.2	25.1	0.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	349	288	231	325	267	229	237	669	563	299	721	662
V/C Ratio(X)	0.59	0.77	0.02	0.57	0.73	0.07	0.13	0.77	0.04	0.39	0.80	0.03
Avail Cap(c_a), veh/h	455	565	454	425	535	459	286	1228	1033	347	1283	1178
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.2	32.1	28.0	24.5	32.4	28.9	15.9	20.2	13.9	15.5	19.3	12.6
Incr Delay (d2), s/veh	0.6	1.6	0.0	0.6	1.5	0.0	0.2	4.0	0.1	0.6	4.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	4.1	0.1	2.8	3.6	0.2	0.3	8.5	0.2	1.2	9.5	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.7	33.8	28.0	25.1	33.8	28.9	16.0	24.3	14.0	16.1	23.8	12.6
LnGrp LOS	C	C	C	C	C	C	B	C	B	B	C	B
Approach Vol, veh/h		431			394			571			714	
Approach Delay, s/veh		29.4			29.6			23.4			22.3	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.1	41.2	14.8	18.0	9.4	38.9	14.0	18.7
Change Period (Y+Rc), s	4.5	5.0	4.5	5.0	4.5	5.0	4.5	5.0
Max Green Setting (Gmax), s	5.1	64.4	15.5	26.0	7.3	62.2	14.5	27.0
Max Q Clear Time (g_c+I1), s	2.9	27.1	10.2	11.0	5.2	24.4	9.5	12.1
Green Ext Time (p_c), s	0.0	9.1	0.1	0.6	0.0	7.9	0.1	0.7

Intersection Summary	
HCM 6th Ctrl Delay	25.4
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	210	30	175	185	90	30	490	55	110	550	40
Future Volume (vph)	195	210	30	175	185	90	30	490	55	110	550	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1628	1683	1326	1596	1651	1410	1539	1577	1330	1614	1591	1454
Flt Permitted	0.46	1.00	1.00	0.39	1.00	1.00	0.29	1.00	1.00	0.25	1.00	1.00
Satd. Flow (perm)	785	1683	1326	661	1651	1410	477	1577	1330	424	1591	1454
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	205	221	32	184	195	95	32	516	58	116	579	42
RTOR Reduction (vph)	0	0	26	0	0	76	0	0	33	0	0	22
Lane Group Flow (vph)	205	221	6	184	195	19	32	516	25	116	579	20
Confl. Peds. (#/hr)	2		4	4		2	1		1	1		1
Confl. Bikes (#/hr)									4			
Heavy Vehicles (%)	2%	4%	9%	4%	6%	3%	8%	11%	9%	3%	10%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)	29.7	17.4	17.4	29.7	17.4	17.4	44.9	42.3	42.3	54.3	47.2	47.2
Effective Green, g (s)	29.7	17.4	17.4	29.7	17.4	17.4	44.9	42.3	42.3	54.3	47.2	47.2
Actuated g/C Ratio	0.30	0.18	0.18	0.30	0.18	0.18	0.46	0.43	0.43	0.55	0.48	0.48
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.5	5.0	5.0	2.5	5.0	5.0
Lane Grp Cap (vph)	341	297	234	316	291	249	245	677	571	324	762	696
v/s Ratio Prot	c0.07	c0.13		0.07	0.12		0.00	0.33		c0.03	c0.36	
v/s Ratio Perm	0.11		0.00	0.10		0.01	0.06		0.02	0.17		0.01
v/c Ratio	0.60	0.74	0.02	0.58	0.67	0.08	0.13	0.76	0.04	0.36	0.76	0.03
Uniform Delay, d1	27.6	38.4	33.5	27.4	37.9	33.8	16.0	23.8	16.3	13.6	21.0	13.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	8.5	0.0	1.8	4.7	0.0	0.2	6.0	0.1	0.5	5.2	0.0
Delay (s)	29.7	47.0	33.5	29.2	42.6	33.9	16.2	29.8	16.4	14.1	26.2	13.6
Level of Service	C	D	C	C	D	C	B	C	B	B	C	B
Approach Delay (s)		38.3			35.6			27.8			23.6	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	98.5	Sum of lost time (s)	19.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	5	45	5	5	15	45	545	15	15	705	40
Future Vol, veh/h	20	5	45	5	5	15	45	545	15	15	705	40
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	3	3	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	120	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	6	0	11	25	0	0	0	12	27	8	8	15
Mvmt Flow	22	5	48	5	5	16	48	586	16	16	758	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1514	1514	781	1531	1527	597	802	0	0	605	0	0
Stage 1	813	813	-	693	693	-	-	-	-	-	-	-
Stage 2	701	701	-	838	834	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.31	7.35	6.5	6.2	4.1	-	-	4.18	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.399	3.725	4	3.3	2.2	-	-	2.272	-	-
Pot Cap-1 Maneuver	96	121	381	85	119	507	830	-	-	944	-	-
Stage 1	367	395	-	399	448	-	-	-	-	-	-	-
Stage 2	423	444	-	330	386	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	86	112	381	69	110	506	829	-	-	941	-	-
Mov Cap-2 Maneuver	201	231	-	160	218	-	-	-	-	-	-	-
Stage 1	345	388	-	375	421	-	-	-	-	-	-	-
Stage 2	381	417	-	279	379	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	19.1	18.3	0.7	0.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	829	-	-	206	381	298	941	-	-
HCM Lane V/C Ratio	0.058	-	-	0.13	0.127	0.09	0.017	-	-
HCM Control Delay (s)	9.6	-	-	25.1	15.8	18.3	8.9	-	-
HCM Lane LOS	A	-	-	D	C	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.4	0.4	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	5	5	55	5	115	5	485	20	30	710	20
Future Vol, veh/h	5	5	5	55	5	115	5	485	20	30	710	20
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	0	0	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	5	0	6	0	12	7	5	8	29
Mvmt Flow	6	6	6	61	6	128	6	539	22	33	789	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1498	1442	803	1434	1442	550	814	0	0	561	0	0
Stage 1	869	869	-	562	562	-	-	-	-	-	-	-
Stage 2	629	573	-	872	880	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.15	6.5	6.26	4.1	-	-	4.15	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.15	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.15	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.545	4	3.354	2.2	-	-	2.245	-	-
Pot Cap-1 Maneuver	102	134	387	110	134	527	822	-	-	995	-	-
Stage 1	349	372	-	506	513	-	-	-	-	-	-	-
Stage 2	474	507	-	341	368	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	73	128	386	103	128	527	820	-	-	995	-	-
Mov Cap-2 Maneuver	185	243	-	220	245	-	-	-	-	-	-	-
Stage 1	346	359	-	502	509	-	-	-	-	-	-	-
Stage 2	353	503	-	320	355	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.6	18.7	0.1	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	820	-	-	248	220	503	995	-	-
HCM Lane V/C Ratio	0.007	-	-	0.067	0.278	0.265	0.034	-	-
HCM Control Delay (s)	9.4	-	-	20.6	27.5	14.7	8.7	-	-
HCM Lane LOS	A	-	-	C	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	1.1	1.1	0.1	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	80	1	35	1	1	1	10	415	1	1	680	60
Future Vol, veh/h	80	1	35	1	1	1	10	415	1	1	680	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	11	14	0	0	7	10
Mvmt Flow	89	1	39	1	1	1	11	461	1	1	756	67

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1277	1276	790	1296	1309	462	823	0	0	462	0	0
Stage 1	792	792	-	484	484	-	-	-	-	-	-	-
Stage 2	485	484	-	812	825	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.21	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.299	-	-	2.2	-	-
Pot Cap-1 Maneuver	145	168	393	140	161	604	769	-	-	1110	-	-
Stage 1	385	404	-	568	555	-	-	-	-	-	-	-
Stage 2	567	555	-	376	390	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	143	165	393	124	159	604	769	-	-	1110	-	-
Mov Cap-2 Maneuver	268	285	-	240	273	-	-	-	-	-	-	-
Stage 1	380	404	-	560	547	-	-	-	-	-	-	-
Stage 2	557	547	-	338	390	-	-	-	-	-	-	-

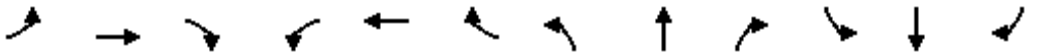
Approach	EB	WB	NB	SB
HCM Control Delay, s	26.1	16.5	0.2	0
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	769	-	-	297	316	1110	-	-
HCM Lane V/C Ratio	0.014	-	-	0.434	0.011	0.001	-	-
HCM Control Delay (s)	9.8	-	-	26.1	16.5	8.2	-	-
HCM Lane LOS	A	-	-	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	2.1	0	0	-	-

Inputs in yellow

Summary Table

ID	Software/Method	Intersection	Control Type	LOS	Delay	V/C Ratio
1	Synchro HCM 6th Signal	OR 99W & Hoffman Rd	Signal	C	34.9	0.80
5	Synchro HCM 6th Signal	OR 99W & Main St	Signal	C	33.1	0.90



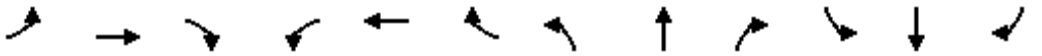
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	170	35	95	115	125	15	670	105	215	655	70
Future Volume (veh/h)	70	170	35	95	115	125	15	670	105	215	655	70
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1750	1736	1695	1695	1736	1750	1750	1682	1723	1736	1682	1682
Adj Flow Rate, veh/h	76	185	30	103	125	98	16	728	54	234	712	49
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	1	4	4	1	0	0	5	2	1	5	5
Cap, veh/h	188	342	55	197	213	167	29	795	690	262	1031	874
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.02	0.47	0.47	0.16	0.61	0.61
Sat Flow, veh/h	1083	1451	235	1057	902	707	1667	1682	1460	1654	1682	1425
Grp Volume(v), veh/h	76	0	215	103	0	223	16	728	54	234	712	49
Grp Sat Flow(s),veh/h/ln	1083	0	1686	1057	0	1609	1667	1682	1460	1654	1682	1425
Q Serve(g_s), s	7.3	0.0	12.1	10.3	0.0	13.4	1.0	43.7	2.2	15.1	30.9	1.5
Cycle Q Clear(g_c), s	20.6	0.0	12.1	22.4	0.0	13.4	1.0	43.7	2.2	15.1	30.9	1.5
Prop In Lane	1.00		0.14	1.00		0.44	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	188	0	398	197	0	379	29	795	690	262	1031	874
V/C Ratio(X)	0.40	0.00	0.54	0.52	0.00	0.59	0.54	0.92	0.08	0.89	0.69	0.06
Avail Cap(c_a), veh/h	312	0	590	318	0	563	100	898	779	297	1099	932
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.0	0.0	36.4	46.2	0.0	36.8	52.9	26.6	15.7	44.8	14.1	8.4
Incr Delay (d2), s/veh	1.0	0.0	0.9	1.6	0.0	1.1	11.1	13.4	0.1	24.7	2.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	5.1	2.8	0.0	5.3	0.5	19.7	0.7	7.9	11.4	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.0	0.0	37.2	47.8	0.0	37.9	64.1	40.1	15.8	69.6	16.1	8.5
LnGrp LOS	D	A	D	D	A	D	E	D	B	E	B	A
Approach Vol, veh/h		291			326			798			995	
Approach Delay, s/veh		39.8			41.0			38.9			28.3	
Approach LOS		D			D			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	71.6		30.6	21.7	56.3		30.6				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	6.5	71.0		38.0	19.5	58.0		38.0				
Max Q Clear Time (g_c+I1), s	3.0	32.9		24.4	17.1	45.7		22.6				
Green Ext Time (p_c), s	0.0	9.2		1.2	0.1	5.6		1.1				

Intersection Summary			
HCM 6th Ctrl Delay		34.9	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	170	35	95	115	125	15	670	105	215	655	70
Future Volume (vph)	70	170	35	95	115	125	15	670	105	215	655	70
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0		5.0	5.0		4.5	5.0	5.0	4.5	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1662	1672		1599	1606		1662	1667	1458	1646	1667	1417
Flt Permitted	0.29	1.00		0.38	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	501	1672		632	1606		1662	1667	1458	1646	1667	1417
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	185	38	103	125	136	16	728	114	234	712	76
RTOR Reduction (vph)	0	7	0	0	35	0	0	0	55	0	0	25
Lane Group Flow (vph)	76	216	0	103	226	0	16	728	59	234	712	51
Confl. Bikes (#/hr)			4									
Heavy Vehicles (%)	0%	1%	4%	4%	1%	0%	0%	5%	2%	1%	5%	5%
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4					6			2
Actuated Green, G (s)	20.2	20.2		20.2	20.2		2.4	57.9	57.9	19.2	74.7	74.7
Effective Green, g (s)	20.2	20.2		20.2	20.2		2.4	57.9	57.9	19.2	74.7	74.7
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.02	0.52	0.52	0.17	0.67	0.67
Clearance Time (s)	5.0	5.0		5.0	5.0		4.5	5.0	5.0	4.5	5.0	5.0
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.0	4.0	2.5	4.0	4.0
Lane Grp Cap (vph)	90	302		114	290		35	863	755	282	1113	946
v/s Ratio Prot		0.13			0.14		0.01	c0.44		c0.14	0.43	
v/s Ratio Perm	0.15			c0.16					0.04			0.04
v/c Ratio	0.84	0.72		0.90	0.78		0.46	0.84	0.08	0.83	0.64	0.05
Uniform Delay, d1	44.3	43.1		44.8	43.7		54.1	23.1	13.5	44.7	10.8	6.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	47.4	7.4		54.9	11.9		6.7	7.9	0.1	17.6	1.4	0.0
Delay (s)	91.7	50.5		99.7	55.6		60.8	30.9	13.6	62.3	12.1	6.4
Level of Service	F	D		F	E		E	C	B	E	B	A
Approach Delay (s)		60.9			68.1			29.2			23.2	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	111.8	Sum of lost time (s)	14.5
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	20	1	45	1	735	25	35	745	1
Future Vol, veh/h	1	1	1	20	1	45	1	735	25	35	745	1
Conflicting Peds, #/hr	0	0	0	0	0	0	9	0	0	0	0	9
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	14	0	0	0	7	0	4	5	0
Mvmt Flow	1	1	1	22	1	48	1	790	27	38	801	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1717	1706	811	1685	1693	804	811	0	0	817	0	0
Stage 1	887	887	-	806	806	-	-	-	-	-	-	-
Stage 2	830	819	-	879	887	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.24	6.5	6.2	4.1	-	-	4.14	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.24	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.24	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.626	4	3.3	2.2	-	-	2.236	-	-
Pot Cap-1 Maneuver	72	92	383	70	94	386	824	-	-	802	-	-
Stage 1	341	365	-	359	398	-	-	-	-	-	-	-
Stage 2	367	392	-	326	365	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	58	83	380	65	85	386	817	-	-	802	-	-
Mov Cap-2 Maneuver	58	83	-	177	203	-	-	-	-	-	-	-
Stage 1	338	331	-	359	398	-	-	-	-	-	-	-
Stage 2	320	392	-	296	331	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	44.7	22.1	0	0.4
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	817	-	-	94	281	802	-	-
HCM Lane V/C Ratio	0.001	-	-	0.034	0.253	0.047	-	-
HCM Control Delay (s)	9.4	-	-	44.7	22.1	9.7	0	-
HCM Lane LOS	A	-	-	E	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1	0.1	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	5	105	5	5	5	100	730	5	10	710	55
Future Vol, veh/h	35	5	105	5	5	5	100	730	5	10	710	55
Conflicting Peds, #/hr	0	0	2	2	0	0	5	0	4	4	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	0	0	0	0	5	0	12	4	4
Mvmt Flow	38	5	114	5	5	5	109	793	5	11	772	60

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1848	1849	809	1904	1877	800	837	0	0	802	0	0
Stage 1	829	829	-	1018	1018	-	-	-	-	-	-	-
Stage 2	1019	1020	-	886	859	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.22	7.1	6.5	6.2	4.1	-	-	4.22	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.318	3.5	4	3.3	2.2	-	-	2.308	-	-
Pot Cap-1 Maneuver	58	75	380	53	72	388	806	-	-	779	-	-
Stage 1	368	388	-	289	317	-	-	-	-	-	-	-
Stage 2	288	317	-	342	376	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	49	63	377	32	61	387	802	-	-	776	-	-
Mov Cap-2 Maneuver	143	169	-	87	149	-	-	-	-	-	-	-
Stage 1	316	381	-	249	273	-	-	-	-	-	-	-
Stage 2	240	273	-	231	369	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.7	33.2	1.2	0.1
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	802	-	-	143	357	144	776	-	-
HCM Lane V/C Ratio	0.136	-	-	0.266	0.335	0.113	0.014	-	-
HCM Control Delay (s)	10.2	-	-	39.1	20.1	33.2	9.7	-	-
HCM Lane LOS	B	-	-	E	C	D	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	1	1.4	0.4	0	-	-

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	10	90	5	15	65	25	750	10	35	750	35
Future Vol, veh/h	35	10	90	5	15	65	25	750	10	35	750	35
Conflicting Peds, #/hr	1	0	2	2	0	1	6	0	2	2	0	6
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	17	0	0	0	0	0	5	11	0	5	4
Mvmt Flow	37	11	95	5	16	68	26	789	11	37	789	37

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1778	1742	816	1786	1755	798	832	0	0	802	0	0
Stage 1	888	888	-	849	849	-	-	-	-	-	-	-
Stage 2	890	854	-	937	906	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.67	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.67	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.67	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.153	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	65	80	380	64	86	389	809	-	-	830	-	-
Stage 1	341	342	-	358	380	-	-	-	-	-	-	-
Stage 2	340	355	-	320	358	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	47	73	377	43	79	388	804	-	-	828	-	-
Mov Cap-2 Maneuver	141	177	-	132	190	-	-	-	-	-	-	-
Stage 1	328	325	-	346	367	-	-	-	-	-	-	-
Stage 2	259	343	-	221	340	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.2	22.1	0.3	0.4
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	804	-	-	141	339	299	828	-	-
HCM Lane V/C Ratio	0.033	-	-	0.261	0.311	0.299	0.044	-	-
HCM Control Delay (s)	9.6	-	-	39.3	20.3	22.1	9.6	-	-
HCM Lane LOS	A	-	-	E	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1	1.3	1.2	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	330	45	175	325	120	65	540	120	205	560	50
Future Volume (veh/h)	125	330	45	175	325	120	65	540	120	205	560	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.99		0.98	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1736	1709	1750	1736	1709	1750	1695	1654	1723	1723	1682	1750
Adj Flow Rate, veh/h	128	337	10	179	332	30	66	551	48	209	571	23
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	3	0	1	3	0	4	7	2	2	5	0
Cap, veh/h	260	384	319	271	430	365	258	652	572	292	748	657
Arrive On Green	0.07	0.22	0.22	0.10	0.25	0.25	0.04	0.39	0.39	0.09	0.45	0.45
Sat Flow, veh/h	1654	1709	1419	1654	1709	1454	1615	1654	1453	1641	1682	1476
Grp Volume(v), veh/h	128	337	10	179	332	30	66	551	48	209	571	23
Grp Sat Flow(s),veh/h/ln	1654	1709	1419	1654	1709	1454	1615	1654	1453	1641	1682	1476
Q Serve(g_s), s	6.0	19.3	0.6	8.3	18.3	1.6	2.4	30.6	2.1	7.3	28.9	0.9
Cycle Q Clear(g_c), s	6.0	19.3	0.6	8.3	18.3	1.6	2.4	30.6	2.1	7.3	28.9	0.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	260	384	319	271	430	365	258	652	572	292	748	657
V/C Ratio(X)	0.49	0.88	0.03	0.66	0.77	0.08	0.26	0.85	0.08	0.71	0.76	0.04
Avail Cap(c_a), veh/h	260	557	463	279	612	520	272	896	787	343	1034	908
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.3	37.9	30.6	27.9	35.2	28.9	19.8	27.9	19.2	21.3	23.6	15.8
Incr Delay (d2), s/veh	0.5	8.0	0.0	4.3	2.2	0.0	0.4	8.0	0.1	5.1	3.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	8.8	0.2	3.5	7.7	0.6	0.9	13.1	0.7	3.0	11.8	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.9	45.9	30.6	32.3	37.4	29.0	20.2	35.8	19.4	26.4	27.5	15.9
LnGrp LOS	C	D	C	C	D	C	C	D	B	C	C	B
Approach Vol, veh/h		475			541			665			803	
Approach Delay, s/veh		41.0			35.2			33.1			26.8	
Approach LOS		D			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.7	50.0	12.0	30.4	13.9	44.8	14.7	27.7
Change Period (Y+Rc), s	4.5	5.0	4.5	5.0	4.5	5.0	4.5	5.0
Max Green Setting (Gmax), s	5.1	62.2	7.5	36.2	12.5	54.8	10.7	33.0
Max Q Clear Time (g_c+I1), s	4.4	30.9	8.0	20.3	9.3	32.6	10.3	21.3
Green Ext Time (p_c), s	0.0	8.5	0.0	1.2	0.1	7.2	0.0	1.0

Intersection Summary	
HCM 6th Ctrl Delay	33.1
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	330	45	175	325	120	65	540	120	205	560	50
Future Volume (vph)	125	330	45	175	325	120	65	540	120	205	560	50
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1641	1699	1432	1644	1699	1426	1597	1636	1458	1630	1667	1441
Flt Permitted	0.33	1.00	1.00	0.21	1.00	1.00	0.31	1.00	1.00	0.18	1.00	1.00
Satd. Flow (perm)	566	1699	1432	372	1699	1426	515	1636	1458	317	1667	1441
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	128	337	46	179	332	122	66	551	122	209	571	51
RTOR Reduction (vph)	0	0	35	0	0	90	0	0	73	0	0	27
Lane Group Flow (vph)	128	337	11	179	332	32	66	551	49	209	571	24
Confl. Peds. (#/hr)	10		7	7		10	4					4
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	3%	0%	1%	3%	0%	4%	7%	2%	2%	5%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)	33.4	26.0	26.0	39.4	29.0	29.0	48.4	44.6	44.6	61.2	52.9	52.9
Effective Green, g (s)	33.4	26.0	26.0	39.4	29.0	29.0	48.4	44.6	44.6	61.2	52.9	52.9
Actuated g/C Ratio	0.30	0.23	0.23	0.35	0.26	0.26	0.43	0.40	0.40	0.55	0.47	0.47
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	5.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.5	5.0	5.0	2.5	5.0	5.0
Lane Grp Cap (vph)	239	394	332	248	439	368	259	650	580	314	786	680
v/s Ratio Prot	0.04	c0.20		c0.07	0.20		0.01	c0.34		c0.07	0.34	
v/s Ratio Perm	0.12		0.01	0.19		0.02	0.10		0.03	0.29		0.02
v/c Ratio	0.54	0.86	0.03	0.72	0.76	0.09	0.25	0.85	0.08	0.67	0.73	0.04
Uniform Delay, d1	30.6	41.2	33.3	28.2	38.3	31.5	19.9	30.7	21.0	18.5	23.8	15.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	15.9	0.0	8.5	6.5	0.0	0.4	11.0	0.1	4.7	4.1	0.0
Delay (s)	31.7	57.1	33.3	36.7	44.8	31.5	20.2	41.7	21.2	23.2	27.9	15.9
Level of Service	C	E	C	D	D	C	C	D	C	C	C	B
Approach Delay (s)		48.6			39.9			36.4			26.0	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	112.1	Sum of lost time (s)	19.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	20	80	10	5	25	50	715	25	25	695	70
Future Vol, veh/h	10	20	80	10	5	25	50	715	25	25	695	70
Conflicting Peds, #/hr	1	0	1	1	0	1	5	0	0	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	120	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	11	0	3	14	0	0	0	6	11	0	4	2
Mvmt Flow	11	22	88	11	5	27	55	786	27	27	764	77

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1789	1785	809	1823	1810	801	846	0	0	813	0	0
Stage 1	862	862	-	910	910	-	-	-	-	-	-	-
Stage 2	927	923	-	913	900	-	-	-	-	-	-	-
Critical Hdwy	7.21	6.5	6.23	7.24	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.21	5.5	-	6.24	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.21	5.5	-	6.24	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4	3.327	3.626	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	60	82	379	55	80	388	800	-	-	823	-	-
Stage 1	337	375	-	313	356	-	-	-	-	-	-	-
Stage 2	310	351	-	312	360	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	50	73	377	35	72	388	796	-	-	823	-	-
Mov Cap-2 Maneuver	145	183	-	109	174	-	-	-	-	-	-	-
Stage 1	312	361	-	291	331	-	-	-	-	-	-	-
Stage 2	263	327	-	217	346	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.3	25.9	0.6	0.3
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	796	-	-	168	377	216	823	-	-
HCM Lane V/C Ratio	0.069	-	-	0.196	0.233	0.204	0.033	-	-
HCM Control Delay (s)	9.9	-	-	31.6	17.4	25.9	9.5	-	-
HCM Lane LOS	A	-	-	D	C	D	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.7	0.9	0.7	0.1	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	10	10	30	10	75	10	705	90	95	665	15
Future Vol, veh/h	10	10	10	30	10	75	10	705	90	95	665	15
Conflicting Peds, #/hr	0	0	0	0	0	0	5	0	0	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	0	0	0	0	7	1	1	4	9
Mvmt Flow	11	11	11	32	11	81	11	758	97	102	715	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1807	1809	728	1767	1769	807	736	0	0	855	0	0
Stage 1	932	932	-	829	829	-	-	-	-	-	-	-
Stage 2	875	877	-	938	940	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	62	80	427	66	84	385	879	-	-	789	-	-
Stage 1	322	348	-	368	388	-	-	-	-	-	-	-
Stage 2	347	369	-	320	345	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	42	68	425	55	72	385	875	-	-	789	-	-
Mov Cap-2 Maneuver	114	159	-	160	182	-	-	-	-	-	-	-
Stage 1	317	302	-	363	383	-	-	-	-	-	-	-
Stage 2	263	364	-	262	299	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	30.7	23	0.1	1.3
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	875	-	-	172	160	340	789	-	-
HCM Lane V/C Ratio	0.012	-	-	0.188	0.202	0.269	0.129	-	-
HCM Control Delay (s)	9.2	-	-	30.7	33.1	19.4	10.2	-	-
HCM Lane LOS	A	-	-	D	D	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0.7	0.7	1.1	0.4	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	1	20	1	1	1	30	665	1	5	505	90
Future Vol, veh/h	60	1	20	1	1	1	30	665	1	5	505	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	4	7	0	0	6	1
Mvmt Flow	65	1	22	1	1	1	33	723	1	5	549	98

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1399	1398	598	1410	1447	724	647	0	0	724	0	0
Stage 1	608	608	-	790	790	-	-	-	-	-	-	-
Stage 2	791	790	-	620	657	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.14	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.236	-	-	2.2	-	-
Pot Cap-1 Maneuver	119	142	506	117	133	429	929	-	-	888	-	-
Stage 1	486	489	-	386	404	-	-	-	-	-	-	-
Stage 2	386	404	-	479	465	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	115	136	506	108	127	429	929	-	-	888	-	-
Mov Cap-2 Maneuver	239	257	-	229	244	-	-	-	-	-	-	-
Stage 1	469	486	-	372	389	-	-	-	-	-	-	-
Stage 2	370	389	-	455	462	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.1	18.1	0.4	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	929	-	-	275	278	888	-	-
HCM Lane V/C Ratio	0.035	-	-	0.32	0.012	0.006	-	-
HCM Control Delay (s)	9	-	-	24.1	18.1	9.1	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.3	0	0	-	-

APPENDIX D: PRELIMINARY TRAFFIC SIGNAL WARRANTS

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Church St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - AM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	15120	N
	Minor	1	2650	310	
Case B	Major	1	13300	15120	N
	Minor	1	1350	310	

Analyst and Date: Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Analysis Procedures Manual

Oregon Department of Transportation
Transportation Development Branch
Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Church St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - PM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250

X	100 percent of standard warrants
	70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	15420	N
	Minor	1	2650	210	
Case B	Major	1	13300	15420	N
	Minor	1	1350	210	

Analyst and Date:	Reviewer and Date:

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Analysis Procedures Manual

Oregon Department of Transportation
Transportation Development Branch
Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Powell St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - AM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	15100	N
	Minor	1	2650	650	
Case B	Major	1	13300	15100	N
	Minor	1	1350	650	

Analyst and Date: Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Analysis Procedures Manual

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Powell St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - PM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	16100	N
	Minor	1	2650	400	
Case B	Major	1	13300	16100	N
	Minor	1	1350	400	

Analyst and Date:	Reviewer and Date:

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[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Jackson St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - AM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	15150	N
	Minor	1	2650	300	
Case B	Major	1	13300	15150	N
	Minor	1	1350	300	

Analyst and Date: Reviewer and Date:

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Jackson St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - PM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	16050	N
	Minor	1	2650	450	
Case B	Major	1	13300	16050	N
	Minor	1	1350	450	

Analyst and Date: Reviewer and Date:

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Clay St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - AM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250

X	100 percent of standard warrants
	70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	13650	N
	Minor	1	2650	250	
Case B	Major	1	13300	13650	N
	Minor	1	1350	250	

Analyst and Date:	Reviewer and Date:

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Clay St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - PM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250

X	100 percent of standard warrants
	70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	15800	N
	Minor	1	2650	369	
Case B	Major	1	13300	15800	N
	Minor	1	1350	369	

Analyst and Date:	Reviewer and Date:

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Madrona St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - AM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250

X	100 percent of standard warrants
	70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	12700	N
	Minor	1	2650	600	
Case B	Major	1	13300	12700	N
	Minor	1	1350	600	

Analyst and Date:	Reviewer and Date:

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Madrona St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - PM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	15800	N
	Minor	1	2650	400	
Case B	Major	1	13300	15800	N
	Minor	1	1350	400	

Analyst and Date: Reviewer and Date:

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Gwinn St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - AM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	11670	N
	Minor	1	2650	810	
Case B	Major	1	13300	11670	N
	Minor	1	1350	810	

Analyst and Date: Reviewer and Date:

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Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99W	**Minor Street:**	Gwinn St
Project:	Monmouth TSP	**City/County:**	Monmouth
Year:	2045 - PM Peak	**Alternative:**	Project List

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	12960	N
	Minor	1	2650	610	
Case B	Major	1	13300	12960	N
	Minor	1	1350	610	

Analyst and Date: Reviewer and Date:

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