memo

to Dustin Nilsen and Will Norris, City of Hood River

from Nathan Polanski, PE, Alex Dupey, AICP, MIG

re The Heights Streetscape Plan – Evaluation Summary of Design Alternatives

date February 25, 2022

This memorandum summarizes findings from the project team's evaluation of the preliminary design alternatives. The evaluation included a traffic analysis and a review of project specific evaluation criteria to determine the alignment of design alternatives with the Urban Renewal Agency Board (URAB) adopted project goals.

The memorandum includes an overview of:

- how each design alternative aligns with project goals,
- key findings from the traffic analysis,
- which evaluation criteria appear to be differentiators when comparing the performance of design alternatives,
- design adjustments needed to improve the mobility performance based on issues observed during the traffic analysis, and
- cost considerations for the design alternative for future implementation.

The purpose of this memorandum is to provide an overview of the design alternatives and evaluation process and to identify and focus on key issues that distinguish between the design alternatives. These key issues will be used to lead a discussion with the Urban Renewal Advisory Committee (URAC), URAB, ODOT and the public to understand the trade-offs between the design alternatives as we develop a preferred design alternative.

Evaluation Process

The evaluation is based on the evaluation criteria and design alternatives approved by the URAB and URAC on October 21, 2021, with the following modifications based on URAB and URAC feedback:

1. Intersection at 13th Street/May Street: Given the concern for both traffic flow, and routine closures impacting vehicle traffic travelling south uphill on 13th, as well as the expressed safety concern for school and pedestrian traffic crossing 13th between May Street Elementary and Hood River Middle School, the URA felt this intersection would be best served by a roundabout rather than a traffic signal (the existing intersection has two-way stop control for east/west traffic and the City's adopted Transportation System Plan calls for a roundabout or traffic signal).

2. Modifications to Design Alternative 3: the URA recommended exploring two modifications to Design Alternative 3:
    a. Explore shifting on-street parking along 13th Street from the east side of street to the west side of the street to improve on street parking access
    b. Explore modifying the street design along 12th Street to eliminate the straight line-of-sight and calm traffic between Belmont Street and May Street.

The evaluation, which included quantitative and qualitative criteria, considered the overall function of each alternative and the individual function of 12th and 13th Streets. This approach helped the project team better understand how each alternative aligns with project goals given differences between the designs for 12th and 13th Street within a single alternative.

While the evaluation does get into the details of each design the purpose of the evaluation is not intended to compare the performance of individual criteria but to gain a more complete understanding of the overall performance of each design alternative as related to project goals. This will help guide conversations with the URA and community as we discuss trade-offs between the designs and work towards developing a preferred design alternative, which we anticipate may combine components from each of the design alternatives.

Overview of Design Alternatives

The preliminary design alternatives (Appendix D) identify potential elements that could be considered, together or in part, for the preferred design that will be developed with URAB, URAC and community input. The intent of these preliminary alternatives is not to provide a single alternative that will be selected, but options for consideration. The preferred alternative may combine aspects of more than one design alternative that best meets the goals of the project and incorporates community input.

Design Alternative 1

This alternative converts existing one-way traffic on 12th and 13th Streets to two-way traffic, eliminating one-way streets that lead to wrong-way drivers who are unfamiliar with the area. Two travel lanes are maintained on each street; however, each street is designed differently:

- 12th Street is designed to function as more of a traditional "Main Street" with two-way vehicle travel and parking on both sides of the street.
- 13th Street is designed to function as more of a "Mobility Street" that focuses on moving people driving and biking north and south through the Heights.

This approach prioritizes people headed to local destinations along 12th Street while people passing through the Heights can use 13th Street. The conversion to two-way traffic also provides an all ages and abilities bike facility on one-way separated bike lanes, which are separated from the roadway with a curb and are not located adjacent to parking. Key intersections at 12th and 13th Streets along May Street and Belmont Avenue would be controlled with traffic signals.

Design Alternative 2

This alternative reduces 12th Street and 13th Street to one lane of one-way traffic in each direction. This alternative was developed to slow traffic through the Heights, provide shared space for walking and biking, and provide on-street parking on 12th and 13th Streets. For this alternative:

- 12th Street is designed as a "Parking Street" with on-street parking on both sides of the street.
- 13th Street is designed as a "Green Street" with a shared use path for people walking and biking and a wider planting area for healthy trees and landscaping.

A mini roundabout at 13th/May and a double roundabout at 13th/12th/Belmont help reduce impacts to traffic flow (compared to a traffic signal) for the one lane, one-way roadways.

Design Alternative 3

This alternative changes how the streets are used and how traffic and people move through the Heights. This alternative converts the existing one-way traffic on 13th Street to two-way traffic while maintaining one-way traffic on 12th Street. For this alternative:

- 12th Street is designed as more of a "People Street" with diagonal parking, a two-way protected bike lane (or cycle track), and opportunities for gathering spaces.
- 13th Street is designed to function as more of a "Vehicle Street" with a center turn lane and on-street parking.

This alternative was developed to balance the community's desires to maintain traffic flow, accommodate on-street parking, and create safe places for people biking and gathering. Key intersections at 12th and 13th Streets along May Street and Belmont Avenue would be controlled with traffic signals.

Goal Alignment

When the design alternatives were initially presented to the URAB, we highlighted how each design alternative aligned with project goals based on key evaluation criteria (Appendix A). Since that initial presentation a full evaluation of the design alternatives has been completed across all criteria and additional implementation feasibility criteria. This full evaluation uses the same rating system based on how each criterion aligns with the project goals:

Very good alignment with project goals

Good alignment with project goals

Average alignment with project goals

Poor alignment with project goals

Undesirable alignment with project goals

Based on feedback received from the URAB and URAC on October 21, 2021 each criteria is weighted equally, with no prioritization of one goal over another.

The project goals adopted by the URAB in Phase 1 are:

Project Goal 1: Calm traffic and improve intersections to improve safety for people driving, walking, biking, taking transit and supporting local businesses.

Project Goal 2: Preserve and promote a livable community and economy through streetscape improvements that increases safety for people walking and biking and addresses parking needs to support local business access, and future mixed-use development.

Project Goal 3: Create an identify for the Heights that reflects the diverse culture and history of the area and as destination for local residents for goods and services.

Project Goal 4: Create streets and gathering spaces that provide safe, comfortable places for people walking, accessing transit, and biking along and across the corridor and that connects area recreation and commercial destinations and neighborhoods.

Project Goal 5: Support existing and future development by maintaining and improving utility infrastructure as part of the streetscape project.

Project Goal 6: Engage local residents and businesses, the school district, and those that use the corridor to provide ongoing input in the streetscape project.

- Note, this goal is not part of the current evaluation but will be part of the final evaluation after the public has had the opportunity to review and provide comments on the design alternatives and evaluation process.

Project Goal 7: Provide locations for people to gather, to stop and rest.

The additional feasibility criteria that are part of this evaluation include the following:

- Potential cost and funding opportunities for implementation
- Potential construction impacts

- Ability to maintain the proposed infrastructure improvements
- Ease of obtaining ODOT design approval
- Property impacts and the potential need for right of way acquisition

Table 1 is a summary of the full evaluation for each design alternative. The colored rating shown for each goal is an average rating derived from ratings for each individual criterion based on how the design alternative aligns with project goals. Based on this evaluation Design Alternative 1 aligns best with project goals followed by Design Alternative 3 and then Design Alternative 2.

Table 1: Evaluation Summary of Preliminary Design Alternatives

	Goal 1 Traffic	Goal 2 Livability	Goal 3 Identity	Goal 4 Connecting People	Goal 5 Utility	Goal 7 Placemaking	Feasibility
Design Alternative 1							
Design Alternative 2							
Design Alternative 3							

What stands out from this table is that many of the ratings have a “good” alignment with projects goals and only a few ratings have “very good” or “poor” alignment with project goals.

Of the seven project goals:

- two goals (4 and 7) have the same rating for each alternative,
- three goals (2, 3 and 5) are only separated by one rating “step” across each alternative, and
- Goal 1 and the Feasibility Criteria have different ratings for each alternative.

For Goal 1 and the Feasibility Criteria, which have all different ratings, the variation in ratings suggests these categories might be differentiators when comparing alternatives:

- Goal 1 evaluation metrics include how the design accomodates vehicular traffic, improves intersection functionality, and accomodates truck and emergency vehicle access.
- Feasibility Criteria generally refers to the ablity to fund and construct street improvements and metrics include considerations such as costs and funding differences, implementation, construction impacts, obtaining design approval, property impacts, and additional right of way land needed.

For both of these categories Design Alternative 2 aligns poorly with project goals. Goal 1 was identified by the URAB as being the most important goal for addressing community needs. The following discussion highlights findings from the traffic analysis.

Traffic Analysis

Each of the design alternatives creates significant changes from today's traffic patterns and reduces the comfort and convenience for vehicular traffic. Therfore, a critical part in identifying a preferred design for the Heights is understanding how vehicle mobility will be impacted today and in the future. To provide a comparison to today's vehicle traffic the traffic analysis evaluated all three design alternatives and the Transportation System Plan (TSP) Scenario. This section highlights key findings from the traffic analysis (see Appendix B for the complete analysis).

The evaluation of future traffic is based on forecasted traffic volumes for 2039 from the City's Transportation System Plan.

Traffic Flow and Intersection Performance

All three alternatives result in more traffic congestion and delay travelling through the Heights compared to the future TSP Scenario.

Design Alternative 1 performs the best and has the least delay, adding approximately 30 additional seconds for vehicles travelling through the Heights.

Design Alternative 2 performs the worst with vehicles experiencing delays up to approximately 90 additional seconds to travel through the Heights. At key intersections vehicle queues extend for multiple blocks for Design Alternative 2 and are significantly longer than vehicle queues for Design Alternatives 1 and 3.

Alternative 2, with only one lane of one-way traffic, could have the highest potential to divert traffic away from the Heights. However, because there are not good alternate routes through the Heights (i.e. a lack of parallel routes to 12th and 13th Streets) the amount of traffic that could travel a different route is low regardless of the design alternative.

The performance of Design Alternative 3 depends on the direction of travel. Vehicles travelling south through the Heights on 13th Street might experience delays similar to Design Alternative 2 (up to 90 additional seconds to travel through the Heights) whereas northbound delays on 13th are expected to be more reasonable and increase by less than 30 seconds.

Key Intersection Bottlenecks

Two key intersections, 13th/May and 13th/12th/Belmont, function as "bottlenecks" for vehicle performance in each of the alternatives. These locations function poorly for each of the alternatives and require adjustments to the preliminary intersection designs (i.e. capacity enhancements) to improve the performance at the intersections and overall function of the design alternatives. These adjustments will increase property impacts at intersections to accommodate additional or longer intersection channelization and the streetscape experience near the intersections.

Roundabouts

Although roundabouts are only included in Design Alternatives 2 and 3 both roundabouts and traffic signals were tested at each major intersection (13th/May, 13th/Belmont, 13th/12th/Belmont) for each of the alternatives. Because the intersection control (i.e. roundabout vs signal) is not necessarily a requirement of the broader circulation changes and active transportation improvements this comparison was conducted to understand potential trade-offs for selecting intersection controls.

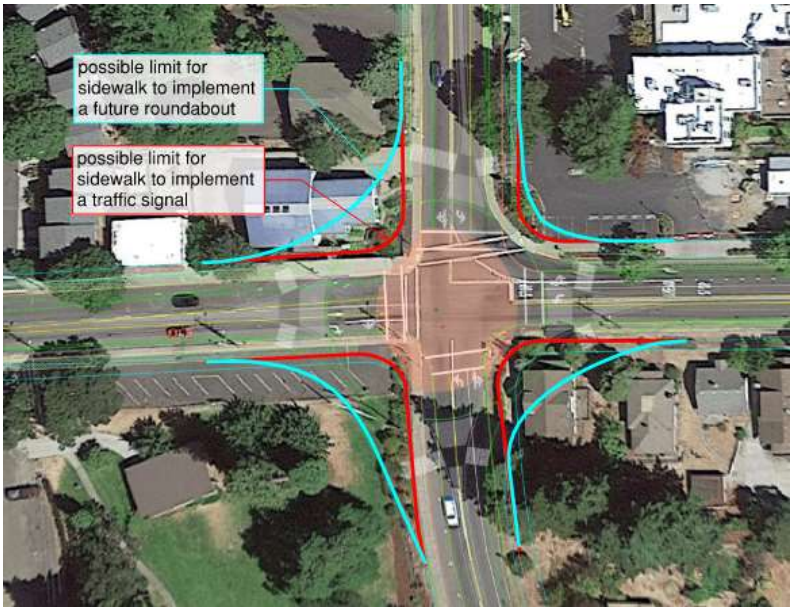
The results showed that given the high traffic volumes on 13th Street, single-lane roundabouts do not perform well, with significant delay expected, similar to the preliminary intersection design with a traffic

signal. To improve the performance of the roundabouts, a second lane would need to be added through part of the roundabout. For example:

- 13th/May – a single lane mini roundabout (as originally drawn), or even a full-sized single-lane roundabout, would fail to meet mobility targets during the 2039 p.m. peak hour and would experience significant congestion and long vehicle queues. Instead, a larger roundabout with a second southbound lane through the intersection would be needed, making the roundabout a partial multilane roundabout. Due to the circulation changes associated with Alternative 3, a westbound right turn slip lane would also be required.
- 13th/12th/Belmont – a double roundabout such as the one shown in Design Alternative 2 should include two southbound lanes through the roundabout and two northbound lanes exiting the roundabout on 12th Street. The northbound lanes would extend one or two blocks north of Belmont and would impact the streetscape character and experience on 12th Street.

These changes would greatly increase the footprints of the intersections and the street approaching/ exiting the roundabout, compared to what is currently drawn, and will require significant right of way acquisition (see Figure 1), have greater impacts on adjacent properties, and significantly increase implementation costs. At 13th/May the existing topography and slopes of the roadway also present challenges for a larger roundabout.

Figure 1 – Footprint comparison of potential future traffic signal vs roundabout at 13th Street/May Street



Design Adjustments to Improve Vehicle Performance

The traffic analysis memo (Appendix B) discusses specific design adjustments (or mitigation measures) needed for the intersection concepts at the two "bottleneck" intersections of 13th/May and 13th/12th/Belmont. These adjustments are needed to address significant mobility deficiency issues for each design alternative.

To identify these adjustments an alternative-by-alternative analysis was performed to confirm that reasonable modifications could be made to the original intersection concepts to achieve "acceptable" results. Although these adjustments will be further refined with the preferred design alternative, we

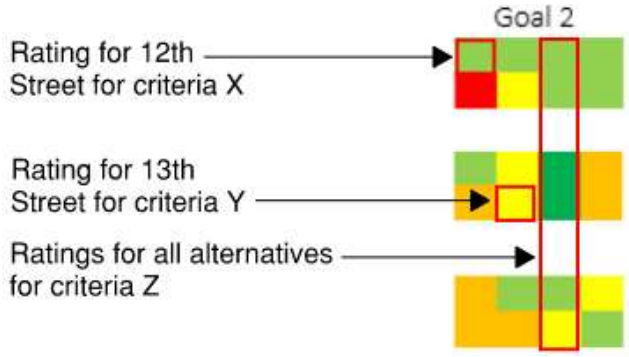
recommend communicating these modifications to the URAB, URAC, ODOT, and community when the preliminary design alternatives and evaluation are presented; while the adjustments help improve operational issues they do come with tradeoffs including additional property impacts or turn restrictions.

Updated intersection graphics that incorporate the adjustments will be developed for the final preferred design alternative.

How Design Alternatives Differ

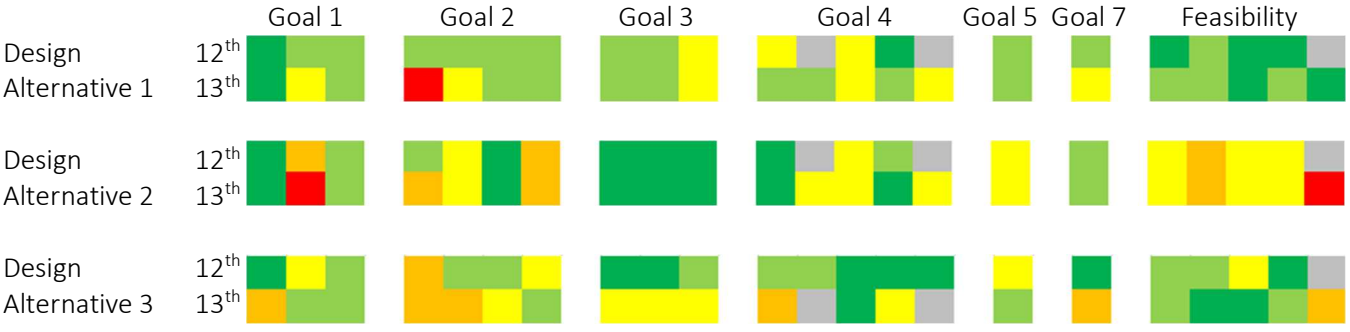
In addition to exploring the traffic analysis we also examine ratings within individual criteria to look for differences in the performance across design alternatives. The average ratings for each goal in Table 1 were based from ratings for each individual criterion, which included separate ratings for 12th and 13th for each design alternative. A matrix of the full evaluation and individual ratings for all of the evaluation criteria is included in Appendix C.

Table 2 below presents a more detailed graphic of the full evaluation matrix. Each colored square corresponds to a rating given to a specific street (12th or 13th) for each specific evaluation criteria (note, gray squares indicate a criterion that did not apply). Each column of colored squares represents the ratings across a single criterion for each design alternative.



Although the graphic in Table 2 does not have labels to indicate which column is associated with a specific evaluation criterion it does show at a high-level how the ratings vary across evaluation criteria within each goal and across each of the design alternatives.

Table 2: Evaluation Summary of Preliminary Design Alternatives



Looking closely at this graphic we can identify a handful of evaluation criteria (shown as columns) that have a wider range of color coding from top to bottom. These evaluation criteria have ratings that range from “very good to poor” or “good to undesirable” across the three design alternatives. These criteria are:

- Goal 1 (column 1) - Traffic calming: All alternatives were rated as having very good traffic calming except for the three-lane street section on 13th Street in Design Alternative 3. The three-lane street section is not ideal for calming traffic (however, the typical street section can be mitigated by integrating design measures along the street such as medians).
- Goal 1 (column 2) - Accommodates vehicular traffic: Design Alternative 2 with single travel lanes performs significantly the worse for vehicle traffic along the corridor and at intersections and present challenges for emergency service vehicles and was rated as undesirable.
- Goal 2 (column 1) - Accommodates parking: Parking is maintained or reduced in all scenarios, however in Design Alternative 1 parking is removed entirely from 13th Street, which is rated as undesirable.
- Goal 4 (column 1) - Comfortable places for walking: Design Alternative 2 provides wider sidewalks than existing width and aligns very good with project goals. However, although sidewalks are not reduced in any alternative, the sidewalk on 13th Street in Design Alternative 3 has no buffer from the northbound travel lane and was given a poor rating.
- Goal 7 – Opportunities for Placemaking: In Design Alternative 3 12th Street functions as a "People Street" and offers very good opportunities for placemaking but 13th Street is designed as a "Vehicle Street" had poor opportunities for placemaking.
- Feasibility criteria (column 2) - Potential implementation considerations and construction impacts: The implementation of Design Alternatives 1 and 3 was rated as good or very good given the similarities for where future travel lanes would be located compared to today's roadway and because the wider two- or three-lane streets provide more flexibility, whereas the single travel lanes in Design Alternative 2 was rated as poor due to concerns associated with having one travel lane in each direction through the Heights, which creates both challenges for both operations and construction.
- Feasibility criteria, last column - Property impacts/ROW acquisition: the roundabouts in Design Alternatives 2 and 3 require more right of way acquisition and have greater impacts on adjacent properties than traffic signals would have at the same intersections and were rated as poor..

Although we have only singled out a few evaluation criteria, when coupled with key findings from the traffic analysis, we can begin to see where key differences exist between the design alternatives. Based on our analysis and evaluation of design alternatives we have identified the following as key elements to be discussed further with the URAB, URAC, ODOT, and broader community:

1. Confirm the level of congestion that can be tolerated for vehicle traffic to achieve a safer, more comfortable street environment for all modes of travel.
2. Key intersections are not well suited for roundabouts.
3. Impacts to parking, loading, and delivery vary between the design alternatives with the impact depending on the configuration and location of on-street parking and number of travel lanes on the street, which can impact access.
4. One lane streets rate poor in terms of flexibility, adaptability, and feasibility compared to two lane streets.
5. Are future bike connections and alignment with Safe Routes to School recommendations, which best align with Design Alternative 3.

Cost Considerations for Constructing Future Street Improvements

A planning level cost estimate was developed for each design alternative to identify an order of magnitude cost range for constructing future street improvements and to determine whether significant cost differences exist between the design alternatives. This cost range should not be used for budgeting or future project planning. A cost estimate for the preferred design alternative will be developed during the next phase of the project for the City and Urban Renewal Agency's use in planning future street improvements.

The order of magnitude cost range was developed using the following steps:

1. A list of typical unit costs was identified for each element shown in the typical street cross sections (e.g. unit costs per square foot of concrete sidewalk, asphalt pavement, planting area, bike lane, planting area and linear foot for curb and gutter).
2. Unit costs were multiplied by the widths shown in the typical street sections to identify a linear foot cost for constructing the street.
3. Linear foot costs for each street were multiplied by the lengths of each roadway.
4. Cost allowances were added for intersection improvements, including key intersections (i.e. roundabouts and traffic signals) and minor intersections at local streets (e.g. A, B, C Streets).
5. Costs were added for providing new storm drainage infrastructure, planting street trees, adjusting existing utilities to grade, removing existing pavement and sidewalks, and providing street furnishings.
6. Costs were added as a percentage of total costs to account for site preparation, earthwork, temporary traffic control, and mobilization.
7. Cost allowances were added for property acquisition at 13th/May and 13th/Belmont for the construction of traffic signals and roundabouts. These allowances are not based on a market analysis and include the following assumptions:
    a. $125k to accommodate a traffic signal and additional channelization
    b. $1.5M to accommodate a roundabout at 13th/May
    c. $2.5M to accommodate a double roundabout at 13th/Belmont/12th
8. Finally, costs were added as a percentage of total costs for design contingency and the phasing of future street improvements; the phasing allowance recognizes the project area will not be constructed at one time and allows for some rework as portions of the streetscape are implemented over.

The table below identifies a possible cost range for constructing new streets and intersections within the Heights. Additional assumptions and notes that apply to the development of this cost include:

- Assumes that all of the study area streets are fully reconstructed.
- Does not include new street or pedestrian lighting.
- Does not include costs to replace existing utilities or underground exiting overheard utilities.
- Does not include soft costs, such as design and engineering, city project management, permitting, and construction management.
- Includes an allowance for treating stormwater runoff from roadways.
- Does not include a cost for flow control to detain stormwater runoff from new pavement surfaces. If required, infrastructure for flow control will be designed and costed as part of future design phases.

- Does not include escalation.

Table 1: Planning level range of cost for constructing future street improvements

	Low Range	High Range
Design Alternative 1	$26M	$33M
Design Alternative 2	$35M	$44M
Design Alternative 3	$31M	$39M

Similar to the findings of the traffic analysis the key differences for costs between the design alternatives is the cost to implement key intersection improvements. The larger footprint for the roundabouts requires more cost to construct and acquire property.

Although this range in costs assumes full reconstruction of the full right of way, it is anticipated that some elements of the project could be partially retrofit and may not need full replacement.

As noted above this cost exercise was conducted to identify a possible order of magnitude cost range for constructing future street improvements and to determine whether significant cost differences exist between the design alternatives. This cost range should not be used for future project planning as it does not include design, engineering, and management and other soft costs. A planning level cost estimate for the preferred design alternative will be developed during the next phase of the project for the City and Urban Renewal Agency's use in planning future street improvements.

Next Steps

We recommend sharing the results of the evaluation with the URAB and URAC while the project team prepares for a public open house to present the preliminary design alternatives and evaluation findings to the public. The purpose of the open house will be to gather public feedback on the design alternatives to help the City and Urban Renewal Agency move forward with developing a preferred design alternative., which may combine aspects of more than one design alternative to best meets the goals of the project and incorporate community input.

Attached

Appendix A – Preliminary Evaluation Summary

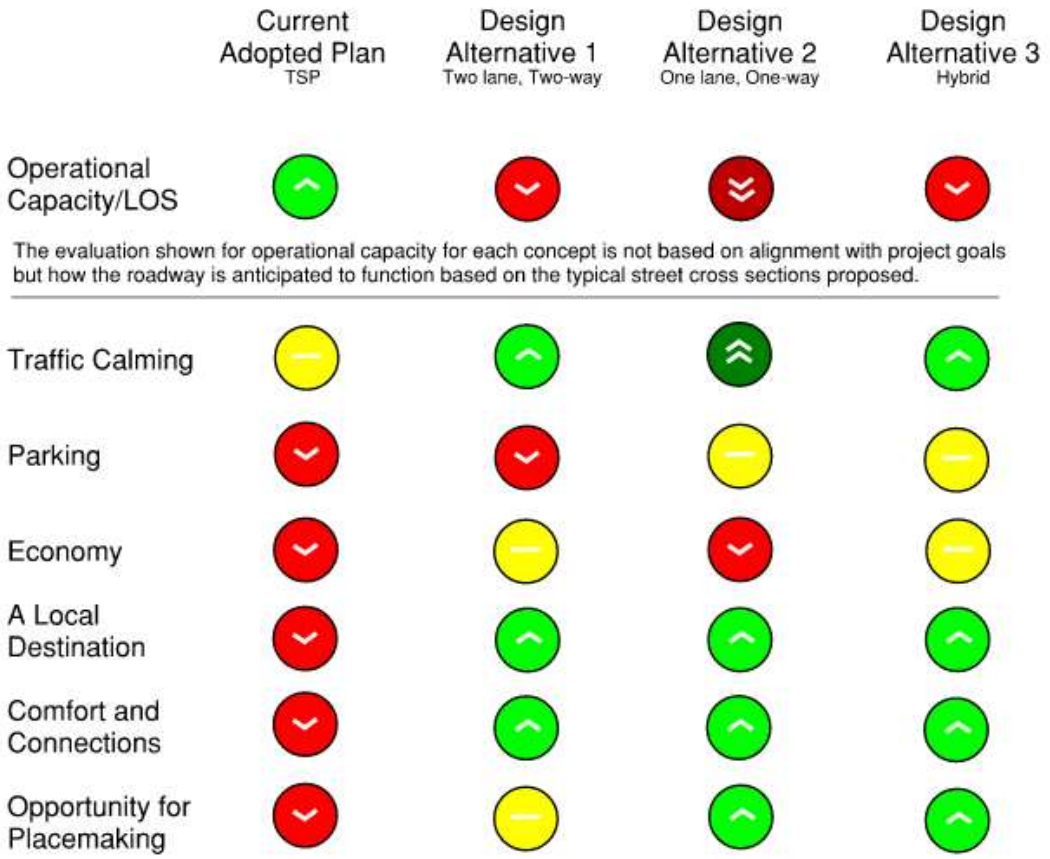
Appendix B – Alternatives Transportation Evaluation Memorandum

Appendix C – Full Evaluation of Preliminary Design Alternatives

Appendix D – Preliminary Design Alternatives

PRELIMINARY EVALUATION SUMMARY

This graphic presents is a side-by-side summary of the preliminary evaluation for each of the preliminary design alternatives and the City's current adopted plan in the TSP. This preliminary evaluation highlights key evaluation criteria and rates each alternative based on its alignment with the project goals.



Legend for Preliminary Evaluation

- Very good alignment with project goals
- Good alignment with project goals
- Average alignment with project goals
- Poor alignment with project goals
- Undesirable alignment with project goals

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TECHNICAL MEMORANDUM

DATE: February 28, 2022

TO: Nathan Polanski, PE | MIG

FROM: Alex Correa; Will McKenzie; Kayla Fleskes, PE; John Bosket, PE | DKS Associates

SUBJECT: Hood River Heights Streetscape Plan - Alternatives Transportation Evaluation Project #20203-000

This memorandum evaluates transportation conditions associated with alternatives being considered for improving multimodal travel within the Hood River Heights District, especially 12th and 13th Streets between May Street and the end of the couplet south of Belmont Avenue/Union Street. It is anticipated that this evaluation will act as a supplement to a larger evaluation of each alternative's ability to meet the project goals. The following sections provide a comparison of each alternative's strengths and weaknesses from the perspectives of travelers driving, walking, biking, and using transit (in the future).

ALTERNATIVES EVALUATED

Concept drawings of the alternatives evaluated from the Heights Streetscape Plan project are included in Appendix A. Below is a summary of the major elements of each alternative and key assumptions made for the evaluation process that are not explicitly shown in the conceptual layouts.

- Design Alternative 1: Two-Lane, Two-Way Circulation
  - Both 12th Street and 13th Street are converted to two-lane, two-way streets. 13th Street includes a separated bike lane in both directions, but all on-street parking is removed.
  - 13th Street/May Street and 13th Street/Belmont Avenue were evaluated under conditions with a traffic signal and with a roundabout.
  - Under the assumption of a traffic signal, the westbound lane figuration at 13th Street/May Street is assumed to be a dedicated left turn lane and a through/right lane rather than as drawn with a dedicated right turn lane and a through/left lane. This would require the through lane alignment to be adjusted through the intersection.
- Design Alternative 2: One-Lane, One-Way Circulation
  - Both 12th Street and 13th Street remain as one-way streets but are reduced to one lane in each direction.

- 13th Street/May Street was evaluated under conditions with a traffic signal and with a roundabout.
- 12th Street/Belmont Avenue and 12th Street/13th Street were evaluated as a joined "dog bone" roundabout where both intersections are fed into the same roundabout (See concept drawings in Appendix A for details).
- Union Street is assumed to be changed to right in/right out access and does not directly tie into the roundabout.

- Design Alternative 3: Hybrid Circulation
  - 13th Street is a two-way, two-lane street with a center turn lane/median between 13th Street/Taylor Avenue and 13th Street/12th Street.
  - 13th Street/May Street and 13th Street/Belmont Avenue were evaluated under conditions with a traffic signal and with a roundabout.
  - Under the assumption of a traffic signal, the westbound lane configuration at 13th Street/May Street is assumed to be a dedicated left turn lane and a through/right lane rather than as drawn with a dedicated right turn lane and a through/left lane. This would require the through lane alignment to be adjusted through the intersection.

ALTERNATIVES EVALUATION

The alternatives were evaluated using performance metrics that describe conditions important to each of the major modes of travel in the corridor and that align with the goals of the project. The following sections describe conditions for people driving, walking, biking, and using transit – beginning with conditions for people driving since the alternatives being considered will significantly alter travel patterns and speeds by automobile, which will in turn influence comfort and safety for the other modes of travel.

CONDITIONS FOR PEOPLE DRIVING

The nature of all alternatives being considered involves a reallocation of the public right-of-way with the purpose of improving the balance of comfort and convenience for all modes of travel. **Each alternative lessens the amount of comfort and convenience for motor vehicle travel, which in the past has been given priority, but by varying degrees.** The alternatives were evaluated for motor vehicle mobility using the following three-step process:

1. Traffic Volume Development – Future year traffic volumes were re-distributed throughout the Hood River transportation system due to changes in circulation brought on by characteristics of each design alternative such as intersection lane configurations, one-way vs two-way streets, number of lanes on each street, etc. Each alternative has a unique traffic volume set based on the re-distribution of trips in the area.

2. Intersection Performance Evaluation - Performance for all intersections within the study area was evaluated, utilizing the volumes developed in Step 1. Signalized and stop-controlled intersection calculations were performed using Synchro 10th edition and Highway Capacity Manual 6th Edition methodology. Roundabout intersection calculations were performed using PTV Vistro 2021 and Highway Capacity Manual 6th Edition methodology.

Intersection delay, level of service, volume-to-capacity ratio (v/c), travel time, and vehicle queuing, were all used to evaluate mobility.

3. Alternative Mitigation – In cases where mobility deficiencies for motor vehicle travel were found to be significant, reasonable modifications to the original concept to improve conditions were tested.

Evaluation criteria for motor vehicle travel are not only limited to mobility. Accessibility for truck and emergency vehicles, impacts on property access, and safety were all evaluated for each alternative as well. For each alternative, the degree to which the criteria are supported by each of the main corridors along 12th Street and 13th Street has been rated, with brief descriptions provided below and a summary chart provided in Table 5.

TRAFFIC VOLUME DEVELOPMENT AND DIVERSION IMPACTS

12th and 13th Streets currently form a couplet through the Hood River Heights District. Each of the alternatives makes modifications to circulation on 12th Street, 13th Street, and May Street. To understand future traffic volume shifts based on the changes in circulation, each of the alternatives were coded into the Hood River travel forecasting model developed for the Hood River Transportation System Plan (TSP). Based on the changes in circulation identified in the model, the future 2039 "No-Build" traffic volumes[1] were adjusted at each intersection.

In general, the following adjustments were made for each alternative:

- Alternative 1
  - Both northbound and southbound traffic volumes were split between 12th Street and 13th Street with the conversion to two-way traffic. Approximately 55 percent of northbound traffic is expected to remain on 12th Street, with 45 percent utilizing 13th Street instead.
  - Southbound volumes on 12th Street are significantly lower than southbound volumes on 13th Street given the limited connectivity north of May Street, representing only 15 to 20 percent of all traffic traveling southbound.
  - There is a slight increase in eastbound trips along May Street to the west of 13th Street as the eastbound left turn at May Street/13th Street, which is not allowed today, is allowed under Alternative 1.
  - With northbound travel now allowed on 13th Street, the number of northbound left turning vehicles at May Street/12th Street that subsequently turn right at 13th Street is reduced by approximately 80 percent.
- Alternative 2
  - Alternative 2 results in more diversion to the east and west than the other alternatives, but the amount of diverted traffic is relatively minor due to the limited north-south connectivity in the vicinity. To the west, about 75 p.m. peak hour southbound trips could be expected to divert to 22nd Street and Belmont Avenue. This is expected to increase eastbound right turns at 13th Street/Belmont Avenue by nearly 90 percent. To the east, where connectivity is

[1] Hood River Heights Urban Renewal Area – Transportation Study, Toole Design, February 7, 2020.

significantly more limited, there is the potential for a small amount (up to 25 p.m. peak hour trips) of trips to divert to local streets like 7th Street and Pine Street.

- There is a slight increase in eastbound trips along May Street to the west of 13th Street as the eastbound left turn at May Street/13th Street, which is not allowed today, is allowed under Alternative 1.

- Alternative 3
  - Alternative 3 sees a slightly higher shift in northbound traffic to 13th Street compared to Alternative 1, with approximately 65 percent utilizing 13th Street and 35 percent utilizing 12th Street.
  - There is a slight increase in eastbound trips along May Street to the west of 13th Street as the eastbound left turn at May Street/13th Street, which is not allowed today, is allowed under Alternative 1.

The average daily traffic volumes projected for the primary travel corridors of 12th Street, 13th Street, and May Street as a result of the circulation changes in each alternative are shown in Table 1. For reference, average daily traffic volumes today are approximately 9,700-10,600 on 12th and 13th Street and 9,400 on May Street[2].

Alternative 2 is expected to serve a similar amount of daily traffic on 12th Street and 13th Street as the No-Build conditions. Daily trips significantly increase on 13th Street in both Alternative 3 and Alternative 1 as 13th Street becomes the more natural through route. A corresponding decrease in daily traffic occurs on 12th Street in Alternatives 1 and 3. Daily trips increase more significantly on 13th Street in Alternative 3, as 13th Street serves both northbound and southbound traffic while 12th Street only serves northbound traffic and would be designed to be a slower "people street". Under both alternatives, 13th Street would serve a significant amount of daily traffic in a single lane per direction (for reference, Cascade Avenue today serves approximately 12,000-14,000 vehicles per day).

Traffic on May Street between 12th Street and 13th Street decreases in Alternative 1 and Alternative 3 as northbound traffic no longer needs to turn left at 12th Street and right on 13th Street to travel through the Heights.

[2] 2020 data obtained from ODOT TransGIS https://gis.odot.state.or.us/transGIS/

TABLE 1. APPROXIMATE 2039 DAILY TRAFFIC VOLUMES ON AREA STREETS

STREET	APPROXIMATE 2039 DAILY TRAFFIC VOLUMES			
	NO-BUILD	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
12TH STREET (BELMONT TO MAY)	13,000	10,000	13,000	6,000
13TH STREET (MAY TO BELMONT)	13,000	16,000	13,000	20,000
MAY STREET (12TH TO 13TH)	9,500	6,500	11,000	8,000

INTERSECTION PERFORMANCE EVALUATION

Intersection operations were analyzed in Synchro/SimTraffic software and PTV Vistro 2021 using Highway Capacity Manual 6th Edition methodology to understand the impact of the various alternatives. Performance measures used for this analysis include volume-to-capacity (v/c) ratios, seconds of control delay, and levels of service (LOS). Intersection operations and queueing reports are included in Appendix B to E. Table 2 lists the intersection operations for each alternative, as well as the TSP Build alternative, which maintains the existing traffic circulation and lane configuration but adds a traffic signal at 13th Street/May Street and 13th Street/Belmont Avenue. Both roundabouts and traffic signals were tested at the major intersections for each of the alternatives, as specific intersection control is not necessarily a requirement of the broader circulation changes and active transportation improvements identified in each alternative.

13th Street, 12th Street, and May Street between 12th and 13th Streets are under the jurisdiction of the Oregon Department of Transportation (ODOT)[3], while all other streets analyzed in this study are under the jurisdiction of the City of Hood River. For the ODOT roadways, the adopted mobility target is a v/c ratio at or below 0.95[4]. For all other roadways, the City of Hood River's adopted mobility standard is LOS D or better.

While ODOT's adopted mobility target ($v/c \leq 0.95$) already allows for a considerable amount of congestion, ODOT would allow more ($v/c \leq 1.0$) if this area were designated as a Special Transportation Area. Special Transportation Areas are intended to be areas with compact, mixed-use development and well-developed transit, bicycle, and pedestrian facilities, which aligns with the vision for the Heights. Therefore, for planning purposes, a maximum v/c ratio threshold of 1.0 will be used to indicate when there is too much congestion at intersections. Similarly a LOS F condition

[3] OR 281 is a state highway routed over a City street, where ODOT maintains jurisdiction between the curbs.

[4] Typically, ODOT would design to lower v/c ratios in the Highway Design Manual when planning for improvement projects. However, the v/c ratios in the 1999 Oregon Highway Plan are more consistent with the long-range vision for this area as expressed by the City. Therefore, for the purpose of this plan, it is assumed that ODOT would not require designing future improvements to meet the Highway Design Manual standards.

will be used to identify areas where delays would be excessively long, even where v/c ratios are less than 1.0.

As presented in Table 2, there are areas in each alternative where mobility deficiencies exist. The TSP Build alternative performs the best at the major bottlenecks at 13th Street/May Street and 13th Street/Belmont Avenue, as there are two southbound through lanes and no conflicting northbound traffic. Without additional capacity enhancements, neither roundabouts nor signalized intersections are able to serve the expected demand at those intersections in any of the alternatives, with v/c ratios above 1.0 (with the exception of a signalized intersection at 13th Street/Belmont Avenue in Alternative 3). 12th Street/May Street operates well below capacity, regardless of alternative.

TABLE 2. INTERSECTION OPERATIONS RESULTS (2039 WEEKDAY PM PEAK HOUR)

STUDY INTERSECTION	TSP BUILD			ALTERNATIVE 1			ALTERNATIVE 2			ALTERNATIVE 3		
	LOS	DELAY	V/C	LOS	DELAY	V/C	LOS	DELAY	V/C	LOS	DELAY	v/c
SIGNALIZED												
13TH STREET / MAY STREET	C	31	0.96	D	36	**1.11**	**F**	**96**	**1.47**	D	37	**1.12**
12TH STREET / MAY STREET	C	23	0.62	C	27	0.66	D	41	0.76	C	20	0.32
13TH STREET / BELMONT AVE	A	9	0.71	D	35	**1.55**	N/A	N/A	N/A	C	26	0.92
ROUNDABOUT												
13TH STREET / MAY STREET	N/A	N/A	N/A	E	50	**1.14**	E	45	**1.09**	**F**	**92**	**1.25**
13TH STREET / BELMONT AVE	N/A	N/A	N/A	E	47	**1.09**	N/A	N/A	N/A	**F**	**59**	**1.12**
13TH STREET / 12TH STREET / BELMONT AVE	N/A	N/A	N/A	N/A	N/A	N/A	**F**	**94**	**1.20**	N/A	N/A	N/A
TWO-WAY STOP-CONTROLLED												
13TH STREET / TAYLOR AVE	A/**F**	7/**400**	0.56/**1.68**	B/**F**	11/**73**	0.42/0.62	A/**F**	7/**135**	0.73/0.99	B/**F**	12/**291**	0.54/**1.21**
13TH STREET / A STREET	A/**F**	7/**246**	0.61/**1.24**	B/**F**	11/**208**	0.38/0.99	A/**F**	7/**84**	0.75/0.66	B/**F**	11/**642**	0.56/**1.89**
12TH STREET / TAYLOR AVE	A/**F**	8/**58**	0.72/0.48	A/C	8/17	0.53/0.18	A/**F**	8/**134**	0.86/0.71	A/C	7/15	0.36/0.06
12TH STREET / PINE STREET	A/**F**	0/**80**	0.63/0.86	B/D	10/27	0.16/0.40	A/**F**	0/**76**	0.81/0.79	A/B	0/14	0.34/0.22
12TH STREET / WILSON STREET	A/**F**	7/**368**	0.65/**1.40**	A/D	10/30	0.15/0.19	A/**F**	7/**138**	0.79/0.80	A/C	7/15	0.32/0.07
12TH STREET / UNION STREET	A/**F**	8/**1214**	0.68/**3.40**	A/E	10/48	0.14/0.49	N/A	N/A	N/A	A/C	7/18	0.34/0.21
13TH STREET / 12TH STREET	N/A	N/A	N/A	-/D	-/26	-/0.56	N/A	N/A	N/A	N/A	N/A	N/A

Bold and red indicates a "failing" condition, which could be a v/c ratio of 1.0 or greater or a LOS F.
For two-way stop-controlled intersections, results are shown for the major street/minor street approaches with the most congestion, where the minor street would be stop-controlled.

Key findings for the major intersections (as currently drawn in the concepts and without any additional mitigations) are discussed below:

- 13th Street/May Street
  - This intersection functions well under the TSP Build scenario. It would feel somewhat congested, but not excessively.
  - A single lane roundabout at this location is not expected to perform well, with the southbound approach operating over capacity in each of the three alternatives (ranging from a v/c of 1.09 to 1.25). Southbound queues would be expected to extend to Eugene Street. In Alternative 3, the westbound approach is also over capacity and would need further mitigation.
  - A traffic signal at this intersection is not expected to perform well under either Alternative 1, 2, or 3 as designed in the original concept. In particular, a single shared southbound lane is shown in each of the alternatives, which significantly increases queueing and delay on the southbound approach.
- 13th Street/Belmont Avenue
  - This intersection would operate very well under the TSP Build scenario.
  - A single lane roundabout would be unable to serve the demand at this intersection, with the southbound approach experiencing significant delay and queues expected to extend beyond C Street.
  - A traffic signal at this intersection is not expected to perform well in Alternative 1 with an expected intersection v/c ratio of 1.55. However, when a southbound left turn lane is added in Alternative 3, the intersection v/c ratio is significantly improved and operates below capacity.
  - The "dog bone" roundabout at 12th Street/13th Street/Belmont Avenue (shown in Alternative 2) also would not perform well with only a single lane to serve demand at the northbound and southbound approaches. The resulting vehicle queues on those approaches would be very long.
- 12th Street/May Street
  - The signalized intersection generally performs well under all alternatives, with a v/c ratio well below 1.0.
  - Under Alternative 2, there is only a single westbound through lane between the north and south leg of the intersection, which provides limited storage space and causes queue spillback on the southbound and westbound legs of the intersection.
- Two-way stop-controlled intersections
  - In general, many future two-way stop-controlled intersections operate with significant side-street delay, regardless of alternatives.
  - Side street delay is higher on 12th Street in Alternative 2 as there is significant northbound volume in a single through lane, leading to fewer gaps for side street vehicles to turn onto 12th Street.
  - Alternatives 1 and 3 experience less side street delay than the TSP Build scenario, with Alternative 1 having slightly better performance overall, especially on 13th Street.
  - The southbound connection from 12th Street to 13th Street in Alternative 2 is expected to function well as the southbound traffic only yields to a single northbound lane prior to turning into an added southbound lane shadowed by the pedestrian refuge island.

ALTERNATIVE MITIGATION

The key to identifying what aspects of which streetscape alternative work best and which have areas for improvement relies on looking closely at "bottleneck" intersections. To do this, an alternative-by-alternative analysis is performed, and reasonable mitigation measures are implemented to improve mobility while taking into account right-of-way limitations, topography, and the inclusion of improved pedestrian and bicycle facilities included in each alternative. The two main bottleneck intersections evaluated for mitigations for each alternative are 13th Street/May Street and 13th Street/Belmont Avenue. Table 3 summarizes the operational results for the proposed mitigations, described in more detail below.

13th Street/May Street

- A traffic signal at this intersection should include the addition of a dedicated southbound left turn lane8. This addition could be difficult due to topographical concerns in the northwest corner and right-of-way limitations with the hospital parking lot in the northeast corner of the intersection.
- A traffic signal is not expected to perform well in Alternative 2 without significant mitigation, such as converting May Street between 12th Street and 13th Street to westbound only and adding extra turn lanes (which would have a significant impact on connectivity in the area and to the hospital and the ability to maintain the pedestrian and cyclist improvements shown in Alternative 2 on May Street) or adding a second southbound through lane (which is inconsistent with the rest of the alternative, which includes a single southbound lane on 13th Street).
- A roundabout at this intersection should include an additional southbound through lane, making the roundabout a partial multilane roundabout. This mitigation would greatly increase the footprint of the intersection, have large impacts to adjacent properties and significantly increase costs (see concept drawing in Appendix F). Due to the circulation changes associated with Alternative 3, a westbound right turn slip lane would also be required to reduce to the westbound v/c ratio below 1.0.

13th Street/Belmont Avenue

- A traffic signal at this intersection could include varying levels of mitigations, depending on the alternative.
    - For the alternatives with two-way traffic on 13th Street (Alternatives 1 and 3), the following mitigations should be included to reduce southbound queueing and reduce the potential for queue spillback between 12th Street and 13th Street on Belmont Avenue:
        - Add a southbound left turn lane (already included in Alternative 3).
        - Close the northbound left turn, rerouting traffic along 12th Street to Belmont Avenue to become a westbound through movement instead.
        - Close the westbound left turn. The vehicle rerouting caused by this mitigation would be more easily accommodated in Alternative 1 as 12th Street connects directly to southbound 12th Street at the south end of the couplet.
    - For Alternative 2 with one-way traffic on 13th Street, dual southbound through lanes would be necessary at the intersection with a traffic signal (similar to what exists today) and an eastbound right turn lane would be needed to reduce excessive queueing eastbound. The dual southbound through lanes would minimally need to extend the block between A Street and Belmont Avenue.

- A roundabout at this intersection would function best with dual southbound through lanes, regardless of if the roundabout is a dog bone style, such as the one shown in Alternative 2 or a standard roundabout.
  - Even with dual southbound lanes approaching the roundabout, in Alternative 2 with the dog bone configuration, the northbound approach v/c would be 1.07, as shown in Table 3 below. To mitigate the northbound approach v/c, a second northbound through lane would need to be carried through the roundabout before being dropped as a turn lane at A Street or B Street.
  - In Alternative 1, instead of dual southbound through lanes, Belmont Avenue could be converted to eastbound only (i.e., only a roundabout exit) to reduce the southbound v/c ratio just below 1.0 as shown in Table 3.

TABLE 3: MITIGATED INTERSECTION OPERATIONAL RESULTS (2039 WEEKDAY PM PEAK HOUR)

STUDY INTERSECTION	ALTERNATIVE 1			ALTERNATIVE 2			ALTERNATIVE 3		
	LOS	DELAY	V/C	LOS	DELAY	V/C	LOS	DELAY	V/C
SIGNALIZED									
13TH STREET / MAY STREET	C	29	0.92	D	38	0.71	C	30	0.92
13TH STREET / BELMONT AVE	C	20	0.80	A	9	0.68	C	23	0.83
ROUNDABOUT									
13TH STREET / MAY STREET	C	17	0.83	C	17	0.87	C	18	0.86
13TH STREET / BELMONT AVE	D	33	0.97	N/A	N/A	N/A	D	27	0.97
13TH STREET / 12TH STREET / BELMONT AVE	N/A	N/A	N/A	D	32	**1.07**	N/A	N/A	N/A

Bold and red indicates a "failing" condition, which could be a v/c ratio of 1.0 or greater or a LOS F.
For two-way stop-controlled intersections, results are shown for the major street/minor street approaches with the most congestion, where the minor street would be stop-controlled.

With the mitigations listed above, intersection operations can be significantly improved compared to the original concept drawings. However, each of the mitigations come with various tradeoffs related to property impacts, costs, and impacts to other modes of travel. These tradeoffs will need to be weighed before deciding on a preferred concept. In general, the following summarizes the operational performance of each alternative:

- **Alternative 1** performs the best between alternatives, as two-way traffic allows the demand to spread across both 12th and 13th Street. With mitigation, there would still be significant queueing southbound, with 95th percentile queues[5] extending from Belmont Avenue nearly to May Street.
- **Alternative 2** is expected to perform poorly, even with mitigation, as there is only a single northbound and southbound through lane to serve the traffic demand, resulting in significant queueing and spillback between intersections, particularly at 13th Street/May Street
- **Alternative 3** performs slightly better than Alternative 2, but since there is still only a single southbound through lane to serve the demand, it does not perform as well as Alternative 1, and experiences significant southbound queue spillback on 13th Street.

SIDE STREET DELAY

Side street delay (i.e., how long it takes to turn onto 12th and 13th Streets from stop-controlled side streets) is another performance measure used to describe levels of congestion associated with each alternative. Based on the performance listed in Table 2, the following summarizes key findings related to side street delay.

- Overall, side street delay is the lowest on Alternative 1 with moderate delays on 13th Street and low delays on 12th Street.
- Side street delay is generally the worst with Alternative 2. The is especially true along 12th Street, where there is significant northbound volume in a single through lane leading to fewer gaps for side street vehicles to turn onto 12th Street.
- With Alternative 3, side street delay on 13th Street is significant, as 13th Street is serving far more traffic than under the other alternatives and the street crossing is wider. However, side street delays on 12th Street are low.

TRAVEL TIME

Travel time is a practical measure of mobility that can help to contextualize the performance of a system and can be used to make high-level comparisons between alternatives. For the Hood River Heights, travel time from the north end of the area (12th or 13th Street bounded by May Street) and the south end of the area (where the couplet converges) is of particular importance for local and regional connectivity.

The change in travel time for each alternative with the traffic signal mitigations relative to the TSP Build scenario is shown below in Table 4. Tavel times were calculated using SimTraffic software for comparison purposes only between scenarios, as this model was not calibrated to existing conditions travel times.

Alternative 1 experiences reasonable increases in travel times compared to the TSP Build scenario, with about 30 seconds or fewer of added time in either direction. Travel times under Alternative 2 increase significantly, taking more than 90 seconds longer to travel southbound (13th Street) and 60 seconds longer to travel northbound (12th Street). Southbound travel times under Alternative 3

[5] 95th percentile queues represent queue lengths that have a five percent probability of being exceeded during the analysis period and are typically used when designing appropriate storage lengths at intersections.

also take about 90 seconds longer (13th Street) but northbound travel times (also 13th Street) are reasonable and increase by less than 30 seconds.

TABLE 4. TRAVEL TIMES ALONG 12TH AND 13TH STREETS

DIRECTION	STREET	CHANGE IN TRAVEL TIME RELATIVE TO TSP BUILD SCENARIO (SECONDS / PERCENT CHANGE)		
		ALTERNATIVE 1 W/ SIGNAL MITIGATIONS	**ALTERNATIVE 2** W/ SIGNAL MITIGATIONS	**ALTERNATIVE 3** W/ SIGNAL MITIGATIONS
NORTHBOUND (SOUTH COUPLET END TO MAY ST)	12th Street	+ 33s / 43%	+ 60s / 78%	+ 63s / 82%
	13th Street	+ 18s / 23%	-	+ 23s / 30%
SOUTHBOUND (MAY ST TO SOUTH COUPLET END)	12th Street	- 100s / - 57% [A]	-	-
	13th Street	+ 35s / 20%	+ 95s / 54%	+ 90s / 51%

[A] Southbound travel time in Alternative 1 on 12th Street is compared to the TSP Build southbound travel time on 13th Street. The Alternative 1 travel time does not include any signal delay at May Street/12th Street while the TSP Build southbound travel time on 13th Street does include the signal delay at May Street/13th Street, making it appear as if there is a decrease in travel time.

TRUCK ACCESIBILITY AND EMERGENCY SERVICE NEEDS

Given the location of the hospital on the north end of the couplet, it is critical that emergency vehicles can easily pass through this corridor. Alternatives that include multiple travel lanes on each street provide more opportunities for emergency vehicles to pass around stopped traffic. In addition, the presence of parallel parking may provide more space for vehicles to pull over, as long as there are a sufficient number of empty spaces. Parallel parking also provides opportunities for loading zones, so parallel parking in close proximity to businesses would be beneficial for delivery truck access.

With multiple travel lanes on both 13th and 12th Streets, Alternative 1 provides opportunities for emergency vehicles to pass around stopped traffic. The parallel parking on 12th Street may make this easier at times and also creates opportunities for truck loading zones. With only single travel lanes on both 13th and 12th Streets, emergency vehicle access could be restricted under Alternative 2, though the parallel parking may create opportunities if empty. Having parallel parking on both streets under Alternative 2 creates many opportunities for loading zones close to businesses. 13th Street may be the most accessible for emergency vehicles under Alternative 3, but 12th Street could be the most restricted. Loading zones could be located on one side of 13th Street, but may not be possible on 12th Street without losing many parking spaces.

One freight concern identified along 13th Street is the ability for trucks to travel up the hill just north of May Street, particularly during icy conditions. If a roundabout was installed at that intersection instead of a traffic signal, it could provide an opportunity for trucks to continue with less stopping (as roundabouts often have rolling queues). Trucks would occasionally have to stop on the hill if a traffic signal was installed, although a technology application that detects oncoming

trucks and extends the signal green time could be used to reduce the need to stop during inclement weather.

Consideration will need to be given to intersections where truck turning needs are more common when designing and locating curb extensions. Even with reduced size curb extensions, larger trucks may be required to encroach upon adjacent lanes when making turns. Alternatives with wider space between curbs typically allows for trucks to more easily make turns.

IMPACTS ON PROPERTY ACCESS

Each alternative may have different levels of impact to property access. While much won't be known until a project advances to engineering design, at the concept level it is assumed that most impacts to property access would occur from: 1) the need for additional right-of-way to build wider streets and intersections and 2) changes to street designs that could make direct connections for driveways infeasible or undesirable.

The conceptual improvements under consideration generally maintain existing right-of-way widths along street corridors, but all alternatives will require improvements around the major intersections (primarily 13th Street/May Street and 13th Street/Belmont Avenue) that will need additional right-of-way. At the current level of concept design it is not known if there would be a significant difference in right-of-way needs and associated property access impacts between the alternatives.

However, the alternatives do include fairly different street designs that could impact the ability or desire to have direct driveway connections. The primary street element that could impact property access is the type and design of bicycle facility. The main conflicts between bicycle facilities and driveways include:

- **Two-way bicycle facilities and driver expectations** – Drivers pulling out of driveways may not expect to have cyclists approaching from both directions when crossing a bicycle facility like a shared use path or two-way cycle track. It is generally preferred to minimize the number of driveway crossings with two-way bicycle facilities for safety reasons, and also to preserve the high level of comfort that these types of facilities are intended to provide for people biking. Where these conflicts cannot be avoided, design treatments can be applied to make drivers aware that they need to look both ways for people biking.
- **Off-street bicycle facilities and driveway designs** – Because sidewalks are higher than street level, driveways must be designed to comfortably allow vehicles to transition between these high and low points within a relatively short distance. Ideally, the area where the driveway crosses the sidewalk would be level to maintain a comfortable crossing for people with mobility devices. However, maintaining a level sidewalk requires some separation between the sidewalk and street – ideally about five feet. While there are various driveway designs that can accommodate vehicle passage with little to no separation between the sidewalk and street, such designs will include partial to full cross slopes in the sidewalk or require the sidewalk to ramp down and back up across the driveway. These designs are not fatally flawed, but may not provide an ideal walking or biking environment.

In both cases, closing driveways where feasible should be considered to eliminate these conflicts and provide a low-stress bikeway. However, design treatments are possible to mitigate conflicts in lieu of driveway closures.

Alternative 1 includes the most potential conflicts with driveways and new bicycle facilities (about 17 in total). Four of these conflicts are on May Street, but the proposed street design includes the five-foot buffer between the raised bike lane and street needed for a comfortable design. However, there are about 13 driveways on 13th Street and Belmont Avenue where the bicycle facility is anticipated to be next to the curb with very little separation from the street.

Alternative 2 has the fewest potential conflicts with driveways and new bicycle facilities (about 13 in total). Similar to Alternative 1, there are four conflicts on May Street, but the proposed street design includes a sufficient buffer between the raised bike lane and street. Because the bike facility is only on one side of the street, there are only nine conflicts along 13th Street and Belmont Avenue. However, while there may be sufficient space between the bike facility and street, Alternative 2 includes a two-way bikeway that will require special signing and pavement markings to alert drivers.

Alternative 3 includes 12 potential driveway/bike facility conflicts, with seven on 12th Street, three on May Street, and two on Belmont Avenue. A small, three-foot buffer is provided between the bikeway and street, but the two-way bikeways on May Street and 12th Street will require special signing and pavement markings to alert drivers.

SAFETY

Several factors influence safety along the corridor, as discussed in more detail below.

Active Transportation

Each of the alternatives are expected to enhance safety for active transportation compared to current conditions. For example, all of the alternatives are expected to add curb extensions and enhance pedestrian crossings to improve safety and visibility of people walking. Each of the alternatives include bike enhancements (bike lanes, cycle tracks or buffered bike lanes) that would improve the safety of people biking.

Turning Movement Conflicts and Predictable Routing

Alternative 2 is the only alternative that maintains one-way traffic on the couplet. Converting to two-way traffic (like in Alternative 1 and Alternative 3) increases the number of conflicting turning movements. While the higher number of potential conflicts could result in more crashes, it may also have a calming effect on traffic and could result in lower travel speeds that counteract the impact of having more potential conflicts.

Adding left turn lanes and adding protected left turn phasing (such as the ones proposed in the mitigations) could also reduce potential conflicts. Alternative 3 also adds a center left turn lane on 13th Street, providing a space for left turning vehicles to wait for an appropriate gap in conflicting traffic before turning.

In general, Alternatives 1 and 2 provide more predictable routing for drivers who may be unfamiliar with the area. Alternative 3 only includes northbound traffic on 12th Street, which could be confusing to unfamiliar drivers.

Intersection Control

In general, roundabouts have great potential to reduce the severity of crashes at intersections and have the potential to reduce injury crashes by up to 82 percent[6] and also reduce vehicle speeds. Traffic signals would improve safety compared to the existing two-way stop-control, but not as greatly as roundabouts. Any alternative could include roundabouts or traffic signals at the major intersections. Therefore, this factor does not help in the selection of a preferred alternative.

TABLE 5. SUMMARY OF PERFORMANCE FOR PEOPLE DRIVING

PERFORMANCE CRITERIA	13TH STREET			12TH STREET		
	ALT 1	ALT 2	ALT 3	ALT 1	ALT 2	ALT 3
GOAL 1: CALM TRAFFIC AND IMPROVE INTERSECTIONS TO IMPROVE SAFETY FOR PEOPLE DRIVING, WALKING, BIKING, TAKING TRANSIT AND SUPPORTING LOCAL BUSINESSES.						
INTERSECTION OPERATIONS	●	⏬	●	⌃	⌃	⌃
TRAVEL TIME THROUGH THE HEIGHTS	●	⏬	⏬	●	⌄	⌄
SIDE STREET DELAY	●	⌄	⏬	⌃	⏬	⌃
FIRE/EMERGENCY SERVICE NEEDS	⌃	⌄	⏫	⏫	⌄	⏬
TRUCK ACCESSIBILITY	⌄	●	●	⌃	⌃	⌄
SAFETY	⌃	⏫	⌃	⌃	⏫	⌃
GOAL 2: PRESERVE AND PROMOTE A LIVABLE COMMUNITY AND ECONOMY THROUGH STREETSCAPE IMPROVEMENTS THAT INCREASES SAFETY FOR PEOPLE WALKING AND BIKING AND ADDRESSES PARKING NEEDS TO SUPPORT LOCAL BUSINESS ACCESS, AND FUTURE MIXED-USE DEVELOPMENT.						
DIVERSION IMPACTS	⌃	●	⌃	⌃	●	⌃
IMPACTS ON PROPERTY ACCESS	●	●	⌃	⌃	⌃	●

[6] ODOT Crash Reduction Factor List, 2020, CMF ID: 228

CONDITONS FOR PEOPLE WALKING

Today, 12th and 13th Streets are challenging for pedestrians to navigate. The existing two-lane cross section of both busy streets have unmarked crossings, several skewed or offset intersections, and on-street parking with no curb extensions. All of these conditions increase pedestrian exposure, reduce pedestrian visibility, and introduces risk for "double threat" crashes - where a vehicle which has stopped for a pedestrian then blocks that same pedestrian from view of the adjacent travel lane (see Figure 1). Although there are painted "continental" pedestrian crossings at some intersections, these treatments do not warn or control on-coming traffic and there are no pedestrian median refuges in the corridor other than at the intersection of 13th Street and May Street.

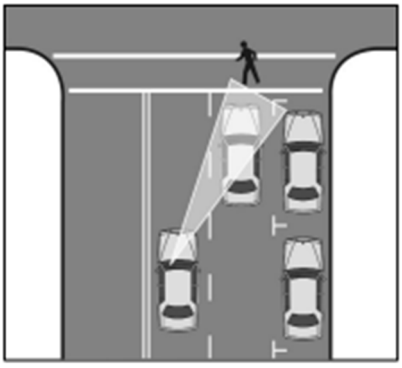


FIGURE 1: ILLUSTRATION OF THE "DOUBLE THREAT" RISK

To enhance conditions for people walking on either 12th or 13th Streets, each of the three alternatives contain elements such as additional separation from vehicle traffic (via landscaping or bicycle facilities), wider sidewalks, and signal or roundabout control at the intersections along 13th Street at May Street and Belmont Avenue. While not explicitly shown in the concept drawings, the alternatives are also assumed to include ADA improvements, curb extensions to shorten crossing distances and improve pedestrian visibility, pedestrian-scale lighting, and enhanced crossings that could include treatments such as flashing beacons and pedestrian refuge islands. Appendix G documents analysis for level of pedestrian treatment may be warranted within each alternative.

Corridor conditions for people walking were evaluated for each alternative using the criteria described below. These will be considered alongside additional criteria related to each alternative's ability to complete connections to area destinations that are being evaluated by others. For each alternative, the degree to which the criteria is supported by each of the main corridors along 12th Street and 13th Street has been rated, with brief descriptions provided below and a summary chart provided in Table 6.

- **Visibility at crossings** was assessed qualitatively by considering factors that could increase pedestrian visibility (e.g., curb extensions or median refuges) and factors that could decrease pedestrian visibility (e.g., landscaping, on-street parking). Each alternative was also evaluated for its ability to reduce the potential risk for "double threat" crashes where a stopped vehicle blocks a crossing pedestrian from view of the adjacent travel lane.

<u>Alternative 1</u>

13th Street: No on-street parking improves visibility but pedestrians are still set back from the corner due to the presence of the bicycle facility.

12th Street: On-street parking is present but it is assumed that curb extensions will be used to enhance visibility. With no bicycle facilities, pedestrians waiting to cross are close to the street and easily within a driver's field of vision.

Alternative 2

13th Street: Parked cars with curb extensions on one side, no obstructions on the other side.

12th Street: Parked cars with curb extensions on both sides.

Alternative 3

13th Street: Parked cars with curb extensions on one side, no obstructions on the other side.

12th Street: Parked cars with curb extensions on one side. On the other side, there are no visibility obstructions but pedestrians are still set back from the corner due to the presence of the bicycle facility.

- **Time exposed to vehicular traffic at crossings** was assessed by considering factors along 12th and 13th streets such as the number of vehicle lanes to cross as well as curb extensions and pedestrian median refuges, which shorten the pedestrian crossing distance and reduce vehicle exposure.

Alternative 1

13th Street: The street crossing is 22 feet wide. The bicycle facilities must also be crossed, adding another 16 feet.

12th Street: The street crossing is 24 feet wide (similar to existing conditions if curb extensions were provided).

Alternative 2

13th Street: The street crossing is 12 feet wide, with only one direction of travel to cross.

12th Street: The street crossing is 12 feet wide, with only one direction of travel to cross

Alternative 3

13th Street: If no median refuge islands are provided, this alternative has the widest crossings at 32 feet. If median refuge islands are provided, crossing distances are reduced to about 11 feet (twice).

12th Street: The street crossing is 12 feet with only one direction of travel to cross. The cycle track crossing is 10 feet.

- **Access to low-stress crossings** was assessed by considering the total potential number of low-stress, unsignalized pedestrian crossings and the distance between low-stress crossings along the corridor. Providing evenly spaced crossings minimizes out-of-direction travel for pedestrians. The ongoing Hood River Safe Routes to School project identification program has identified key routes along May Street, 12th Street, Taylor Avenue, B Street, Pine Street, A Street, and Wilson Street. To connect these routes, enhanced street crossings are being called for at the following intersections:
  - 13th Street / May Street
  - 13th Street / Taylor Avenue
  - 13th Street / A Street

- 12th Street / May Street
- 12th Street / Taylor Avenue
- 12th Street / Pine Street
- 12th Street / B Street
- 12th Street / Wilson Street

All alternatives can accommodate enhanced crossing improvements at these locations. However, some alternatives may result in lower stress, easier crossings, as noted below.

Alternative 1

13th Street: Accommodates enhanced crossings, but the 22-foot crossing distance will reduce comfort.

12th Street: Accommodates enhanced crossings, but the 24-foot crossing distance will reduce comfort.

Alternative 2

13th Street: Accommodates enhanced crossings and the single-lane crossings will significantly improve comfort.

12th Street: Accommodates enhanced crossings and the single-lane crossings will significantly improve comfort.

Alternative 3

13th Street: Median refuge islands should be provided to create low-stress crossings. This may require prohibiting left turns from 13 Street at alternating intersections (i.e., prohibiting southbound lefts at one intersection and northbound lefts at the next) to create space in the center lane for a refuge island. Where median refuge islands are provided, the ability to cross one lane at a time will improve comfort.

12th Street: Accommodates enhanced crossings and the single-lane crossings will significantly improve comfort.

- **Width of walkways** was assessed by simply measuring the width of provided pedestrian facilities and accounting for space shared with street furniture and landscaping zones or people biking. Wider spaces dedicated solely for people walking were rated more highly.

Alternative 1

13th Street: 10 feet but includes the furniture/landscaping zone (about the same as the no build condition).

12th Street: 10 feet but includes the furniture/landscaping zone (about the same as the no build condition).

Alternative 2

13th Street: 14 feet but shared with people biking on one side, 8 feet on the other side.

12th Street: 9 feet on one side, 10 feet on the other side.

Alternative 3

13th Street: 10 feet but includes the furniture/landscaping zone (about the same as the no build condition).

12th Street: 10 feet on one side, 8 feet on the other but includes the furniture/landscaping zone.

- **Buffer from traffic and bikes** was assessed by the horizontal separation from traffic and bikes as well as the presence of any physical barrier such as a curb.

Alternative 1

13th Street: Adjacent to raised bike lanes on both sides, which provide a buffer from traffic.

12th Street: Buffered by parking on both sides. Bikes would be in the street.

Alternative 2

13th Street: Mixed with bikes on one side. Buffered from traffic by a landscape strip on one side and by parking and a landscape strip on the other.

12th Street: Buffered by parking and landscaping on both sides. Bikes would be in the street.

Alternative 3

13th Street: Buffered by parking on one side but adjacent to the travel lane on the other. Bikes would be in the street.

12th Street: Buffered by parking on one side. Buffered from traffic on the other side by the cycle track, but would be adjacent to the cycle track (uncertain if any barrier would be present).

TABLE 6. SUMMARY OF PERFORMANCE FOR PEOPLE WALKING

PERFORMANCE CRITERIA	13TH STREET			12TH STREET		
	ALT 1	ALT 2	ALT 3	ALT 1	ALT 2	ALT 3
GOAL 1: CALM TRAFFIC AND IMPROVE INTERSECTIONS TO IMPROVE SAFETY FOR PEOPLE DRIVING, WALKING, BIKING, TAKING TRANSIT AND SUPPORTING LOCAL BUSINESSES.						
VISIBILITY AT CROSSINGS	↑	⇑	⇑	⇑	⇑	↑
EXPOSURE TIME	–	⇑	⇓/↑ (no refuge islands / refuge islands)	–	⇑	↑
GOAL 2: PRESERVE AND PROMOTE A LIVABLE COMMUNITY AND ECONOMY THROUGH STREETSCAPE IMPROVEMENTS THAT INCREASES SAFETY FOR PEOPLE WALKING AND BIKING AND ADDRESSES PARKING NEEDS TO SUPPORT LOCAL BUSINESS ACCESS, AND FUTURE MIXED-USE DEVELOPMENT.						
ACCESS TO LOW-STRESS CROSSINGS	↑	⇑	↑	↑	⇑	⇑
GOAL 4: CREATE STREETS AND GATHERING SPACES THAT PROVIDE SAFE, COMFORTABLE PLACES FOR PEOPLE WALKING, ACCESSING TRANSIT, AND BIKING ALONG AND ACROSS THE CORRIDOR AND THAT CONNECTS AREA RECREATION AND COMMERCIAL DESTINATIONS AND NEIGHBORHOODS.						
WIDTH OF WALKWAYS	⇑	↑	⇑	⇑	⇑	–
BUFFER FROM TRAFFIC AND BIKES	↑	↓	–	⇑	⇑	↑
ACCESS TO LOW-STRESS CROSSINGS – ALSO IN GOAL 2	↑	⇑	↑	↑	⇑	⇑

CONDITONS FOR PEOPLE BIKING

Today, people biking on 13th, 12th, and May Streets, as well as Belmont Avenue, must share a travel lane with motor vehicles, which is a high-stress environment that can limit use to more experienced riders. These conditions create a significant gaps in bicycle facilities that otherwise could facilitate a safe, low-stress, multimodal connections within the corridor to local businesses, nearby schools, recreation, and healthcare. Furthermore, needing to cross two lanes of uncontrolled traffic can be discouraging and with both lanes traveling in the same direction, there is the risk of "double threat" crashes.

To enhance conditions for people biking along the corridor, each of the three alternatives contain:

- Various bicycle facilities along May Street plus Belmont Avenue, and either along 12th or 13th Streets, ranging from traditional bicycle lanes, a raised dedicated cycle track, and a raised shared use path.
- Different bicycle crossing treatments at the ends of the corridor, including use of bicycle traffic signals.
- Improvements for bicycle connectivity, extending facilities the full length of the project corridor with attention to future connections such as to the Indian Creek Trail and other proposed bike lane upgrades to May Street.

Corridor conditions for people biking were evaluated for each alternative using the criteria described below. These will be considered alongside additional criteria related to each alternative's ability to complete connections to area destinations and other planned bike routes and ease of use by riders unfamiliar to the area that are being evaluated by others. For each alternative, the degree to which the criteria is supported by each of the main corridors along 12th Street and 13th Street has been rated, with brief descriptions provided below and a summary chart provided in Table 7.

- **Visibility at crossings** was assessed based on the type of crossing provided and the type of bicycle facility, such as a two-way cycle track or a separated one-way bicycle lane. Factors that could decrease bicyclist visibility (e.g., landscaping, on-street parking) were also considered, though thoughtful landscaping can restrict vehicle movement while still allowing access for people biking which generally reduces conflicts, increases visibility, and provides safer crossings for bicyclists.

<u>Alternative 1</u>

13th Street: No on-street parking improves visibility but crossing cyclists are still set back from the corner due to the presence of the bicycle facility (though they are likely to wait in the bike lane if no oncoming bikes are present).

12th Street: On-street parking is present but it is assumed that curb extensions will be used to enhance visibility. With no bicycle facilities, cyclists waiting to cross are close to the street and easily within a driver's field of vision.

<u>Alternative 2</u>

13th Street: Parked cars with curb extensions on one side, no obstructions on the other side. Drivers may not expect to encounter people biking from both directions along the

shared use path. However, design treatments at street crossings can be applied to improve awareness.

12th Street: Parked cars with curb extensions on both sides.

Alternative 3

13th Street: Parked cars with curb extensions on one side, no obstructions on the other side.

12th Street: Parked cars with curb extensions on one side. On the other side, there are no visibility obstructions but crossing cyclists are still set back from the corner due to the presence of the bicycle facility (though they are likely to wait in the bike lane if no oncoming bikes are present).

- **Access to low-stress crossings** was assessed by considering the total potential number of low-stress, unsignalized crossings and the distance between low-stress crossings along the corridor. Providing evenly spaced crossings minimizes out-of-direction travel for people biking. The ongoing Hood River Safe Routes to School project identification program has identified key routes along May Street, 12th Street, Taylor Avenue, B Street, Pine Street, A Street, and Wilson Street (previously mentioned under Conditions for People Walking).

  All alternatives can accommodate enhanced crossing improvements at these locations. However, some alternatives may result in lower stress, easier crossings, as noted below.

  Alternative 1

  13th Street: Accommodates enhanced crossings, but the 22-foot crossing distance will reduce comfort.

  12th Street: Accommodates enhanced crossings, but the 24-foot crossing distance will reduce comfort.

  Alternative 2

  13th Street: Accommodates enhanced crossings and the single-lane crossings will significantly improve comfort.

  12th Street: Accommodates enhanced crossings and the single-lane crossings will significantly improve comfort.

  Alternative 3

  13th Street: Median refuge islands should be provided to create low-stress crossings. This may require prohibiting left turns from 13 Street at alternating intersections (i.e., prohibiting southbound lefts at one intersection and northbound lefts at the next) to create space in the center lane for a refuge island. Where median refuge islands are provided, the ability to cross one lane at a time will improve comfort.

  12th Street: Accommodates enhanced crossings and the single-lane crossings will significantly improve comfort.

- **Width of bikeways** was assessed by simply measuring the width of provided bicycle facilities and accounting for space shared with people walking. Wider spaces dedicated solely for people biking were rated more highly.

  Alternative 1

  13th Street: 8-foot separated bike lanes.

  12th Street: No bike facilities are provided on this street.

  Alternative 2

  13th Street: 14 feet on one side but must accommodate both directions of travel and would be shared with people. 8 feet on the other side.

  12th Street: No bike facilities are provided on this street.

  Alternative 3

  13th Street: No bike facilities are provided on this street.

  12th Street: The 10-foot width of the two-way cycle track is less than the desired 12-foot width but more than the minimum with of 8 feet for constrained areas.

- **Buffer from traffic and pedestrians** was assessed by the horizontal separation from traffic and people walking, as well as the presence of any physical barrier such as a curb.

  Alternative 1

  13th Street: The raised bike lanes keep people biking off of the street. The bikeways are adjacent to walkways.

  12th Street: No bike facilities are provided on this street.

  Alternative 2

  13th Street: Mixed with people walking on a shared use path.

  12th Street: No bike facilities are provided on this street.

  Alternative 3

  13th Street: No bike facilities are provided on this street.

  12th Street: The two-way cycle track is physically separated from traffic and pedestrians.

TABLE 7. SUMMARY OF PERFORMANCE FOR PEOPLE BIKING

PERFORMANCE CRITERIA	13TH STREET			12TH STREET		
	ALT 1	ALT 2	ALT 3	ALT 1	ALT 2	ALT 3
GOAL 1: CALM TRAFFIC AND IMPROVE INTERSECTIONS TO IMPROVE SAFETY FOR PEOPLE DRIVING, WALKING, BIKING, TAKING TRANSIT AND SUPPORTING LOCAL BUSINESSES.						
VISIBILITY AT CROSSINGS						
GOAL 2: PRESERVE AND PROMOTE A LIVABLE COMMUNITY AND ECONOMY THROUGH STREETSCAPE IMPROVEMENTS THAT INCREASES SAFETY FOR PEOPLE WALKING AND BIKING AND ADDRESSES PARKING NEEDS TO SUPPORT LOCAL BUSINESS ACCESS, AND FUTURE MIXED-USE DEVELOPMENT.						
ACCESS TO LOW-STRESS CROSSINGS						
GOAL 4: CREATE STREETS AND GATHERING SPACES THAT PROVIDE SAFE, COMFORTABLE PLACES FOR PEOPLE WALKING, ACCESSING TRANSIT, AND BIKING ALONG AND ACROSS THE CORRIDOR AND THAT CONNECTS AREA RECREATION AND COMMERCIAL DESTINATIONS AND NEIGHBORHOODS.						
WIDTH OF BIKEWAYS			NA	NA	NA	
BUFFER FROM TRAFFIC AND PEDESTRIANS			NA	NA	NA	

CONDITONS FOR PEOPLE USING TRANSIT

There are currently no transit stops in the Heights District, though Columbia Area Transit (CAT) has expressed interest in establishing stops in this area in the future. The project team has coordinated with CAT to identify potential future stops along 12th and 13th Streets. Specific locations of interest vary by alternative and could include (note, this does not include stops outside of the project area, such as north of May Street):

Alternative 1

13th Street: No stops proposed; assumes buses would operate along 12th Street.

12th Street: Northbound, north of June Street; Southbound, north of A Street or south of Belmont Avenue.

Alternative 2

13th Street: Southbound, north of A Street

12th Street: Northbound, north of June Street

Alternative 3

13th Street: Southbound, north of A Street; Northbound, north of Taylor Street (OR the northbound stop on 12th Street)

12th Street: Northbound, north of June Street (OR the northbound stop on 13th Street)

The accessibility of each of the stops (given the proximity to enhanced pedestrian crossings proposed by the Safe Routes to School program) is summarized below:

- All proposed bus stops along 13th Street (Alternatives 2 and 3) would be sited near enhanced crossings proposed by the Safe Routes to School program.
- The proposed stop on 12th Street north of June Street in all alternatives would not be located adjacent to an enhanced crossing already proposed by the Safe Routes to School program, but would be within one block of the signalized crossing at May Street and just over a block from the proposed crossing at Taylor Avenue.
- The proposed stop on 12th Street at A Street (Alternative 1) would align with a proposed enhanced crossing.
- The proposed stop on 12th Street south of Belmont Avenue (Alternative 1) would be more than a block from the proposed enhanced crossing at A Street.

The ability to accommodate transit amenities at the proposed bus stops is primarily driven by two factors: the presence of a raised bicycle lane or cycle track that would conflict with any transit stops and the width of sidewalk, buffer, and parking lanes (space which could be used for transit amenities). Alternative 3 includes a cycle track on the east side of 12th Street, which would need to be designed to minimize conflicts with a proposed bus stop on 12th Street.

To allow for transit shelters, a minimum of 10 feet is needed (four-foot shelter, five-foot clear zone and one-foot buffer to the curb), although a wider clear zone of eight-feet and buffer to the curb of 18 inches are generally preferred[7]. All of the alternatives can accommodate the minimum width for a shelter, with Alternative 2 providing the most potential space for amenities.

Table 8 summarizes the performance of the alternatives for people using transit based on the accessibility of transit stops and the ability to accommodate transit amenities.

[7] https://nacto.org/publication/transit-street-design-guide/station-stop-elements/stop-elements/small-transit-shelter/

TABLE 8. SUMMARY OF PERFORMANCE FOR PEOPLE USING TRANSIT

PERFORMANCE CRITERIA	13TH STREET			12TH STREET		
	ALT 1	ALT 2	ALT 3	ALT 1	ALT 2	ALT 3
GOAL 4: CREATE STREETS AND GATHERING SPACES THAT PROVIDE SAFE, COMFORTABLE PLACES FOR PEOPLE WALKING, ACCESSING TRANSIT, AND BIKING ALONG AND ACROSS THE CORRIDOR AND THAT CONNECTS AREA RECREATION AND COMMERCIAL DESTINATIONS AND NEIGHBORHOODS.						
STOP ACCESSIBILITY – PROXIMITY TO ENHANCED CROSSINGS	NA	⏫	⏫	⏶	⏶	⏶
ABILITY TO ACCOMMODATE AMENITIES AT STOPS	NA	⏫	⏫	⏫	⏫	⏷

SUMMARY OF FINDINGS

This section provides a summary of the key findings for the major modes of travel evaluated.

CONDITIONS FOR PEOPLE DRIVING

- The 12th Street/13th Street corridor is forecast to serve about 26,000 vehicle trips per day by 2039 (it serves about 20,000 today). As this area becomes congested there may be some diversion of traffic to other routes but such diversion is expected to be minimal because regional and local street connectivity is limited.
- Overall, Alternative 1 performs the best for people driving as two-way traffic allows the demand to spread across both 12th and 13th Streets. As a result, Alternative 1 will provide the least amount of congestion at the key bottleneck intersections, will have the least amount of side street delay for drivers turning onto 12th and 13th Streets, will result in the least amount of added travel time to drive through the Heights, and would experience the shortest vehicle queues.
- Alternative 3 performs better than Alternative 2, but since there is still only a single southbound through lane to serve the demand, it does not perform as well as Alternative 1. While Alternative 3 can provide comparable levels of congestion relief at the key bottleneck intersections, side street delay for drivers turning onto 13th Street will be much longer, southbound travel times through the Heights will be about one minute longer, and vehicle queues will extend farther.
- Alternative 2 is expected to perform poorly as there is only a single northbound and southbound through lane to serve the traffic demand, resulting in significant queueing and spillback between intersections, particularly at 13th Street/May Street. This alternative is expected to have the worst side street delay for drivers turning onto 12th and 13th Streets and the longest travel times through the Heights.
- Roundabouts can provide good congestion relief at the key bottleneck intersections on 13th Street at May Street and Belmont Avenue but are expected to have greater right-of-way impacts than traffic signals would at those same locations.

- Alternative 1 provides opportunities for emergency vehicles to pass around stopped traffic on both 12th and 13th Streets, with multiple travel lanes on each.
- With only single travel lanes on both 13th and 12th Streets, emergency vehicle access could be restricted under Alternative 2, though the parallel parking may create opportunities for bypassing traffic, if empty.
- 13th Street may be the most accessible for emergency vehicles under Alternative 3, but 12th Street could be the most restricted.
- Under Alternative 1, the lack of parking on 13th Street will place loading zones farther from businesses.
- Having parallel parking on both streets under Alternative 2 creates good opportunities for loading zones close to businesses.
- Loading zones in Alternative 3 could be located on one side of 13th Street but may not be possible on 12th Street without losing many parking spaces.

CONDITIONS FOR PEOPLE WALKING

- All alternatives can be designed to provide good visibility of pedestrians at street crossings and will eliminate the "double threat" environment currently present with two lanes of one-way traffic on each street.
- Alternative 2 mixes people walking with people biking on a shared-use path along 13th Street, which may be less comfortable than having a separate, designated space.
- There are many opportunities to provide enhanced, low-stress street crossings on 12th and 13th Streets under all alternatives.
- Alternative 2 significantly reduces street crossing times and exposure to traffic with only one lane of one-way traffic on each street.
- Alternative 1 may provide the longest street crossings on 12th and 13th Streets, with exposure to traffic approaching from two directions.

CONDITIONS FOR PEOPLE BIKING

- All alternatives can be designed to provide good visibility of people biking at street crossings and will eliminate the "double threat" environment currently present with two lanes of one-way traffic on each street.
- Alternative 2 mixes people walking with people biking on a shared-use path along 13th Street, which may be less comfortable and efficient than having a separate, designated space.
- There are many opportunities to provide enhanced, low-stress street crossings on 12th and 13th Streets under all alternatives.
- Under Alternative 3, the 10-foot width of the two-way cycle track on 12th Street is less than the desired 12-foot width but more than the minimum width of 8 feet for constrained areas.
- Drivers may not expect to encounter people biking from both directions when crossing two-way bikeways, such as those in Alternatives 2 and 3. This can be a safety concern, but appropriate design treatments can be applied to improve driver awareness and cyclist visibility.

CONDITIONS FOR PEOPLE USING TRANSIT

- The locations of nearly all proposed future bus stops align well with proposed low-stress street crossings with the exception of the bus stop on 12th Street south of Belmont Avenue (Alternative 1) would be more than a block from the proposed enhanced crossing at A Street.
- It is anticipated that all alternatives could accommodate bus stops where proposed, however, the cycle track on the east side of 12th Street in Alternative 3 presents conflicts that must be addressed.

APPENDIX

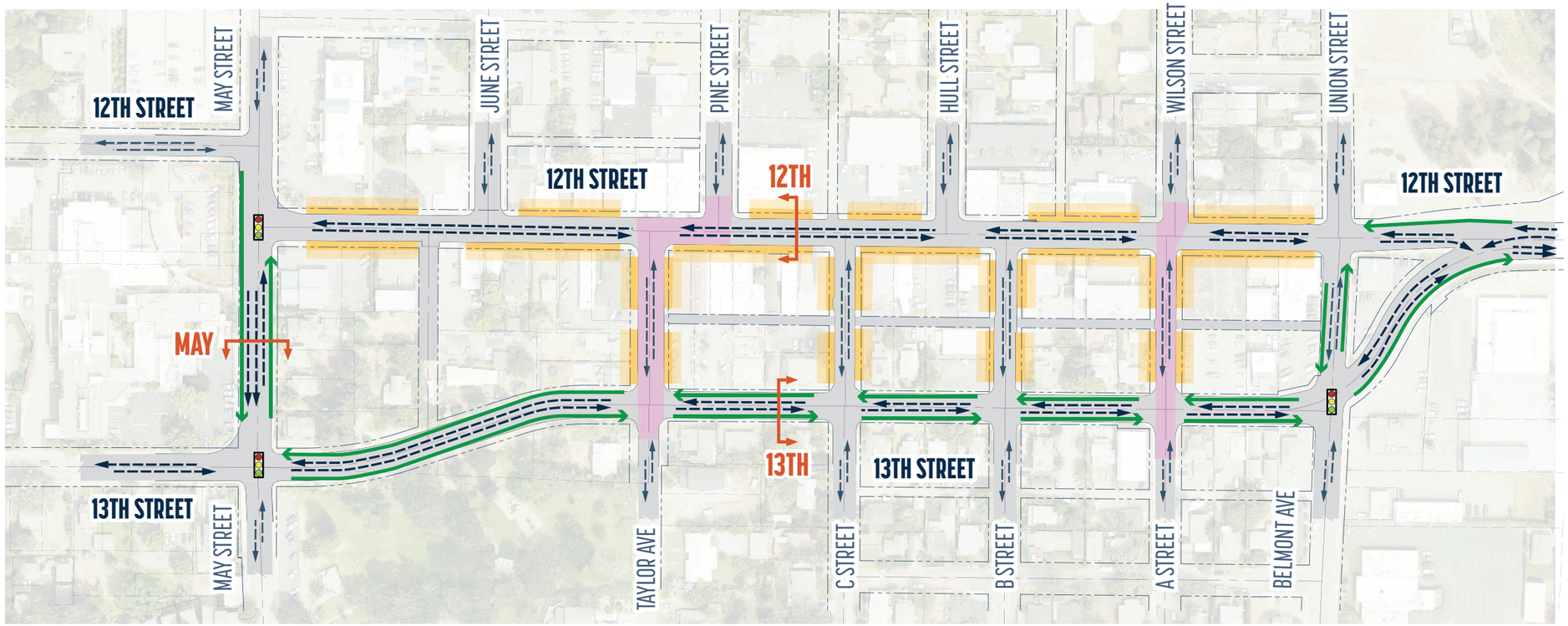
- Appendix A – Alternative Concept Drawings
- Appendix B – TSP Build Traffic Operations
- Appendix C – Alternative Traffic Operations (Unmitigated)
- Appendix D – Alternative Traffic Operations (Mitigated)
- Appendix E – SimTraffic Reports
- Appendix F – Mitigated Roundabout Concept at May Street/13th Street
- Appendix G – NCHRP 562 Pedestrian Crossing Treatment

APPENDIX A: ALTERNATIVE CONCEPT DRAWINGS

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 1 - TWO LANE, TWO-WAY CIRCULATION + STREET SECTIONS

DRAFT FOR PRELIMINARY DISCUSSION ONLY



LEGEND

- Right of Way
- Parcels
- Travel Lane - City Street
- Travel Lane - ODOT
- Bike Lane
- Parallel Street Parking
- Traffic Signal, See Note 1
- Enhancement to Improve East/West Connections

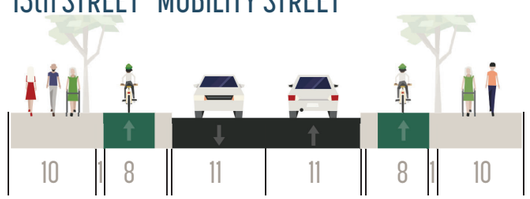
NOTES

1. See intersection concepts for channelization at intersections.

0 50 100 200 400 feet

N

13th STREET "MOBILITY STREET"

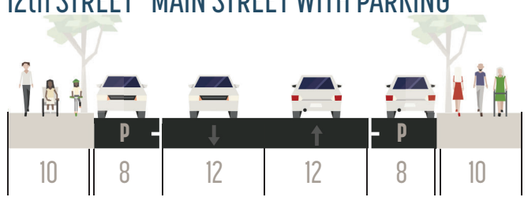


(50' R/W + [2] 5' Utility Easements)

EXAMPLE OF RAISED SEPARATED BIKE LANE - 13TH STREET

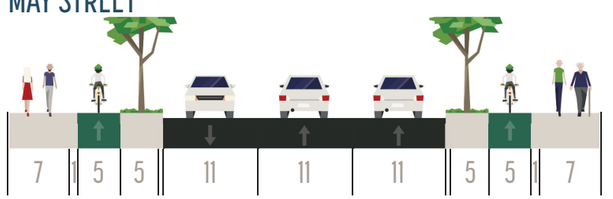
Source: MIG

12th STREET "MAIN STREET WITH PARKING"



(60' R/W)

MAY STREET



(60' R/W + 10' Easement)

EXAMPLE OF RAISED SEPARATED BIKE LANE - MAY STREET

Source: pedbikeimages.com, Carl Sundstrom

MIG

October 2021

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 1 - TWO LANE, TWO-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT MAY STREET

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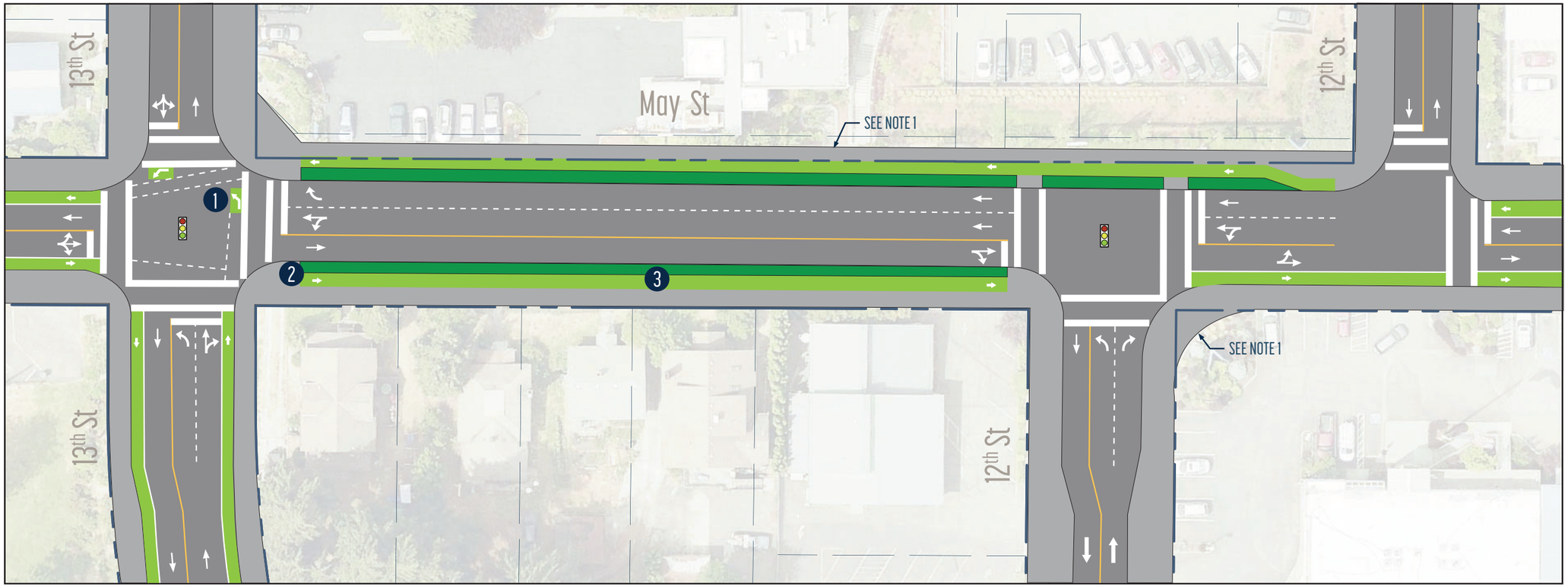

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.

1 Two Stage Bicycle Turn Box

Source: Creative Commons

2 Separated Bike Lane at Intersection

Source: Google Maps

3 Raised, Vegetation Separated Bike Lane

Source: MIG

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THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 1 - TWO LANE, TWO-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT BELMONT AVENUE

DRAFT FOR PRELIMINARY DISCUSSION ONLY

1 Raised, Vegetated Separated Bike Lane

Source: MIG

2 Bike Box

Source: bikepedimages.org, Toole Group

3 Enhanced Crosswalk

Source: MIG

4 Traffic Calming Opportunity

Source: The Urbanist

5 Gateway Opportunity

Source: Visit Bend

N 0 10 20 30 40 50 feet

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.

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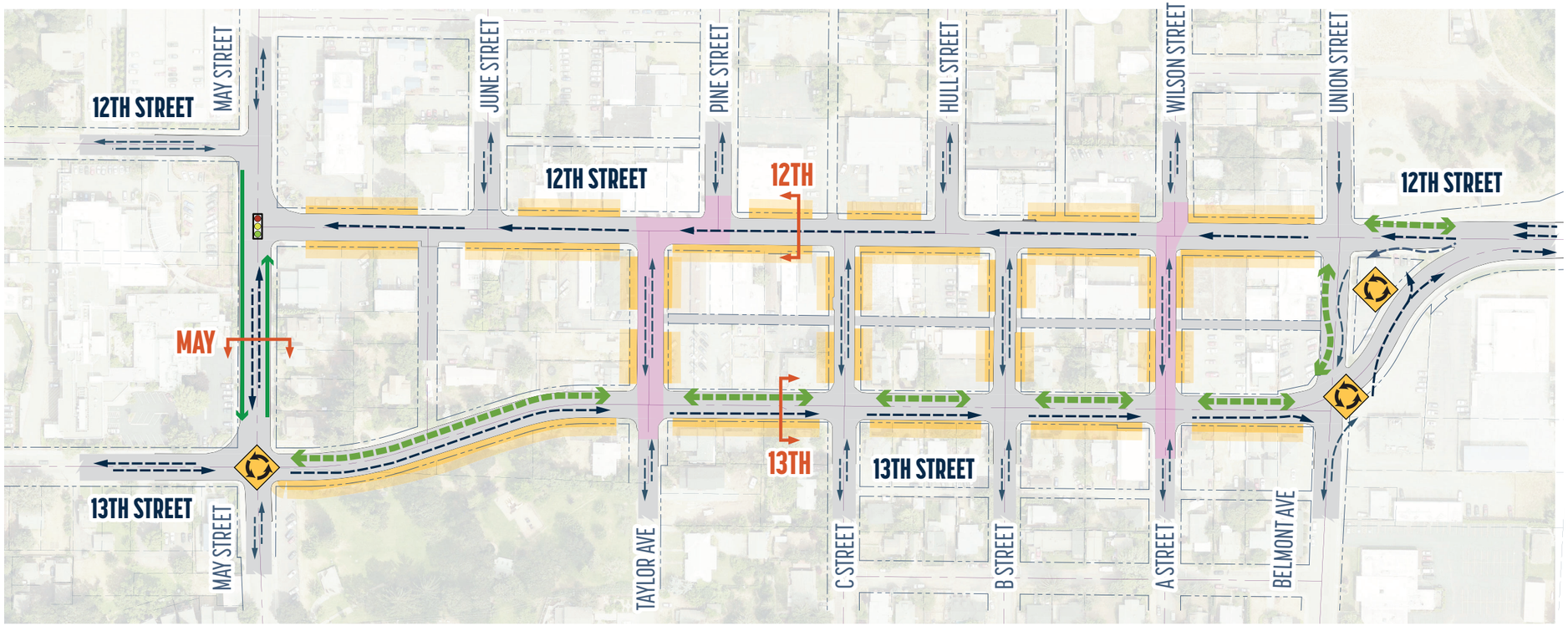
THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 2 - ONE LANE, ONE-WAY CIRCULATION + STREET SECTIONS

DRAFT FOR PRELIMINARY DISCUSSION ONLY



LEGEND

- Right of Way
- Parcels
- Center Line
- Travel Lane - City Street
- Travel Lane - ODOT
- Traffic Signal, See Note 1
- Bike Lane
- Shared Use Path
- Parallel Street Parking
- Roundabout
- Enhancement to Improve East/West Connections

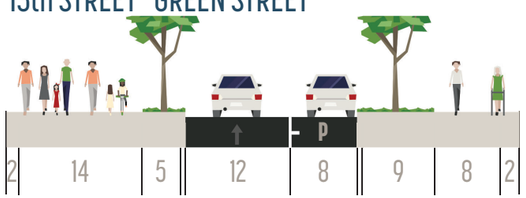
NOTES

1. See intersection concepts for channelization at intersections.

0 50 100 200 400 feet

N

13th STREET "GREEN STREET"

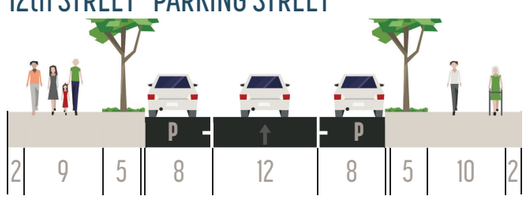


(50' R/W + [2] 5' Utility Easements)

EXAMPLE OF SHARED USE PATH- 13TH STREET

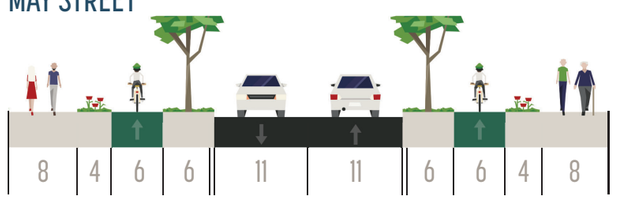
Source: MAG

12th STREET "PARKING STREET"



(60' R/W)

MAY STREET



(60' R/W + 10' Easement)

EXAMPLE OF RAISED VEGETATION SEPARATED BIKE LANE - MAY STREET

Source: Google Maps

MIG

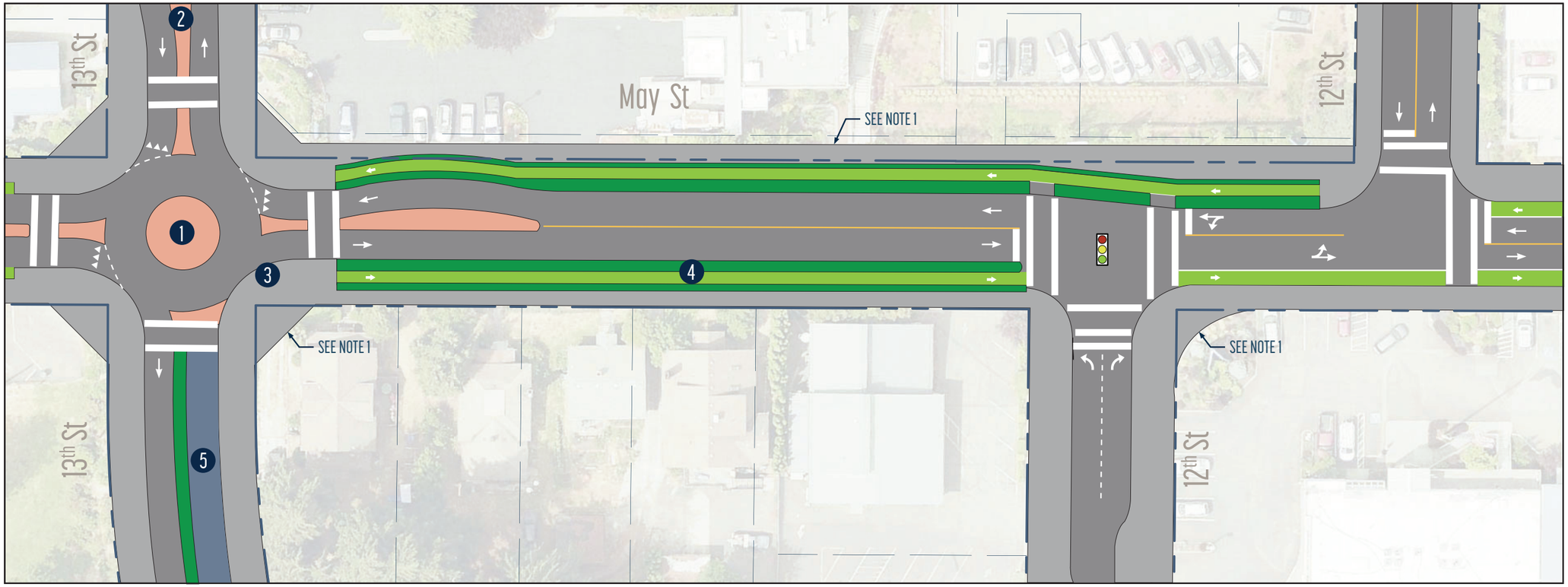
October 2021

THE HEIGHTS STREETSCAPE PLAN

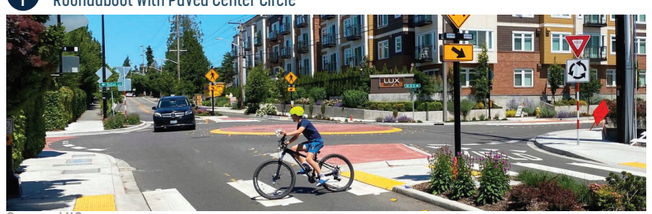
DESIGN ALTERNATIVE 2 - ONE LANE, ONE-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT MAY STREET

DRAFT FOR PRELIMINARY DISCUSSION ONLY



1 Roundabout with Paved Center Circle

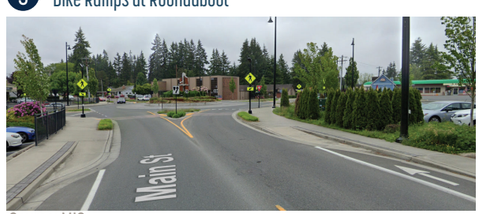


Source: MIG

2 Paved Splitter Island at Roundabout to Accommodate Truck/ Bus Access

Source: MIG

3 Bike Ramps at Roundabout



Source: MIG

4 Raised, Vegetation Separated Bike Lane

Source: Google Maps

5 Shared Use Path Along Road

Source: MAG

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Raised Pavement for Truck Access
- Sidewalk
- Planting
- Bike Lane
- Shared Use Path

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.

MIG

October 2021

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 2 - ONE LANE, ONE-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT BELMONT AVENUE

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LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Raised Pavement for Truck Access
- Sidewalk
- Planting
- Bike Lane
- Shared Use Path

NOTES

1. Trees to be located in a later design phase.
2. Existing driveway locations are not shown and will be incorporated in a later design phase.

1 Double Roundabout (See discussion below)

Source: MassDOT

2 Placemaking Opportunity

Source: DeepRoot

3 Bike Ramps at Roundabout

Source: Google maps streetview

4 Rectangular Rapid Flash Beacon (RRFB) at Crosswalk

Source: Carmanah.com

5 Shared Use Path Along Road

Source: MAG

ROUNDABOUT DISCUSSION

1. The design shown for the double roundabout is conceptual and should only be considered an illustration of potential traffic flow. The actual extents of the roundabout design and potential property impacts will be refined if recommended as part of a refined concept and traffic analysis.

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THEHEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 3 - HYBRID CIRCULATION + STREET SECTIONS

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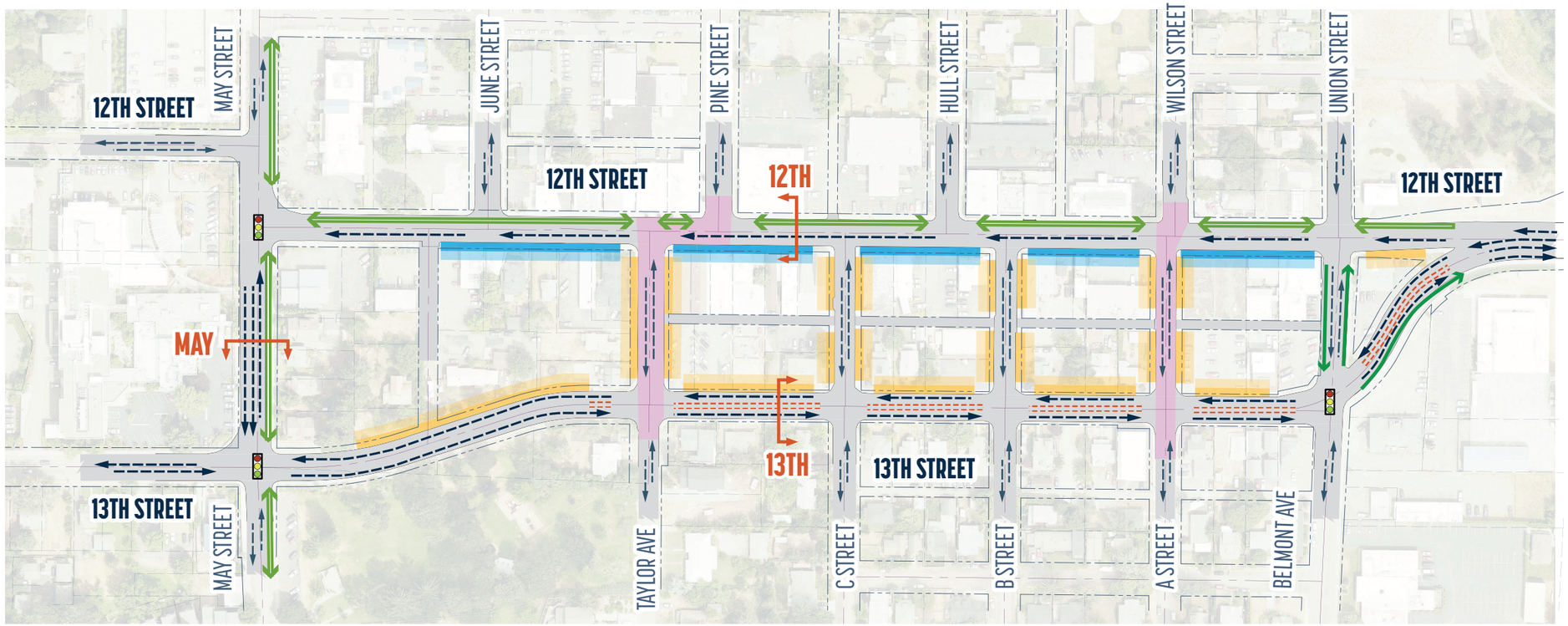


LEGEND

- Right of Way
- Parcels
- Center Line
- Travel Lane - City Street
- Travel Lane - ODOT
- Center Turn Lane
- Bike Lane
- Cycle Track (Two-Way)
- Traffic Signal, See Note 1
- Parallel Street Parking
- Angled Street Parking
- Enhancement to Improve East/West Connections

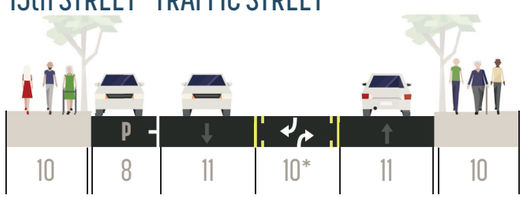
NOTES

1. See intersection concepts for channelization at intersections.

0 50 100 200 400 feet

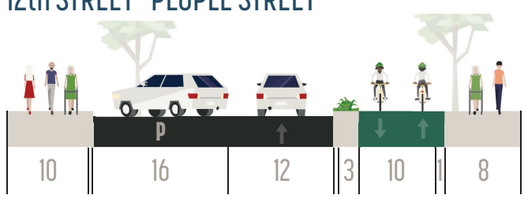
N

13th STREET "TRAFFIC STREET"



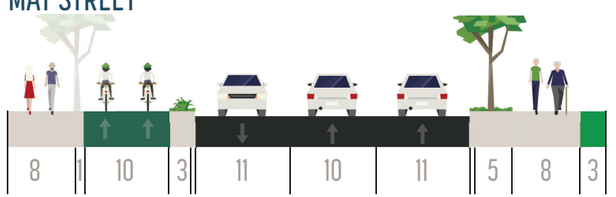
(50' R/W + [2] 5' Utility Easements) * Provide center median between May St and Taylor Ave

12th STREET "PEOPLE STREET"



(60' R/W)

MAY STREET



(60' R/W + 10' Easement)

EXAMPLE OF TWO WAY CYCLE TRACK - 12TH STREET AND MAY STREET

Source: Philadelphia magazine, NV5

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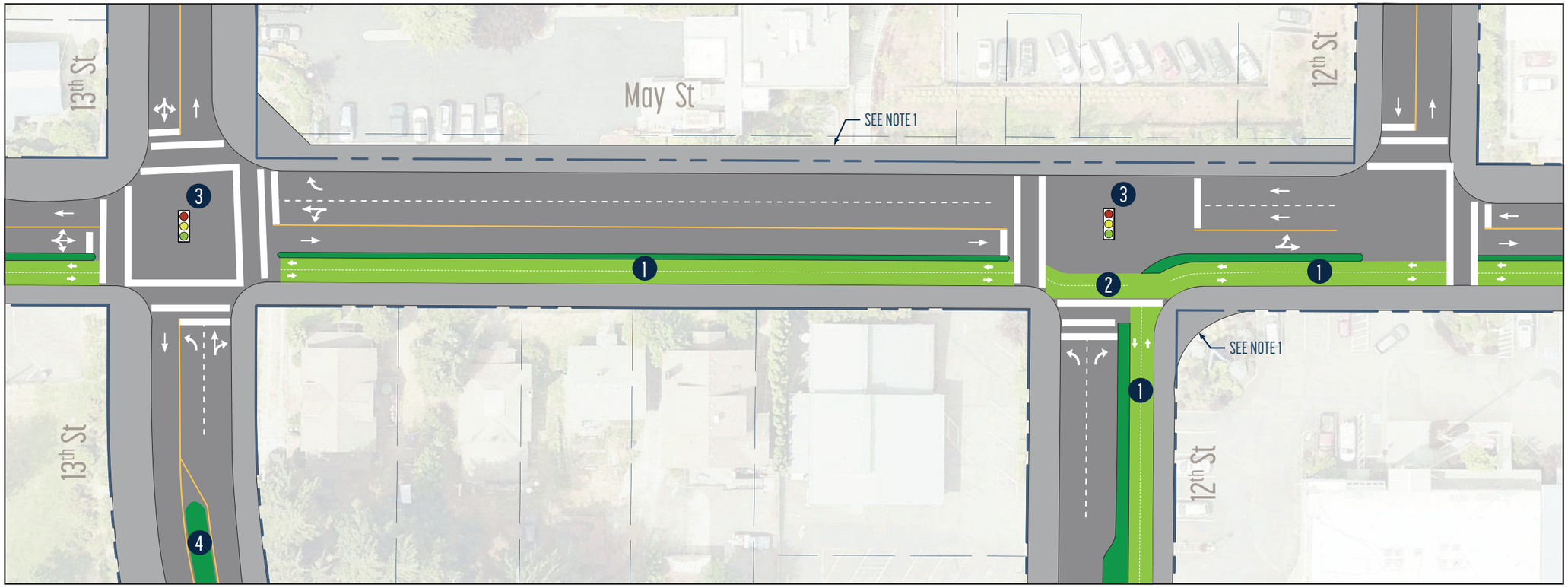
THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 3 - HYBRID INTERSECTION CONCEPT

12TH AND 13TH STREETS AT MAY STREET

DRAFT FOR PRELIMINARY DISCUSSION ONLY



0 10 20 30 40 50 feet

N

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.

1 Two Way Cycle Track

Source: Philadelphia Magazine, NV5

2 Two-Way Cycle Track at Intersection

Source: Roy Symons

3 Bicycle Traffic Signal

Source: SDOT

4 PLANTED MEDIAN

Source: MIG

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THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 3 - HYBRID INTERSECTION CONCEPT

12TH AND 13TH STREETS AT BELMONT AVENUE

DRAFT FOR PRELIMINARY DISCUSSION ONLY

1 Two Way Cycle Track

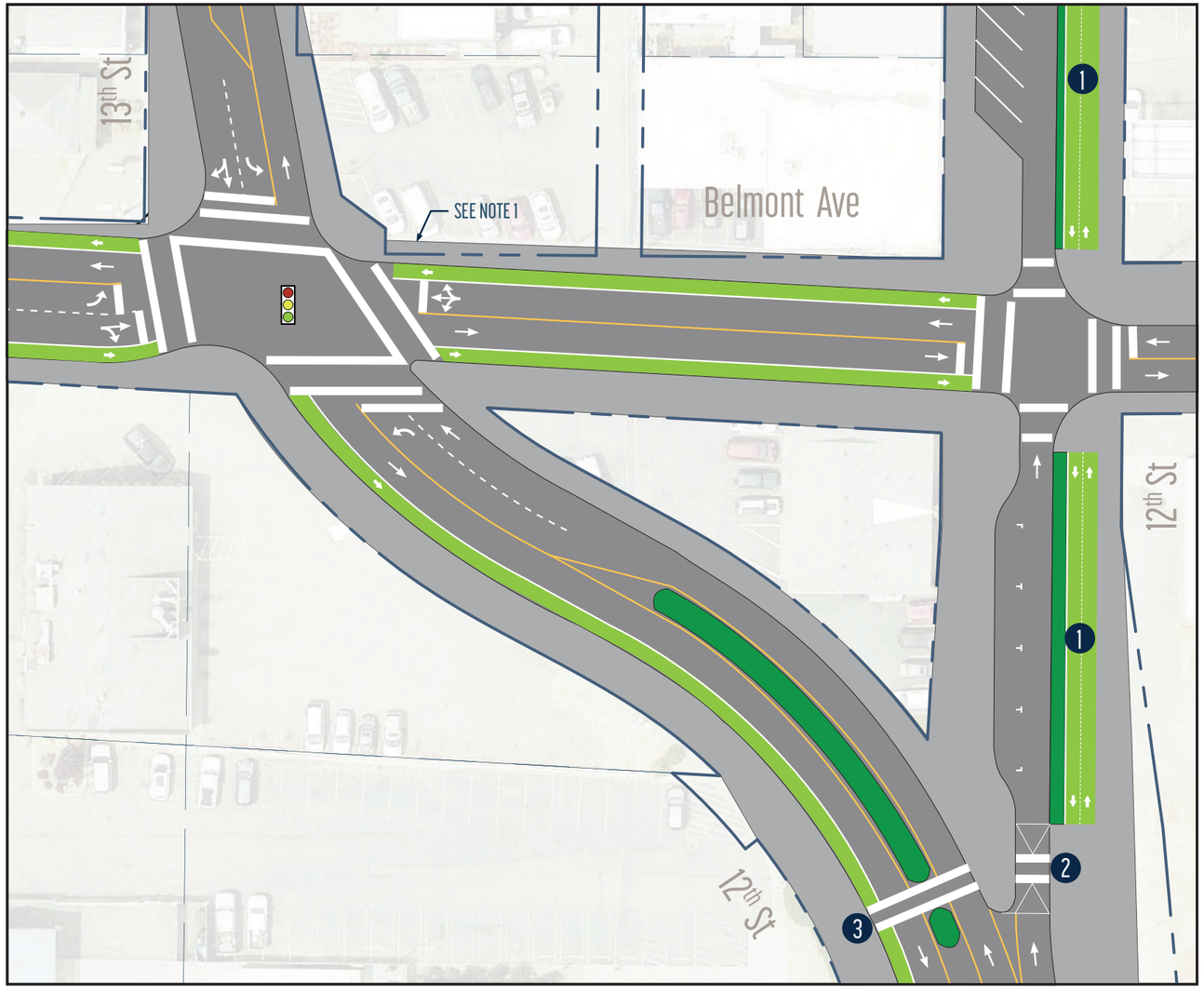
Source: Philadelphia Magazine, NV5

2 Traffic Calming - Raised Crosswalk

Source: Creative Commons

3 Enhanced Crosswalk at Planted Median

Source: MIG



LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.

N

0 10 20 30 40 50 feet

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October 2021

APPENDIX B: TSP BUILD TRAFFIC OPERATIONS

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	229	462	421	225	530	109
Future Volume (vph)	229	462	421	225	530	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1752	1881	1770	1538
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1752	1881	1770	1538
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	244	491	448	239	564	116
RTOR Reduction (vph)	0	59	0	0	0	73
Lane Group Flow (vph)	244	432	448	239	564	43
Confl. Peds. (#/hr)		2	2		1	2
Heavy Vehicles (%)	2%	2%	3%	1%	2%	5%
Turn Type	NA	pt+ov	Prot	NA	Prot	Prot
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						
Actuated Green, G (s)	18.0	54.8	26.5	48.5	32.8	32.8
Effective Green, g (s)	18.0	54.8	26.5	48.5	32.8	32.8
Actuated g/C Ratio	0.20	0.61	0.30	0.54	0.37	0.37
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	375	971	519	1021	650	564
v/s Ratio Prot	c0.13	0.27	c0.26	0.13	c0.32	0.03
v/s Ratio Perm						
v/c Ratio	0.65	0.44	0.86	0.23	0.87	0.08
Uniform Delay, d1	32.8	9.2	29.7	10.7	26.2	18.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0	0.3	13.9	0.1	11.8	0.1
Delay (s)	36.8	9.5	43.5	10.8	38.0	18.4
Level of Service	D	A	D	B	D	B
Approach Delay (s)	18.5			32.2	34.7	
Approach LOS	B			C	C	

Intersection Summary			
HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	89.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	87	81	312	145	541	0	0	0	26	752	57
Future Volume (veh/h)	0	87	81	312	145	541	0	0	0	26	752	57
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		1.00				1.00		0.99
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1885	1856	1900	1841	1885				1900	1856	1870
Adj Flow Rate, veh/h	0	93	86	332	154	0				28	800	61
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	1	3	0	4	1				0	3	2
Cap, veh/h	0	673	557	400	145					30	870	66
Arrive On Green	0.00	0.36	0.36	0.60	0.60	0.00				0.53	0.53	0.53
Sat Flow, veh/h	0	1885	1559	878	407	1598				58	1646	125
Grp Volume(v), veh/h	0	93	86	486	0	0				889	0	0
Grp Sat Flow(s),veh/h/ln	0	1885	1559	1285	0	1598				1829	0	0
Q Serve(g_s), s	0.0	2.3	2.6	22.7	0.0	0.0				31.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	2.3	2.6	25.0	0.0	0.0				31.2	0.0	0.0
Prop In Lane	0.00		1.00	0.68		1.00				0.03		0.07
Lane Grp Cap(c), veh/h	0	673	557	545	0					967	0	0
V/C Ratio(X)	0.00	0.14	0.15	0.89	0.00					0.92	0.00	0.00
Avail Cap(c_a), veh/h	0	673	557	545	0					967	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.77	0.00	0.00				0.70	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.2	15.3	15.9	0.0	0.0				15.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.6	15.7	0.0	0.0				11.4	0.0	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
%ile BackOfQ(50%),veh/ln	0.0	1.0	1.0	7.5	0.0	0.0				14.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	15.6	15.9	31.7	0.0	0.0				26.5	0.0	0.0
LnGrp LOS	A	B	B	C	A					C	A	A
Approach Vol, veh/h		179			486	A					889	
Approach Delay, s/veh		15.8			31.7						26.5	
Approach LOS		B			C						C	

Timer - Assigned Phs		4		6		8
Phs Duration (G+Y+Rc), s		29.0		41.0		29.0
Change Period (Y+Rc), s		4.0		4.0		4.0
Max Green Setting (Gmax), s		25.0		37.0		25.0
Max Q Clear Time (g_c+I1), s		4.6		33.2		27.0
Green Ext Time (p_c), s		0.7		2.2		0.0

Intersection Summary		
HCM 6th Ctrl Delay	26.9	
HCM 6th LOS	C	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	8	8	112	38	0	0	0	0	14	1130	13
Future Vol, veh/h	0	8	8	112	38	0	0	0	0	14	1130	13
Conflicting Peds, #/hr	8	0	11	11	0	8	5	0	2	2	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	0	0	0	0	2	0
Mvmt Flow	0	9	9	122	41	0	0	0	0	15	1228	14

Major/Minor	Minor2			Minor1					Major2		
Conflicting Flow All	-	1272	637	662	1279	-			2	0	0
Stage 1	-	1270	-	2	2	-			-	-	-
Stage 2	-	2	-	660	1277	-			-	-	-
Critical Hdwy	-	6.5	6.9	7.5	6.5	-			4.1	-	-
Critical Hdwy Stg 1	-	5.5	-	-	-	-			-	-	-
Critical Hdwy Stg 2	-	-	-	6.5	5.5	-			-	-	-
Follow-up Hdwy	-	4	3.3	3.5	4	-			2.2	-	-
Pot Cap-1 Maneuver	0	169	425	351	167	0			1634	-	-
Stage 1	0	241	-	-	-	0			-	-	-
Stage 2	0	-	-	423	239	0			-	-	-
Platoon blocked, %										-	-
Mov Cap-1 Maneuver	-	163	423	322	161	-			1631	-	-
Mov Cap-2 Maneuver	-	163	-	322	161	-			-	-	-
Stage 1	-	233	-	-	-	-			-	-	-
Stage 2	-	-	-	387	231	-			-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	21.5	40.5	0.2
HCM LOS	C	E	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	235	257	1631	-	-
HCM Lane V/C Ratio	0.074	0.634	0.009	-	-
HCM Control Delay (s)	21.5	40.5	7.2	0.1	-
HCM Lane LOS	C	E	A	A	-
HCM 95th %tile Q(veh)	0.2	3.9	0	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	10	5	77	16	0	0	0	0	55	1195	10
Future Vol, veh/h	0	10	5	77	16	0	0	0	0	55	1195	10
Conflicting Peds, #/hr	8	0	4	4	0	8	3	0	7	7	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	0	0	2	0	0	0	0	0	0	2	0
Mvmt Flow	0	11	5	81	17	0	0	0	0	58	1258	11

Major/Minor	Minor2			Minor1					Major2		
Conflicting Flow All	-	1390	642	762	1395	-			7	0	0
Stage 1	-	1383	-	7	7	-			-	-	-
Stage 2	-	7	-	755	1388	-			-	-	-
Critical Hdwy	-	6.5	6.9	7.54	6.5	-			4.1	-	-
Critical Hdwy Stg 1	-	5.5	-	-	-	-			-	-	-
Critical Hdwy Stg 2	-	-	-	6.54	5.5	-			-	-	-
Follow-up Hdwy	-	4	3.3	3.52	4	-			2.2	-	-
Pot Cap-1 Maneuver	0	144	422	294	143	0			1627	-	-
Stage 1	0	213	-	-	-	0			-	-	-
Stage 2	0	-	-	367	212	0			-	-	-
Platoon blocked, %										-	-
Mov Cap-1 Maneuver	-	125	421	245	124	-			1616	-	-
Mov Cap-2 Maneuver	-	125	-	245	124	-			-	-	-
Stage 1	-	186	-	-	-	-			-	-	-
Stage 2	-	-	-	300	186	-			-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	29.4	36.3	0.7
HCM LOS	D	E	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	163	210	1616	-	-
HCM Lane V/C Ratio	0.097	0.466	0.036	-	-
HCM Control Delay (s)	29.4	36.3	7.3	0.4	-
HCM Lane LOS	D	E	A	A	-
HCM 95th %tile Q(veh)	0.3	2.3	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	117	190	15	152	0	0	0	0	49	1032	201
Future Volume (veh/h)	0	117	190	15	152	0	0	0	0	49	1032	201
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1856	1856	1781	1870	0				1900	1870	1885
Adj Flow Rate, veh/h	0	129	209	16	167	0				54	1134	221
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	3	3	8	2	0				0	2	1
Cap, veh/h	0	391	330	112	368	0				79	1717	352
Arrive On Green	0.00	0.21	0.21	0.21	0.21	0.00				0.59	0.59	0.59
Sat Flow, veh/h	0	1856	1568	75	1746	0				134	2897	594
Grp Volume(v), veh/h	0	129	209	183	0	0				754	0	655
Grp Sat Flow(s),veh/h/ln	0	1856	1568	1821	0	0				1864	0	1761
Q Serve(g_s), s	0.0	2.4	4.9	0.0	0.0	0.0				11.3	0.0	9.8
Cycle Q Clear(g_c), s	0.0	2.4	4.9	3.5	0.0	0.0				11.3	0.0	9.8
Prop In Lane	0.00		1.00	0.09		0.00				0.07		0.34
Lane Grp Cap(c), veh/h	0	391	330	480	0	0				1105	0	1043
V/C Ratio(X)	0.00	0.33	0.63	0.38	0.00	0.00				0.68	0.00	0.63
Avail Cap(c_a), veh/h	0	857	725	925	0	0				1521	0	1437
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	0.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	13.6	14.6	14.0	0.0	0.0				5.7	0.0	5.4
Incr Delay (d2), s/veh	0.0	0.5	2.0	0.5	0.0	0.0				0.8	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.9	1.7	1.3	0.0	0.0				2.7	0.0	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	14.1	16.6	14.5	0.0	0.0				6.4	0.0	6.0
LnGrp LOS	A	B	B	B	A	A				A	A	A
Approach Vol, veh/h		338			183						1409	
Approach Delay, s/veh		15.7			14.5						6.2	
Approach LOS		B			B						A	

Timer - Assigned Phs		4		6		8
Phs Duration (G+Y+Rc), s		12.6		28.1		12.6
Change Period (Y+Rc), s		4.0		4.0		4.0
Max Green Setting (Gmax), s		18.8		33.2		18.8
Max Q Clear Time (g_c+I1), s		6.9		13.3		5.5
Green Ext Time (p_c), s		1.4		10.9		0.7

Intersection Summary		
HCM 6th Ctrl Delay		8.7
HCM 6th LOS		A

Intersection	
Int Delay, s/veh	22

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	113	23	0	0	8	6	162	1130	38	0	0	0
Future Vol, veh/h	113	23	0	0	8	6	162	1130	38	0	0	0
Conflicting Peds, #/hr	13	0	0	0	0	13	1	0	8	8	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	0	0	0	17	0	2	3	0	0	0	0
Mvmt Flow	119	24	0	0	8	6	171	1189	40	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	955	1580	-	-	1560	636	1	0	0
Stage 1	1	1	-	-	1559	-	-	-	-
Stage 2	954	1579	-	-	1	-	-	-	-
Critical Hdwy	7.56	6.5	-	-	6.84	6.9	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	5.84	-	-	-	-
Critical Hdwy Stg 2	6.56	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4	-	-	4.17	3.3	2.22	-	-
Pot Cap-1 Maneuver	211	110	0	0	96	425	1620	-	-
Stage 1	-	-	0	0	149	-	-	-	-
Stage 2	276	171	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	138	72	-	-	63	422	1618	-	-
Mov Cap-2 Maneuver	138	72	-	-	63	-	-	-	-
Stage 1	-	-	-	-	98	-	-	-	-
Stage 2	165	112	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	216.8	47.6	1.8
HCM LOS	F	E	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1618	-	-	119	99
HCM Lane V/C Ratio	0.105	-	-	1.203	0.149
HCM Control Delay (s)	7.5	1	-	216.8	47.6
HCM Lane LOS	A	A	-	F	E
HCM 95th %tile Q(veh)	0.4	-	-	9	0.5

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	13	0	0	36	25	68	1228	62	0	0	0
Future Vol, veh/h	45	13	0	0	36	25	68	1228	62	0	0	0
Conflicting Peds, #/hr	15	0	20	20	0	15	8	0	13	13	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	3	0	2	3	6	0	0	0
Mvmt Flow	48	14	0	0	39	27	73	1320	67	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	849	1554	-	-	1521	722	8	0	0
Stage 1	8	8	-	-	1513	-	-	-	-
Stage 2	841	1546	-	-	8	-	-	-	-
Critical Hdwy	7.5	6.5	-	-	6.56	6.9	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	5.56	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	-	-	4.03	3.3	2.22	-	-
Pot Cap-1 Maneuver	258	114	0	0	116	374	1611	-	-
Stage 1	-	-	0	0	179	-	-	-	-
Stage 2	330	178	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	134	89	-	-	90	369	1599	-	-
Mov Cap-2 Maneuver	134	89	-	-	90	-	-	-	-
Stage 1	-	-	-	-	140	-	-	-	-
Stage 2	176	140	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	63.7	58	1
HCM LOS	F	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1599	-	-	120	130
HCM Lane V/C Ratio	0.046	-	-	0.52	0.505
HCM Control Delay (s)	7.4	0.7	-	63.7	58
HCM Lane LOS	A	A	-	F	F
HCM 95th %tile Q(veh)	0.1	-	-	2.4	2.4

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	123	1228	82	0	0
Future Vol, veh/h	0	123	1228	82	0	0
Conflicting Peds, #/hr	15	0	0	23	23	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	-
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	0	3	0	0	0
Mvmt Flow	0	135	1349	90	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	743	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.9	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.3	-	-
Pot Cap-1 Maneuver	0	362	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	354	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	21.3	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	354
HCM Lane V/C Ratio	-	-	0.382
HCM Control Delay (s)	-	-	21.3
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	1.7

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	43	0	142	1209	0	0
Future Vol, veh/h	43	0	142	1209	0	0
Conflicting Peds, #/hr	7	0	15	0	0	15
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	0	3	3	0	0
Mvmt Flow	47	0	156	1329	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	999	-	15	0
Stage 1	15	-	-	-
Stage 2	984	-	-	-
Critical Hdwy	6.8	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-
Follow-up Hdwy	3.5	-	2.23	-
Pot Cap-1 Maneuver	244	0	1594	-
Stage 1	-	0	-	-
Stage 2	327	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	147	-	1571	-
Mov Cap-2 Maneuver	147	-	-	-
Stage 1	-	-	-	-
Stage 2	322	-	-	-

Approach	EB	NB
HCM Control Delay, s	40.7	1.9
HCM LOS	E	

Minor Lane/Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	1571	-	147
HCM Lane V/C Ratio	0.099	-	0.321
HCM Control Delay (s)	7.5	1.2	40.7
HCM Lane LOS	A	A	E
HCM 95th %tile Q(veh)	0.3	-	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	112	0	0	404	634	642
Future Volume (veh/h)	112	0	0	404	634	642
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1900	1885	1885
Adj Flow Rate, veh/h	123	0	0	444	697	705
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	0	0	0	1	1
Cap, veh/h	755	0	0	1457	866	770
Arrive On Green	0.81	0.00	0.00	0.40	0.48	0.48
Sat Flow, veh/h	1870	0	0	3800	1795	1598
Grp Volume(v), veh/h	123	0	0	444	697	705
Grp Sat Flow(s),veh/h/ln	1870	0	0	1805	1795	1598
Q Serve(g_s), s	1.0	0.0	0.0	5.9	23.0	28.6
Cycle Q Clear(g_c), s	1.0	0.0	0.0	5.9	23.0	28.6
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	755	0	0	1457	866	770
V/C Ratio(X)	0.16	0.00	0.00	0.30	0.81	0.92
Avail Cap(c_a), veh/h	755	0	0	1457	1129	1004
HCM Platoon Ratio	2.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	4.1	0.0	0.0	14.2	15.3	16.8
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.5	2.5	9.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.0	2.4	9.0	11.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	4.6	0.0	0.0	14.7	17.8	26.0
LnGrp LOS	A	A	A	B	B	C
Approach Vol, veh/h	123			444	1402	
Approach Delay, s/veh	4.6			14.7	21.9	
Approach LOS	A			B	C	

Timer - Assigned Phs	2	4	8
Phs Duration (G+Y+Rc), s	37.8	32.2	32.2
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	44.0	18.0	18.0
Max Q Clear Time (g_c+I1), s	30.6	7.9	3.0
Green Ext Time (p_c), s	3.1	2.3	0.5

Intersection Summary	
HCM 6th Ctrl Delay	19.2
HCM 6th LOS	B

APPENDIX C: ALTERNATIVE TRAFFIC OPERATIONS (UNMITIGATED)

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	230	460	420	225	530	110
Future Volume (vph)	230	460	420	225	530	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1752	1881	1770	1538
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1752	1881	1770	1538
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	245	489	447	239	564	117
RTOR Reduction (vph)	0	379	0	0	0	75
Lane Group Flow (vph)	245	110	447	239	564	42
Confl. Peds. (#/hr)		2	2		1	2
Heavy Vehicles (%)	2%	2%	3%	1%	2%	5%
Turn Type	NA	Prot	Prot	NA	Prot	Prot
Protected Phases	2	2	1	6	8	8
Permitted Phases						
Actuated Green, G (s)	19.5	19.5	26.1	49.6	31.9	31.9
Effective Green, g (s)	19.5	19.5	26.1	49.6	31.9	31.9
Actuated g/C Ratio	0.22	0.22	0.29	0.55	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	405	344	510	1042	630	548
v/s Ratio Prot	c0.13	0.07	c0.26	0.13	c0.32	0.03
v/s Ratio Perm						
v/c Ratio	0.60	0.32	0.88	0.23	0.90	0.08
Uniform Delay, d1	31.5	29.4	30.2	10.2	27.2	19.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.5	0.5	15.5	0.1	15.2	0.1
Delay (s)	34.1	30.0	45.7	10.3	42.4	19.1
Level of Service	C	C	D	B	D	B
Approach Delay (s)	31.3			33.4	38.4	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	89.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	35	80	310	145	40	125	500	10	75	625	55
Future Volume (veh/h)	50	35	80	310	145	40	125	500	10	75	625	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	1.00		0.98	1.00		0.99	1.00		0.99
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	1870	1885	1856	1870	1841	1885	1870	1870	1870	1870	1856	1870
Adj Flow Rate, veh/h	53	37	85	330	154	30	133	532	11	80	665	59
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	1	3	2	4	1	2	2	2	2	3	2
Cap, veh/h	86	58	87	364	478	93	322	1078	22	106	695	60
Arrive On Green	0.17	0.17	0.17	0.03	0.11	0.11	0.06	0.59	0.59	0.48	0.49	0.48
Sat Flow, veh/h	193	334	498	1781	1492	291	1781	1825	38	128	1431	123
Grp Volume(v), veh/h	175	0	0	330	0	184	133	0	543	804	0	0
Grp Sat Flow(s),veh/h/ln	1025	0	0	1781	0	1783	1781	0	1863	1682	0	0
Q Serve(g_s), s	6.6	0.0	0.0	6.8	0.0	8.6	3.1	0.0	15.2	33.4	0.0	0.0
Cycle Q Clear(g_c), s	15.2	0.0	0.0	6.8	0.0	8.6	3.1	0.0	15.2	42.8	0.0	0.0
Prop In Lane	0.30		0.49	1.00		0.16	1.00		0.02	0.10		0.07
Lane Grp Cap(c), veh/h	225	0	0	364	0	572	322	0	1100	851	0	0
V/C Ratio(X)	0.78	0.00	0.00	0.91	0.00	0.32	0.41	0.00	0.49	0.94	0.00	0.00
Avail Cap(c_a), veh/h	225	0	0	364	0	572	323	0	1101	851	0	0
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.96	0.00	0.96	1.00	0.00	1.00	0.54	0.00	0.00
Uniform Delay (d), s/veh	37.7	0.0	0.0	38.4	0.0	31.2	9.1	0.0	10.7	22.6	0.0	0.0
Incr Delay (d2), s/veh	22.7	0.0	0.0	24.5	0.0	1.4	0.8	0.0	0.3	12.0	0.0	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	5.3	0.0	0.0	10.1	0.0	4.2	1.2	0.0	5.9	18.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.4	0.0	0.0	63.0	0.0	32.6	9.9	0.0	11.0	34.5	0.0	0.0
LnGrp LOS	E	A	A	E	A	C	A	A	B	C	A	A
Approach Vol, veh/h		175			514			676			804	
Approach Delay, s/veh		60.4			52.1			10.8			34.5	
Approach LOS		E			D			B			C	

Timer - Assigned Phs	2	3	4	5	6	8
Phs Duration (G+Y+Rc), s	57.2	13.1	19.7	9.5	47.7	32.8
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	52.7	8.6	15.2	5.0	43.2	28.3
Max Q Clear Time (g_c+I1), s	17.2	8.8	17.2	5.1	44.8	10.6
Green Ext Time (p_c), s	4.3	0.0	0.0	0.0	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	33.4
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	10	10	10	20	40	30	565	10	5	990	15
Future Vol, veh/h	5	10	10	10	20	40	30	565	10	5	990	15
Conflicting Peds, #/hr	8	0	11	11	0	8	5	0	2	2	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	11	11	22	43	33	614	11	5	1076	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1825	1792	1100	1804	1795	630	1097	0	0	627	0	0
Stage 1	1099	1099	-	688	688	-	-	-	-	-	-	-
Stage 2	726	693	-	1116	1107	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	59	81	258	61	80	482	636	-	-	955	-	-
Stage 1	258	288	-	436	447	-	-	-	-	-	-	-
Stage 2	416	445	-	252	286	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	38	73	254	48	72	477	633	-	-	953	-	-
Mov Cap-2 Maneuver	38	73	-	48	72	-	-	-	-	-	-	-
Stage 1	236	283	-	400	410	-	-	-	-	-	-	-
Stage 2	327	409	-	227	281	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	70.4	73	0.5	0
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	633	-	-	81	123	953	-	-
HCM Lane V/C Ratio	0.052	-	-	0.335	0.619	0.006	-	-
HCM Control Delay (s)	11	0	-	70.4	73	8.8	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.3	3.2	0	-	-

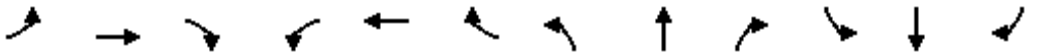
Intersection	
Int Delay, s/veh	8.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	10	5	35	15	15	5	600	5	35	995	10
Future Vol, veh/h	5	10	5	35	15	15	5	600	5	35	995	10
Conflicting Peds, #/hr	8	0	4	4	0	8	3	0	7	7	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	5	37	16	16	5	632	5	37	1047	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1799	1784	1060	1791	1787	650	1061	0	0	644	0	0
Stage 1	1130	1130	-	652	652	-	-	-	-	-	-	-
Stage 2	669	654	-	1139	1135	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	62	82	272	63	81	469	657	-	-	941	-	-
Stage 1	248	279	-	457	464	-	-	-	-	-	-	-
Stage 2	447	463	-	245	277	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	45	72	270	50	72	462	655	-	-	935	-	-
Mov Cap-2 Maneuver	45	72	-	50	72	-	-	-	-	-	-	-
Stage 1	244	251	-	448	455	-	-	-	-	-	-	-
Stage 2	409	454	-	207	250	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	72	207.9	0.1	0.3
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	655	-	-	74	69	935	-	-
HCM Lane V/C Ratio	0.008	-	-	0.284	0.992	0.039	-	-
HCM Control Delay (s)	10.5	0	-	72	207.9	9	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	5	0.1	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	45	200	45	50	5	125	565	5	50	930	60
Future Volume (veh/h)	70	45	200	45	50	5	125	565	5	50	930	60
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	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	1870	1856	1856	1781	1870	1870	1870	1870	1870	1870	1870	1885
Adj Flow Rate, veh/h	77	49	72	49	55	5	137	621	5	55	1022	66
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	3	3	8	2	2	2	2	2	2	2	1
Cap, veh/h	206	92	135	93	91	7	330	1466	12	77	1134	72
Arrive On Green	0.14	0.14	0.13	0.13	0.14	0.13	0.05	0.79	0.79	0.70	0.71	0.70
Sat Flow, veh/h	1337	675	992	333	670	48	1781	1853	15	60	1608	102
Grp Volume(v), veh/h	77	0	121	109	0	0	137	0	626	1143	0	0
Grp Sat Flow(s),veh/h/ln	1337	0	1668	1051	0	0	1781	0	1868	1770	0	0
Q Serve(g_s), s	0.0	0.0	7.4	4.7	0.0	0.0	2.1	0.0	11.6	37.4	0.0	0.0
Cycle Q Clear(g_c), s	8.2	0.0	7.4	12.2	0.0	0.0	2.1	0.0	11.6	58.8	0.0	0.0
Prop In Lane	1.00		0.60	0.45		0.05	1.00		0.01	0.05		0.06
Lane Grp Cap(c), veh/h	206	0	227	186	0	0	330	0	1478	1275	0	0
V/C Ratio(X)	0.37	0.00	0.53	0.59	0.00	0.00	0.42	0.00	0.42	0.90	0.00	0.00
Avail Cap(c_a), veh/h	328	0	379	325	0	0	372	0	1478	1275	0	0
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	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.6	0.0	44.4	46.8	0.0	0.0	3.1	0.0	3.6	13.1	0.0	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.7	1.1	0.0	0.0	0.3	0.0	0.9	10.0	0.0	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	3.2	3.0	0.0	0.0	0.7	0.0	3.9	24.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.0	0.0	45.1	47.9	0.0	0.0	3.4	0.0	4.5	23.1	0.0	0.0
LnGrp LOS	D	A	D	D	A	A	A	A	A	C	A	A
Approach Vol, veh/h		198			109			763			1143	
Approach Delay, s/veh		45.1			47.9			4.3			23.1	
Approach LOS		D			D			A			C	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		91.0		19.0	9.4	81.6		19.0				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		86.5		24.5	7.5	74.5		24.5				
Max Q Clear Time (g_c+I1), s		13.6		10.2	4.1	60.8		14.2				
Green Ext Time (p_c), s		5.4		0.5	0.1	8.6		0.2				

Intersection Summary												
HCM 6th Ctrl Delay			19.8									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	45	25	5	5	10	5	60	750	40	5	185	30
Future Vol, veh/h	45	25	5	5	10	5	60	750	40	5	185	30
Conflicting Peds, #/hr	13	0	0	0	0	13	1	0	8	8	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	2	2	2	17	2	2	3	2	2	2	2
Mvmt Flow	47	26	5	5	11	5	63	789	42	5	195	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1179	1187	212	1181	1182	831	228	0	0	839	0	0
Stage 1	222	222	-	944	944	-	-	-	-	-	-	-
Stage 2	957	965	-	237	238	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.52	6.22	7.12	6.67	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.13	5.52	-	6.12	5.67	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.52	-	6.12	5.67	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.018	3.318	3.518	4.153	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	167	188	828	167	178	370	1340	-	-	796	-	-
Stage 1	778	720	-	315	322	-	-	-	-	-	-	-
Stage 2	308	333	-	766	681	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	143	169	827	135	160	363	1339	-	-	790	-	-
Mov Cap-2 Maneuver	143	169	-	135	160	-	-	-	-	-	-	-
Stage 1	709	714	-	285	291	-	-	-	-	-	-	-
Stage 2	264	301	-	728	676	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	47.6	28.1	0.6	0.2
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1339	-	-	160	177	790	-	-
HCM Lane V/C Ratio	0.047	-	-	0.493	0.119	0.007	-	-
HCM Control Delay (s)	7.8	0	-	47.6	28.1	9.6	0	-
HCM Lane LOS	A	A	-	E	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.4	0.4	0	-	-

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	15	5	5	35	20	30	730	50	10	210	5
Future Vol, veh/h	10	15	5	5	35	20	30	730	50	10	210	5
Conflicting Peds, #/hr	15	0	20	20	0	15	8	0	13	13	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	3	2	2	3	6	2	2	2
Mvmt Flow	11	16	5	5	38	22	32	785	54	11	226	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1180	1175	257	1170	1150	840	239	0	0	852	0	0
Stage 1	259	259	-	889	889	-	-	-	-	-	-	-
Stage 2	921	916	-	281	261	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.53	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.027	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	167	192	782	170	197	365	1328	-	-	787	-	-
Stage 1	746	694	-	338	360	-	-	-	-	-	-	-
Stage 2	324	351	-	726	690	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	123	177	761	145	181	355	1318	-	-	777	-	-
Mov Cap-2 Maneuver	123	177	-	145	181	-	-	-	-	-	-	-
Stage 1	706	677	-	318	339	-	-	-	-	-	-	-
Stage 2	254	331	-	679	673	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	30.3	29.4	0.3	0.4
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1318	-	-	174	211	777	-	-
HCM Lane V/C Ratio	0.024	-	-	0.185	0.306	0.014	-	-
HCM Control Delay (s)	7.8	0	-	30.3	29.4	9.7	0	-
HCM Lane LOS	A	A	-	D	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.7	1.2	0	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	65	745	80	10	225
Future Vol, veh/h	35	65	745	80	10	225
Conflicting Peds, #/hr	15	0	0	23	23	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	2	2	2
Mvmt Flow	38	71	819	88	11	247

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1170	886	0	0	930	0
Stage 1	886	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	213	343	-	-	736	-
Stage 1	403	-	-	-	-	-
Stage 2	764	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	202	335	-	-	720	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	394	-	-	-	-	-
Stage 2	740	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.9	0	0.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	272	720	-
HCM Lane V/C Ratio	-	-	0.404	0.015	-
HCM Control Delay (s)	-	-	26.9	10.1	0
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	1.9	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	40	50	760	195	30
Future Vol, veh/h	20	40	50	760	195	30
Conflicting Peds, #/hr	7	0	15	0	0	15
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	22	44	55	835	214	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1198	246	262	0	-	0
Stage 1	246	-	-	-	-	-
Stage 2	952	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.13	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.227	-	-	-
Pot Cap-1 Maneuver	205	793	1296	-	-	-
Stage 1	795	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	183	782	1277	-	-	-
Mov Cap-2 Maneuver	183	-	-	-	-	-
Stage 1	721	-	-	-	-	-
Stage 2	370	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.7	0.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1277	-	374	-	-
HCM Lane V/C Ratio	0.043	-	0.176	-	-
HCM Control Delay (s)	7.9	0	16.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.6	-	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	60	50	100	385	135	590
Future Volume (veh/h)	60	50	100	385	135	590
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1885	1885
Adj Flow Rate, veh/h	66	55	110	423	148	648
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	1	1
Cap, veh/h	442	368	317	1199	784	698
Arrive On Green	0.15	0.15	0.47	0.47	0.44	0.44
Sat Flow, veh/h	943	786	555	2643	1795	1598
Grp Volume(v), veh/h	0	121	271	262	148	648
Grp Sat Flow(s),veh/h/ln	0	1729	1496	1617	1795	1598
Q Serve(g_s), s	0.0	5.5	6.9	9.3	4.6	34.6
Cycle Q Clear(g_c), s	0.0	5.5	12.3	9.3	4.6	34.6
Prop In Lane		0.45	0.41		1.00	1.00
Lane Grp Cap(c), veh/h	0	810	758	758	784	698
V/C Ratio(X)	0.00	0.15	0.36	0.35	0.19	0.93
Avail Cap(c_a), veh/h	0	810	758	758	987	879
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.40	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	22.5	16.1	15.2	15.6	24.0
Incr Delay (d2), s/veh	0.0	0.2	1.3	1.3	0.1	13.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.3	3.9	3.6	1.9	15.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	22.7	17.4	16.4	15.7	37.8
LnGrp LOS	A	C	B	B	B	D
Approach Vol, veh/h	121			533	796	
Approach Delay, s/veh	22.7			16.9	33.7	
Approach LOS	C			B	C	

Timer - Assigned Phs	2				6	8
Phs Duration (G+Y+Rc), s	46.2				46.2	43.8
Change Period (Y+Rc), s	4.0				4.0	4.5
Max Green Setting (Gmax), s	32.0				32.0	49.5
Max Q Clear Time (g_c+I1), s	7.5				14.3	36.6
Green Ext Time (p_c), s	0.1				0.6	2.7

Intersection Summary	
HCM 6th Ctrl Delay	26.6
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	195	0	685	850	0	0
Future Vol, veh/h	195	0	685	850	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	212	0	745	924	0	0

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	746	-	0	0	-	-
Stage 1	745	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	-	-
Pot Cap-1 Maneuver	381	0	-	-	0	-
Stage 1	469	0	-	-	0	-
Stage 2	1022	0	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	381	-	-	-	-	-
Mov Cap-2 Maneuver	381	-	-	-	-	-
Stage 1	469	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.7	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	381	-
HCM Lane V/C Ratio	-	-	0.556	-
HCM Control Delay (s)	-	-	25.7	-
HCM Lane LOS	-	-	D	-
HCM 95th %tile Q(veh)	-	-	3.3	-

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Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	13th/Belmont	Roundabout	HCM 6th Edition	SB Thru		46.8	E

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: 13th/Belmont

Control Type:	Roundabout	Delay (sec / veh):	46.8
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes		

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Thru	Right	Right2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	125	565	5	50	930	60	70	45	200	45	50	5
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	1.00	2.00	3.00	3.00	8.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	125	565	5	50	930	60	70	45	200	45	50	5
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	34	155	1	14	255	16	19	12	55	12	14	1
Total Analysis Volume [veh/h]	137	621	5	55	1022	66	77	49	220	49	55	5
Pedestrian Volume [ped/h]	2			0			5			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	185			249			1151			852		
Exiting Flow Rate [veh/h]	1322			717			263			112		
Demand Flow Rate [veh/h]	125	565	5	50	930	60	70	45	200	45	50	5
Adjusted Demand Flow Rate [veh/h]	137	621	5	55	1022	66	77	49	220	49	55	5

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1380.00	1380.00	1380.00
B (coefficient)	0.00102	0.00102	0.00102	0.00102
HV Adjustment Factor	0.98	0.98	0.97	0.96
Entry Flow Rate [veh/h]	779	1166	356	115
Capacity of Entry and Bypass Lanes [veh/h]	1143	1071	427	579
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1120	1051	415	554
X, volume / capacity	0.68	1.09	0.83	0.20

Movement, Approach, & Intersection Results

Lane LOS	B	F	E	A
95th-Percentile Queue Length [veh]	5.69	27.29	7.87	0.73
95th-Percentile Queue Length [ft]	142.22	682.23	196.81	18.17
Approach Delay [s/veh]	13.19	73.80	43.70	9.08
Approach LOS	B	F	E	A
Intersection Delay [s/veh]	46.81			
Intersection LOS	E			

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Turning Movement Volume: Summary

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Thru	Right	2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
1	13th/Belmont	125	565	5	50	930	60	70	45	200	45	50	5	2150

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Scenario 1 1-lane
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Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Northbound			Southbound			Eastbound			Westbound			Total Volume
			Thru	Right	2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
1	13th/Belmont	Final Base	125	565	5	50	930	60	70	45	200	45	50	5	2150
		Growth 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	-
		In Process	0	0	0	0	0	0	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0	0	0	0	0	0
		Future Total	**125**	**565**	**5**	**50**	**930**	**60**	**70**	**45**	**200**	**45**	**50**	**5**	**2150**

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	230	460	420	225	530	110
Future Volume (vph)	230	460	420	225	530	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1752	1881	1770	1538
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1752	1881	1770	1538
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	245	489	447	239	564	117
RTOR Reduction (vph)	0	379	0	0	0	75
Lane Group Flow (vph)	245	110	447	239	564	42
Confl. Peds. (#/hr)		2	2		1	2
Heavy Vehicles (%)	2%	2%	3%	1%	2%	5%
Turn Type	NA	Prot	Prot	NA	Prot	Prot
Protected Phases	2	2	1	6	8	8
Permitted Phases						
Actuated Green, G (s)	19.5	19.5	26.1	49.6	31.9	31.9
Effective Green, g (s)	19.5	19.5	26.1	49.6	31.9	31.9
Actuated g/C Ratio	0.22	0.22	0.29	0.55	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	405	344	510	1042	630	548
v/s Ratio Prot	c0.13	0.07	c0.26	0.13	c0.32	0.03
v/s Ratio Perm						
v/c Ratio	0.60	0.32	0.88	0.23	0.90	0.08
Uniform Delay, d1	31.5	29.4	30.2	10.2	27.2	19.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.5	0.5	15.5	0.1	15.2	0.1
Delay (s)	34.1	30.0	45.7	10.3	42.4	19.1
Level of Service	C	C	D	B	D	B
Approach Delay (s)	31.3			33.4	38.4	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	89.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	35	80	335	170	540	0	0	0	25	700	55
Future Volume (veh/h)	50	35	80	335	170	540	0	0	0	25	700	55
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99				1.00		0.99
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	1885	1856	1870	1841	1885				1870	1856	1870
Adj Flow Rate, veh/h	53	37	85	356	181	211				27	745	59
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	2	1	3	2	4	1				2	3	2
Cap, veh/h	52	46	43	288	113	704				27	754	60
Arrive On Green	0.45	0.45	0.45	0.74	0.75	0.74				0.45	0.46	0.45
Sat Flow, veh/h	0	102	96	491	250	1580				59	1639	130
Grp Volume(v), veh/h	175	0	0	537	0	211				831	0	0
Grp Sat Flow(s),veh/h/ln	198	0	0	740	0	1580				1828	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	4.0				40.5	0.0	0.0
Cycle Q Clear(g_c), s	40.1	0.0	0.0	40.1	0.0	4.0				40.5	0.0	0.0
Prop In Lane	0.30		0.49	0.66		1.00				0.03		0.07
Lane Grp Cap(c), veh/h	140	0	0	396	0	704				841	0	0
V/C Ratio(X)	1.25	0.00	0.00	1.35	0.00	0.30				0.99	0.00	0.00
Avail Cap(c_a), veh/h	140	0	0	396	0	704				841	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.59	0.00	0.59				0.54	0.00	0.00
Uniform Delay (d), s/veh	23.2	0.0	0.0	14.7	0.0	6.9				24.1	0.0	0.0
Incr Delay (d2), s/veh	157.5	0.0	0.0	169.4	0.0	0.6				20.2	0.0	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
%ile BackOfQ(50%),veh/ln	7.9	0.0	0.0	26.0	0.0	1.3				21.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	180.7	0.0	0.0	184.0	0.0	7.5				44.3	0.0	0.0
LnGrp LOS	F	A	A	F	A	A				D	A	A
Approach Vol, veh/h		175			748						831	
Approach Delay, s/veh		180.7			134.2						44.3	
Approach LOS		F			F						D	

Timer - Assigned Phs		4		6		8			
Phs Duration (G+Y+Rc), s		44.6		45.4		44.6			
Change Period (Y+Rc), s		4.5		4.5		4.5			
Max Green Setting (Gmax), s		40.1		40.9		40.1			
Max Q Clear Time (g_c+I1), s		42.1		42.5		42.1			
Green Ext Time (p_c), s		0.0		0.0		0.0			

Intersection Summary									
HCM 6th Ctrl Delay		96.3							
HCM 6th LOS		F							

Intersection	
Int Delay, s/veh	13.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	10	10	85	40	0	0	0	0	15	1105	15
Future Vol, veh/h	0	10	10	85	40	0	0	0	0	15	1105	15
Conflicting Peds, #/hr	8	0	11	11	0	8	5	0	2	2	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	11	92	43	0	0	0	0	16	1201	16

Major/Minor	Minor2			Minor1					Major2		
Conflicting Flow All	-	1248	1225	1265	1256	-			2	0	0
Stage 1	-	1246	-	2	2	-			-	-	-
Stage 2	-	2	-	1263	1254	-			-	-	-
Critical Hdwy	-	6.52	6.22	7.12	6.52	-			4.12	-	-
Critical Hdwy Stg 1	-	5.52	-	-	-	-			-	-	-
Critical Hdwy Stg 2	-	-	-	6.12	5.52	-			-	-	-
Follow-up Hdwy	-	4.018	3.318	3.518	4.018	-			2.218	-	-
Pot Cap-1 Maneuver	0	173	218	146	171	0			1620	-	-
Stage 1	0	246	-	-	-	0			-	-	-
Stage 2	0	-	-	208	243	0			-	-	-
Platoon blocked, %										-	-
Mov Cap-1 Maneuver	-	166	217	128	165	-			1617	-	-
Mov Cap-2 Maneuver	-	166	-	128	165	-			-	-	-
Stage 1	-	237	-	-	-	-			-	-	-
Stage 2	-	-	-	183	234	-			-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	26.6	135.2	0.1
HCM LOS	D	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	188	138	1617	-	-
HCM Lane V/C Ratio	0.116	0.985	0.01	-	-
HCM Control Delay (s)	26.6	135.2	7.2	0	-
HCM Lane LOS	D	F	A	A	-
HCM 95th %tile Q(veh)	0.4	7	0	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	10	5	55	15	0	0	0	0	55	1145	10
Future Vol, veh/h	0	10	5	55	15	0	0	0	0	55	1145	10
Conflicting Peds, #/hr	8	0	4	4	0	8	3	0	7	7	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	5	58	16	0	0	0	0	58	1205	11

Major/Minor	Minor2			Minor1					Major2		
Conflicting Flow All	-	1337	1218	1346	1342	-			7	0	0
Stage 1	-	1330	-	7	7	-			-	-	-
Stage 2	-	7	-	1339	1335	-			-	-	-
Critical Hdwy	-	6.52	6.22	7.12	6.52	-			4.12	-	-
Critical Hdwy Stg 1	-	5.52	-	-	-	-			-	-	-
Critical Hdwy Stg 2	-	-	-	6.12	5.52	-			-	-	-
Follow-up Hdwy	-	4.018	3.318	3.518	4.018	-			2.218	-	-
Pot Cap-1 Maneuver	0	153	220	128	152	0			1614	-	-
Stage 1	0	224	-	-	-	0			-	-	-
Stage 2	0	-	-	188	223	0			-	-	-
Platoon blocked, %										-	-
Mov Cap-1 Maneuver	-	134	219	107	134	-			1603	-	-
Mov Cap-2 Maneuver	-	134	-	107	134	-			-	-	-
Stage 1	-	198	-	-	-	-			-	-	-
Stage 2	-	-	-	154	197	-			-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	31	84.4	0.3
HCM LOS	D	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	154	112	1603	-	-
HCM Lane V/C Ratio	0.103	0.658	0.036	-	-
HCM Control Delay (s)	31	84.4	7.3	0	-
HCM Lane LOS	D	F	A	A	-
HCM 95th %tile Q(veh)	0.3	3.4	0.1	-	-

Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	15	0	0	35	25	40	1140	60	0	0	0
Future Vol, veh/h	45	15	0	0	35	25	40	1140	60	0	0	0
Conflicting Peds, #/hr	15	0	20	20	0	15	8	0	13	13	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	3	2	2	3	6	2	2	2
Mvmt Flow	48	16	0	0	38	27	43	1226	65	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	1400	1398	-	-	1366	1287	8	0	0
Stage 1	8	8	-	-	1358	-	-	-	-
Stage 2	1392	1390	-	-	8	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.53	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.53	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.027	3.318	2.218	-	-
Pot Cap-1 Maneuver	118	141	0	0	146	201	1612	-	-
Stage 1	-	-	0	0	216	-	-	-	-
Stage 2	176	209	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	73	125	-	-	129	199	1600	-	-
Mov Cap-2 Maneuver	73	125	-	-	129	-	-	-	-
Stage 1	-	-	-	-	193	-	-	-	-
Stage 2	111	186	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	137.9	45.5	0.2
HCM LOS	F	E	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1600	-	-	81	151
HCM Lane V/C Ratio	0.027	-	-	0.796	0.427
HCM Control Delay (s)	7.3	0	-	137.9	45.5
HCM Lane LOS	A	A	-	F	E
HCM 95th %tile Q(veh)	0.1	-	-	4	1.9

Intersection	
Int Delay, s/veh	6.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	125	1200	60	0	0
Future Vol, veh/h	0	125	1200	60	0	0
Conflicting Peds, #/hr	15	0	0	23	23	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	-
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	2	2	2
Mvmt Flow	0	137	1319	66	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	1375	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	178	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	174	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	76.3	0
HCM LOS	F	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	174
HCM Lane V/C Ratio	-	-	0.789
HCM Control Delay (s)	-	-	76.3
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	5.2

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	45	0	140	1185	0	0
Future Vol, veh/h	45	0	140	1185	0	0
Conflicting Peds, #/hr	7	0	15	0	0	15
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	49	0	154	1302	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	1632	-	15	0
Stage 1	15	-	-	-
Stage 2	1617	-	-	-
Critical Hdwy	6.42	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3.518	-	2.227	-
Pot Cap-1 Maneuver	111	0	1596	-
Stage 1	-	0	-	-
Stage 2	178	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	70	-	1573	-
Mov Cap-2 Maneuver	70	-	-	-
Stage 1	-	-	-	-
Stage 2	176	-	-	-

Approach	EB	NB
HCM Control Delay, s	134.3	0.8
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	1573	-	70
HCM Lane V/C Ratio	0.098	-	0.706
HCM Control Delay (s)	7.5	0	134.3
HCM Lane LOS	A	A	F
HCM 95th %tile Q(veh)	0.3	-	3.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	60	0	0	435	635	640
Future Volume (veh/h)	60	0	0	435	635	640
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1885	1885
Adj Flow Rate, veh/h	66	0	0	478	698	703
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	0	0	2	1	1
Cap, veh/h	517	0	0	517	816	726
Arrive On Green	0.55	0.00	0.00	0.28	0.45	0.45
Sat Flow, veh/h	1870	0	0	1870	1795	1598
Grp Volume(v), veh/h	66	0	0	478	698	703
Grp Sat Flow(s),veh/h/ln	1870	0	0	1870	1795	1598
Q Serve(g_s), s	1.5	0.0	0.0	22.4	31.2	38.6
Cycle Q Clear(g_c), s	1.5	0.0	0.0	22.4	31.2	38.6
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	517	0	0	517	816	726
V/C Ratio(X)	0.13	0.00	0.00	0.92	0.86	0.97
Avail Cap(c_a), veh/h	727	0	0	727	938	834
HCM Platoon Ratio	2.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.9	0.0	0.0	31.7	21.9	23.9
Incr Delay (d2), s/veh	0.0	0.0	0.0	24.8	6.3	21.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0	13.5	14.0	18.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	14.9	0.0	0.0	56.4	28.2	45.4
LnGrp LOS	B	A	A	E	C	D
Approach Vol, veh/h	66			478	1401	
Approach Delay, s/veh	14.9			56.4	36.9	
Approach LOS	B			E	D	

Timer - Assigned Phs	2				6	8
Phs Duration (G+Y+Rc), s	28.9				28.9	44.9
Change Period (Y+Rc), s	4.0				4.0	4.0
Max Green Setting (Gmax), s	35.0				35.0	47.0
Max Q Clear Time (g_c+I1), s	3.5				24.4	40.6
Green Ext Time (p_c), s	0.1				0.5	0.3

Intersection Summary		
HCM 6th Ctrl Delay		40.9
HCM 6th LOS		D

Table of Contents

Intersection Level Of Service Report
Intersection 1: 13th/Belmont

Control Type:	Roundabout	Delay (sec / veh):	94.0
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Thru	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name						
Base Volume Input [veh/h]	1010	200	0	375	165	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	8.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1010	200	0	375	165	0
Peak Hour Factor	0.9100	0.9100	1.0000	0.9100	0.9100	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	277	55	0	103	45	0
Total Analysis Volume [veh/h]	1110	220	0	412	181	0
Pedestrian Volume [ped/h]	0		3		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	195		1132		0	
Exiting Flow Rate [veh/h]	0		420		1552	
Demand Flow Rate [veh/h]	1010	200	0	375	165	0
Adjusted Demand Flow Rate [veh/h]	1110	220	0	412	181	0

Lanes

Overwrite Calculated Critical Headway	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00
A (intercept)	1380.00	1380.00	1380.00
B (coefficient)	0.00102	0.00102	0.00102
HV Adjustment Factor	0.98	0.98	0.93
Entry Flow Rate [veh/h]	1357	421	196
Capacity of Entry and Bypass Lanes [veh/h]	1131	435	1380
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1109	427	1278
X, volume / capacity	1.20	0.97	0.14

Movement, Approach, & Intersection Results

Lane LOS	F	F	A
95th-Percentile Queue Length [veh]	40.13	11.57	0.49
95th-Percentile Queue Length [ft]	1003.29	289.17	12.33
Approach Delay [s/veh]	114.70	66.79	3.99
Approach LOS	F	F	A
Intersection Delay [s/veh]	94.02		
Intersection LOS	F		

Intersection Level Of Service Report
Intersection 2: 13th/12th

Control Type:	Roundabout	Delay (sec / veh):	26.8
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name						
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		30.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		No	

Volumes

Name						
Base Volume Input [veh/h]	160	1225	125	85	115	1385
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	160	1225	125	85	115	1385
Peak Hour Factor	0.9500	0.9500	0.9100	0.9100	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	42	322	34	23	30	364
Total Analysis Volume [veh/h]	168	1289	137	93	121	1458
Pedestrian Volume [ped/h]	0		13		0	

Intersection Settings

Number of Conflicting Circulating Lanes	2		1		2	
Circulating Flow Rate [veh/h]	123		171		0	
Exiting Flow Rate [veh/h]	1487		1438		171	
Demand Flow Rate [veh/h]	160	1225	0	0	115	1385
Adjusted Demand Flow Rate [veh/h]	168	1289	0	0	121	1458

Lanes

Overwrite Calculated Critical Headway	No	No		No	No
User-Defined Critical Headway [s]	4.00	4.00		4.00	4.00
Overwrite Calculated Follow-Up Time	No	No		No	No
User-Defined Follow-Up Time [s]	3.00	3.00		3.00	3.00
A (intercept)	1350.00	1420.00		1350.00	1420.00
B (coefficient)	0.00092	0.00085		0.00092	0.00085
HV Adjustment Factor	0.98	0.98		0.98	0.98
Entry Flow Rate [veh/h]	172	1315		757	854
Capacity of Entry and Bypass Lanes [veh/h]	1206	1279		1350	1420
Pedestrian Impedance	1.00	1.00		1.00	1.00
Capacity per Entry Lane [veh/h]	1182	1254		1324	1393
X, volume / capacity	0.14	1.03		0.56	0.60

Movement, Approach, & Intersection Results

Lane LOS	A	F		A	A
95th-Percentile Queue Length [veh]	0.50	24.32		3.65	4.26
95th-Percentile Queue Length [ft]	12.38	607.89		91.16	106.50
Approach Delay [s/veh]	45.83		0.00	9.19	
Approach LOS	E		A	A	
Intersection Delay [s/veh]	26.77				
Intersection LOS	D				

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	230	460	420	225	530	110
Future Volume (vph)	230	460	420	225	530	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1752	1881	1770	1538
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1752	1881	1770	1538
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	245	489	447	239	564	117
RTOR Reduction (vph)	0	379	0	0	0	75
Lane Group Flow (vph)	245	110	447	239	564	42
Confl. Peds. (#/hr)		2	2		1	2
Heavy Vehicles (%)	2%	2%	3%	1%	2%	5%
Turn Type	NA	Prot	Prot	NA	Prot	Prot
Protected Phases	2	2	1	6	8	8
Permitted Phases						
Actuated Green, G (s)	19.5	19.5	26.1	49.6	31.9	31.9
Effective Green, g (s)	19.5	19.5	26.1	49.6	31.9	31.9
Actuated g/C Ratio	0.22	0.22	0.29	0.55	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	405	344	510	1042	630	548
v/s Ratio Prot	c0.13	0.07	c0.26	0.13	c0.32	0.03
v/s Ratio Perm						
v/c Ratio	0.60	0.32	0.88	0.23	0.90	0.08
Uniform Delay, d1	31.5	29.4	30.2	10.2	27.2	19.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.5	0.5	15.5	0.1	15.2	0.1
Delay (s)	34.1	30.0	45.7	10.3	42.4	19.1
Level of Service	C	C	D	B	D	B
Approach Delay (s)	31.3			33.4	38.4	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	89.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	35	80	310	195	140	100	650	110	25	725	55
Future Volume (veh/h)	50	35	80	310	195	140	100	650	110	25	725	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	1.00		0.98	1.00		0.99	1.00		0.99
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	1870	1885	1856	1870	1841	1885	1870	1870	1870	1870	1856	1870
Adj Flow Rate, veh/h	53	37	85	330	207	116	106	691	117	27	771	59
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	1	3	2	4	1	2	2	2	2	3	2
Cap, veh/h	87	69	98	330	361	202	275	908	154	55	768	58
Arrive On Green	0.20	0.21	0.20	0.12	0.55	0.55	0.06	0.58	0.58	0.48	0.48	0.48
Sat Flow, veh/h	166	329	468	1781	1101	617	1781	1557	264	28	1595	120
Grp Volume(v), veh/h	175	0	0	330	0	323	106	0	808	857	0	0
Grp Sat Flow(s),veh/h/ln	963	0	0	1781	0	1718	1781	0	1820	1743	0	0
Q Serve(g_s), s	5.6	0.0	0.0	6.2	0.0	11.2	2.5	0.0	30.0	22.0	0.0	0.0
Cycle Q Clear(g_c), s	16.8	0.0	0.0	6.2	0.0	11.2	2.5	0.0	30.0	42.9	0.0	0.0
Prop In Lane	0.30		0.49	1.00		0.36	1.00		0.14	0.03		0.07
Lane Grp Cap(c), veh/h	248	0	0	330	0	563	275	0	1062	871	0	0
V/C Ratio(X)	0.71	0.00	0.00	1.00	0.00	0.57	0.39	0.00	0.76	0.98	0.00	0.00
Avail Cap(c_a), veh/h	248	0	0	330	0	563	282	0	1062	871	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.92	0.00	0.92	1.00	0.00	1.00	0.54	0.00	0.00
Uniform Delay (d), s/veh	34.8	0.0	0.0	34.7	0.0	16.2	9.2	0.0	14.1	23.6	0.0	0.0
Incr Delay (d2), s/veh	15.6	0.0	0.0	47.3	0.0	3.9	0.9	0.0	5.1	18.8	0.0	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	4.9	0.0	0.0	10.8	0.0	4.1	1.0	0.0	12.8	22.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.4	0.0	0.0	82.1	0.0	20.1	10.1	0.0	19.2	42.5	0.0	0.0
LnGrp LOS	D	A	A	F	A	C	B	A	B	D	A	A
Approach Vol, veh/h		175			653			914			857	
Approach Delay, s/veh		50.4			51.4			18.2			42.5	
Approach LOS		D			D			B			D	

Timer - Assigned Phs	2	3	4	5	6	8
Phs Duration (G+Y+Rc), s	56.5	10.7	22.8	9.1	47.4	33.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	52.0	6.2	18.3	5.0	42.5	29.0
Max Q Clear Time (g_c+I1), s	32.0	8.2	18.8	4.5	44.9	13.2
Green Ext Time (p_c), s	6.5	0.0	0.0	0.0	0.0	1.9

Intersection Summary	
HCM 6th Ctrl Delay	36.7
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	12.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	10	10	10	20	40	30	830	10	15	1105	15
Future Vol, veh/h	5	10	10	10	20	40	30	830	10	15	1105	15
Conflicting Peds, #/hr	8	0	11	11	0	8	5	0	2	2	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	10	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	11	11	22	43	33	902	11	16	1201	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2260	2227	1225	2239	2230	918	1222	0	0	915	0	0
Stage 1	1246	1246	-	976	976	-	-	-	-	-	-	-
Stage 2	1014	981	-	1263	1254	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	29	43	218	30	43	329	570	-	-	745	-	-
Stage 1	213	246	-	302	329	-	-	-	-	-	-	-
Stage 2	288	328	-	208	243	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	13	39	215	21	39	326	567	-	-	744	-	-
Mov Cap-2 Maneuver	13	39	-	21	39	-	-	-	-	-	-	-
Stage 1	200	239	-	284	309	-	-	-	-	-	-	-
Stage 2	217	308	-	183	236	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	242.2	291.2	0.4	0.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	567	-	-	36	63	744	-	-
HCM Lane V/C Ratio	0.058	-	-	0.755	1.208	0.022	-	-
HCM Control Delay (s)	11.7	-	-	242.2	291.2	9.9	-	-
HCM Lane LOS	B	-	-	F	F	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	2.7	6.2	0.1	-	-

Intersection	
Int Delay, s/veh	22.8

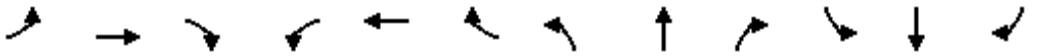
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑		↰	↑	
Traffic Vol, veh/h	5	10	5	35	15	20	5	900	5	25	1095	10
Future Vol, veh/h	5	10	5	35	15	20	5	900	5	25	1095	10
Conflicting Peds, #/hr	8	0	4	4	0	8	3	0	7	7	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	10	-	-	10	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	5	37	16	21	5	947	5	26	1153	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2200	2183	1166	2190	2186	965	1167	0	0	959	0	0
Stage 1	1214	1214	-	967	967	-	-	-	-	-	-	-
Stage 2	986	969	-	1223	1219	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	32	46	236	~ 33	46	309	599	-	-	717	-	-
Stage 1	222	254	-	306	333	-	-	-	-	-	-	-
Stage 2	298	332	-	219	253	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	21	44	234	~ 25	44	305	597	-	-	712	-	-
Mov Cap-2 Maneuver	21	44	-	~ 25	44	-	-	-	-	-	-	-
Stage 1	220	244	-	301	328	-	-	-	-	-	-	-
Stage 2	260	327	-	197	243	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	163	$ 641.7	0.1	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	597	-	-	41	39	712	-	-
HCM Lane V/C Ratio	0.009	-	-	0.513	1.889	0.037	-	-
HCM Control Delay (s)	11.1	-	-	163	$ 641.7	10.2	-	-
HCM Lane LOS	B	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0	-	-	1.8	7.9	0.1	-	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	45	200	15	20	5	120	855	5	50	1000	100
Future Volume (veh/h)	70	45	200	15	20	5	120	855	5	50	1000	100
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		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	1870	1856	1856	1781	1870	1870	1870	1870	1870	1870	1870	1885
Adj Flow Rate, veh/h	77	49	71	16	22	5	132	940	5	55	1099	110
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	3	3	8	2	2	2	2	2	2	2	1
Cap, veh/h	183	69	100	61	70	11	266	1394	7	431	1242	124
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.75	0.75	0.04	0.74	0.74
Sat Flow, veh/h	1375	680	986	162	687	112	1781	1859	10	1781	1672	167
Grp Volume(v), veh/h	77	0	120	43	0	0	132	0	945	55	0	1209
Grp Sat Flow(s),veh/h/ln	1375	0	1666	960	0	0	1781	0	1869	1781	0	1840
Q Serve(g_s), s	0.0	0.0	7.8	0.1	0.0	0.0	1.9	0.0	28.5	0.8	0.0	55.1
Cycle Q Clear(g_c), s	7.7	0.0	7.8	7.9	0.0	0.0	1.9	0.0	28.5	0.8	0.0	55.1
Prop In Lane	1.00		0.59	0.37		0.12	1.00		0.01	1.00		0.09
Lane Grp Cap(c), veh/h	183	0	169	137	0	0	266	0	1401	431	0	1366
V/C Ratio(X)	0.42	0.00	0.71	0.31	0.00	0.00	0.50	0.00	0.67	0.13	0.00	0.89
Avail Cap(c_a), veh/h	275	0	281	242	0	0	298	0	1401	447	0	1366
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	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.5	0.0	48.7	46.3	0.0	0.0	21.7	0.0	7.1	6.5	0.0	10.8
Incr Delay (d2), s/veh	1.5	0.0	5.4	1.3	0.0	0.0	1.4	0.0	2.6	0.1	0.0	8.7
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	2.2	0.0	3.5	1.2	0.0	0.0	2.4	0.0	10.7	0.3	0.0	22.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	0.0	54.1	47.6	0.0	0.0	23.1	0.0	9.7	6.6	0.0	19.5
LnGrp LOS	D	A	D	D	A	A	C	A	A	A	A	B
Approach Vol, veh/h		197			43			1077			1264	
Approach Delay, s/veh		52.5			47.6			11.3			18.9	
Approach LOS		D			D			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	87.6		15.3	9.4	86.8		15.3				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	83.1		18.3	6.9	81.3		18.3				
Max Q Clear Time (g_c+I1), s	2.8	30.5		9.8	3.9	57.1		9.9				
Green Ext Time (p_c), s	0.0	10.9		0.5	0.1	13.5		0.1				

Intersection Summary			
HCM 6th Ctrl Delay		18.8	
HCM 6th LOS		B	

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	45	25	0	0	10	5	60	450	40	0	0	0
Future Vol, veh/h	45	25	0	0	10	5	60	450	40	0	0	0
Conflicting Peds, #/hr	13	0	0	0	0	13	1	0	8	8	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	2	2	2	17	2	2	3	2	2	2	2
Mvmt Flow	47	26	0	0	11	5	63	474	42	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	643	651	-	-	630	516	1	0	0
Stage 1	1	1	-	-	629	-	-	-	-
Stage 2	642	650	-	-	1	-	-	-	-
Critical Hdwy	7.13	6.52	-	-	6.67	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.67	-	-	-	-
Critical Hdwy Stg 2	6.13	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.018	-	-	4.153	3.318	2.218	-	-
Pot Cap-1 Maneuver	385	388	0	0	380	559	1622	-	-
Stage 1	-	-	0	0	453	-	-	-	-
Stage 2	461	465	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	357	364	-	-	356	555	1620	-	-
Mov Cap-2 Maneuver	357	364	-	-	356	-	-	-	-
Stage 1	-	-	-	-	424	-	-	-	-
Stage 2	421	436	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	17.6	14.3	0.8
HCM LOS	C	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1620	-	-	359	404
HCM Lane V/C Ratio	0.039	-	-	0.205	0.039
HCM Control Delay (s)	7.3	0	-	17.6	14.3
HCM Lane LOS	A	A	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	0.8	0.1

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	15	0	0	35	20	30	430	50	0	0	0
Future Vol, veh/h	10	15	0	0	35	20	30	430	50	0	0	0
Conflicting Peds, #/hr	15	0	20	20	0	15	8	0	13	13	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	3	2	2	3	6	2	2	2
Mvmt Flow	11	16	0	0	38	22	32	462	54	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	606	601	-	-	574	517	8	0	0
Stage 1	8	8	-	-	566	-	-	-	-
Stage 2	598	593	-	-	8	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.53	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.53	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.027	3.318	2.218	-	-
Pot Cap-1 Maneuver	409	414	0	0	428	558	1612	-	-
Stage 1	-	-	0	0	506	-	-	-	-
Stage 2	489	493	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	355	395	-	-	408	551	1600	-	-
Mov Cap-2 Maneuver	355	395	-	-	408	-	-	-	-
Stage 1	-	-	-	-	486	-	-	-	-
Stage 2	421	473	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	15.3	14.2	0.4
HCM LOS	C	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1600	-	-	378	451
HCM Lane V/C Ratio	0.02	-	-	0.071	0.131
HCM Control Delay (s)	7.3	0	-	15.3	14.2
HCM Lane LOS	A	A	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.4

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	105	450	80	0	0
Future Vol, veh/h	0	105	450	80	0	0
Conflicting Peds, #/hr	15	0	0	23	23	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	16979
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	2	2	2
Mvmt Flow	0	115	495	88	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	562	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	526	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	514	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	14	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	514
HCM Lane V/C Ratio	-	-	0.224
HCM Control Delay (s)	-	-	14
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.9

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	0	65	485	0	0
Future Vol, veh/h	20	0	65	485	0	0
Conflicting Peds, #/hr	7	0	15	0	0	15
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	16965	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	22	0	71	533	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	697	-	15	0
Stage 1	15	-	-	-
Stage 2	682	-	-	-
Critical Hdwy	6.42	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3.518	-	2.227	-
Pot Cap-1 Maneuver	407	0	1596	-
Stage 1	-	0	-	-
Stage 2	502	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	370	-	1573	-
Mov Cap-2 Maneuver	370	-	-	-
Stage 1	-	-	-	-
Stage 2	495	-	-	-

Approach	EB	NB
HCM Control Delay, s	15.3	0.9
HCM LOS	C	

Minor Lane/Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	1573	-	370
HCM Lane V/C Ratio	0.045	-	0.059
HCM Control Delay (s)	7.4	0	15.3
HCM Lane LOS	A	A	C
HCM 95th %tile Q(veh)	0.1	-	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	160	0	0	435	235	315
Future Volume (vph)	160	0	0	435	235	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	1.00			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1863			3539	1787	1599
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1863			3539	1787	1599
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	176	0	0	478	258	346
RTOR Reduction (vph)	0	0	0	0	0	283
Lane Group Flow (vph)	176	0	0	478	258	63
Confl. Peds. (#/hr)					8	
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	3	
Permitted Phases						8
Actuated Green, G (s)	65.6			65.6	16.4	16.4
Effective Green, g (s)	65.6			65.6	16.4	16.4
Actuated g/C Ratio	0.73			0.73	0.18	0.18
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	0.2			0.2	0.2	0.2
Lane Grp Cap (vph)	1357			2579	325	291
v/s Ratio Prot	0.09			c0.14	c0.14	
v/s Ratio Perm						0.04
v/c Ratio	0.13			0.19	0.79	0.22
Uniform Delay, d1	3.7			3.8	35.2	31.3
Progression Factor	0.54			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.2	11.7	0.1
Delay (s)	2.1			4.0	46.9	31.5
Level of Service	A			A	D	C
Approach Delay (s)	2.1			4.0	38.1	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

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Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	13th/Belmont	Roundabout	HCM 6th Edition	SB Thru		59.3	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: 13th/Belmont

Control Type:	Roundabout	Delay (sec / veh):	59.3
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Thru	Right	Right2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	120	855	5	50	1000	100	70	45	200	15	20	5
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	1.00	2.00	3.00	3.00	8.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	120	855	5	50	1000	100	70	45	200	15	20	5
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	33	235	1	14	275	27	19	12	55	4	5	1
Total Analysis Volume [veh/h]	132	940	5	55	1099	110	77	49	220	16	22	5
Pedestrian Volume [ped/h]	2			0			5			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	185			174			1194			1172		
Exiting Flow Rate [veh/h]	1365			1042			268			112		
Demand Flow Rate [veh/h]	120	855	5	50	1000	100	70	45	200	15	20	5
Adjusted Demand Flow Rate [veh/h]	132	940	5	55	1099	110	77	49	220	16	22	5

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1380.00	1380.00	1380.00
B (coefficient)	0.00102	0.00102	0.00102	0.00102
HV Adjustment Factor	0.98	0.98	0.97	0.96
Entry Flow Rate [veh/h]	1099	1289	356	45
Capacity of Entry and Bypass Lanes [veh/h]	1143	1156	409	418
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1120	1134	398	401
X, volume / capacity	0.96	1.12	0.87	0.11

Movement, Approach, & Intersection Results

Lane LOS	E	F	F	B
95th-Percentile Queue Length [veh]	17.60	31.41	8.64	0.36
95th-Percentile Queue Length [ft]	439.90	785.17	215.90	8.94
Approach Delay [s/veh]	37.69	81.68	50.74	10.59
Approach LOS	E	F	F	B
Intersection Delay [s/veh]	59.29			
Intersection LOS	F			

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Turning Movement Volume: Summary

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Thru	Right	2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
1	13th/Belmont	120	855	5	50	1000	100	70	45	200	15	20	5	2485

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Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Northbound			Southbound			Eastbound			Westbound			Total Volume
			Thru	Right	2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
1	13th/Belmont	Final Base	120	855	5	50	1000	100	70	45	200	15	20	5	2485
		Growth 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	-
		In Process	0	0	0	0	0	0	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0	0	0	0	0	0
		Future Total	**120**	**855**	**5**	**50**	**1000**	**100**	**70**	**45**	**200**	**15**	**20**	**5**	**2485**

APPENDIX D: ALTERNATIVE TRAFFIC OPERATIONS (MITIGATED)

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	230	460	420	225	530	110
Future Volume (vph)	230	460	420	225	530	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1752	1881	1770	1538
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1752	1881	1770	1538
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	245	489	447	239	564	117
RTOR Reduction (vph)	0	59	0	0	0	74
Lane Group Flow (vph)	245	430	447	239	564	43
Confl. Peds. (#/hr)		2	2		1	2
Heavy Vehicles (%)	2%	2%	3%	1%	2%	5%
Turn Type	NA	pt+ov	Prot	NA	Prot	Prot
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						
Actuated Green, G (s)	17.9	54.7	26.5	48.4	32.8	32.8
Effective Green, g (s)	17.9	54.7	26.5	48.4	32.8	32.8
Actuated g/C Ratio	0.20	0.61	0.30	0.54	0.37	0.37
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	373	970	520	1020	650	565
v/s Ratio Prot	c0.13	0.27	c0.26	0.13	c0.32	0.03
v/s Ratio Perm						
v/c Ratio	0.66	0.44	0.86	0.23	0.87	0.08
Uniform Delay, d1	32.8	9.2	29.6	10.7	26.2	18.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.3	13.3	0.1	11.8	0.1
Delay (s)	37.0	9.5	42.9	10.8	38.0	18.4
Level of Service	D	A	D	B	D	B
Approach Delay (s)	18.7			31.7	34.6	
Approach LOS	B			C	C	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	89.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	85	80	310	145	40	125	500	10	75	625	55
Future Volume (veh/h)	0	85	80	310	145	40	125	500	10	75	625	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.99	1.00		0.99	1.00		0.99
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	0	1885	1856	1870	1841	1885	1870	1870	1870	1870	1856	1870
Adj Flow Rate, veh/h	0	90	45	330	154	30	133	532	11	80	665	59
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	1	3	2	4	1	2	2	2	2	3	2
Cap, veh/h	0	148	74	364	571	111	188	608	13	376	718	64
Arrive On Green	0.00	0.13	0.12	0.20	0.38	0.38	0.06	0.33	0.33	0.15	0.43	0.42
Sat Flow, veh/h	0	1167	584	1781	1493	291	1781	1825	38	1781	1678	149
Grp Volume(v), veh/h	0	0	135	330	0	184	133	0	543	80	0	724
Grp Sat Flow(s),veh/h/ln	0	0	1751	1781	0	1784	1781	0	1863	1781	0	1827
Q Serve(g_s), s	0.0	0.0	6.5	16.0	0.0	6.3	2.4	0.0	24.3	0.0	0.0	33.3
Cycle Q Clear(g_c), s	0.0	0.0	6.5	16.0	0.0	6.3	2.4	0.0	24.3	0.0	0.0	33.3
Prop In Lane	0.00		0.33	1.00		0.16	1.00		0.02	1.00		0.08
Lane Grp Cap(c), veh/h	0	0	223	364	0	682	188	0	621	376	0	782
V/C Ratio(X)	0.00	0.00	0.61	0.91	0.00	0.27	0.71	0.00	0.87	0.21	0.00	0.93
Avail Cap(c_a), veh/h	0	0	365	392	0	855	192	0	872	376	0	834
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)	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	36.7	34.4	0.0	18.9	39.6	0.0	27.8	31.6	0.0	24.0
Incr Delay (d2), s/veh	0.0	0.0	1.0	22.2	0.0	0.1	10.5	0.0	6.6	0.2	0.0	15.5
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	0.0	0.0	2.8	9.1	0.0	2.6	3.3	0.0	11.7	1.5	0.0	17.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	37.7	56.6	0.0	18.9	50.0	0.0	34.5	31.8	0.0	39.6
LnGrp LOS	A	A	D	E	A	B	D	A	C	C	A	D
Approach Vol, veh/h		135			514			676			804	
Approach Delay, s/veh		37.7			43.1			37.5			38.8	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6		8
Phs Duration (G+Y+Rc), s	17.2	33.5	22.6	15.3	8.8	42.0		37.9
Change Period (Y+Rc), s	4.0	4.5	4.5	4.5	4.0	4.5		4.5
Max Green Setting (Gmax), s	4.6	41.0	19.5	18.0	5.0	40.0		42.0
Max Q Clear Time (g_c+I1), s	12.3	26.3	18.0	8.5	4.4	35.3		8.3
Green Ext Time (p_c), s	0.0	2.7	0.1	0.2	0.0	2.2		0.8

Intersection Summary	
HCM 6th Ctrl Delay	39.4
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	10	10	10	20	40	30	565	10	5	990	15
Future Vol, veh/h	5	10	10	10	20	40	30	565	10	5	990	15
Conflicting Peds, #/hr	8	0	11	11	0	8	5	0	2	2	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	11	11	22	43	33	614	11	5	1076	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1825	1792	1100	1804	1795	630	1097	0	0	627	0	0
Stage 1	1099	1099	-	688	688	-	-	-	-	-	-	-
Stage 2	726	693	-	1116	1107	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	59	81	258	61	80	482	636	-	-	955	-	-
Stage 1	258	288	-	436	447	-	-	-	-	-	-	-
Stage 2	416	445	-	252	286	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	38	73	254	48	72	477	633	-	-	953	-	-
Mov Cap-2 Maneuver	38	73	-	48	72	-	-	-	-	-	-	-
Stage 1	236	283	-	400	410	-	-	-	-	-	-	-
Stage 2	327	409	-	227	281	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	70.4	73	0.5	0
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	633	-	-	81	123	953	-	-
HCM Lane V/C Ratio	0.052	-	-	0.335	0.619	0.006	-	-
HCM Control Delay (s)	11	0	-	70.4	73	8.8	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.3	3.2	0	-	-

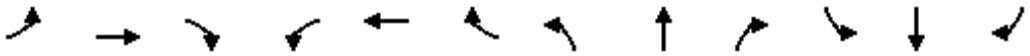
Intersection	
Int Delay, s/veh	8.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	10	5	35	15	15	5	600	5	35	995	10
Future Vol, veh/h	5	10	5	35	15	15	5	600	5	35	995	10
Conflicting Peds, #/hr	8	0	4	4	0	8	3	0	7	7	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	5	37	16	16	5	632	5	37	1047	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1799	1784	1060	1791	1787	650	1061	0	0	644	0	0
Stage 1	1130	1130	-	652	652	-	-	-	-	-	-	-
Stage 2	669	654	-	1139	1135	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	62	82	272	63	81	469	657	-	-	941	-	-
Stage 1	248	279	-	457	464	-	-	-	-	-	-	-
Stage 2	447	463	-	245	277	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	45	72	270	50	72	462	655	-	-	935	-	-
Mov Cap-2 Maneuver	45	72	-	50	72	-	-	-	-	-	-	-
Stage 1	244	251	-	448	455	-	-	-	-	-	-	-
Stage 2	409	454	-	207	250	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	72	207.9	0.1	0.3
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	655	-	-	74	69	935	-	-
HCM Lane V/C Ratio	0.008	-	-	0.284	0.992	0.039	-	-
HCM Control Delay (s)	10.5	0	-	72	207.9	9	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	5	0.1	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	45	200	0	170	5	0	565	5	50	930	60
Future Volume (veh/h)	70	45	200	0	170	5	0	565	5	50	930	60
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	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	1870	1856	1856	0	1870	1870	0	1870	1870	1870	1870	1885
Adj Flow Rate, veh/h	77	49	72	0	187	5	0	621	5	55	1022	66
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	3	3	0	2	2	0	2	2	2	2	1
Cap, veh/h	208	127	186	0	340	9	0	1327	11	579	1245	80
Arrive On Green	0.19	0.19	0.18	0.00	0.19	0.18	0.00	0.72	0.71	0.71	0.72	0.71
Sat Flow, veh/h	1293	676	994	0	1813	48	0	1853	15	868	1737	112
Grp Volume(v), veh/h	77	0	121	0	0	192	0	0	626	55	0	1088
Grp Sat Flow(s),veh/h/ln	1293	0	1670	0	0	1862	0	0	1868	868	0	1850
Q Serve(g_s), s	4.8	0.0	5.3	0.0	0.0	7.8	0.0	0.0	11.9	2.4	0.0	33.7
Cycle Q Clear(g_c), s	12.6	0.0	5.3	0.0	0.0	7.8	0.0	0.0	11.9	14.3	0.0	33.7
Prop In Lane	1.00		0.60	0.00		0.03	0.00		0.01	1.00		0.06
Lane Grp Cap(c), veh/h	208	0	313	0	0	349	0	0	1338	579	0	1325
V/C Ratio(X)	0.37	0.00	0.39	0.00	0.00	0.55	0.00	0.00	0.47	0.10	0.00	0.82
Avail Cap(c_a), veh/h	323	0	462	0	0	515	0	0	1997	885	0	1978
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	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	36.3	0.0	29.8	0.0	0.0	30.6	0.0	0.0	5.0	8.3	0.0	8.1
Incr Delay (d2), s/veh	0.8	0.0	0.6	0.0	0.0	1.0	0.0	0.0	0.2	0.1	0.0	1.5
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	1.5	0.0	2.2	0.0	0.0	3.5	0.0	0.0	3.7	0.4	0.0	10.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.1	0.0	30.3	0.0	0.0	31.6	0.0	0.0	5.2	8.4	0.0	9.6
LnGrp LOS	D	A	C	A	A	C	A	A	A	A	A	A
Approach Vol, veh/h		198			192			626			1143	
Approach Delay, s/veh		33.0			31.6			5.2			9.6	
Approach LOS		C			C			A			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		63.6		19.6		63.6		19.6				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		88.5		22.5		88.5		22.5				
Max Q Clear Time (g_c+I1), s		13.9		14.6		35.7		9.8				
Green Ext Time (p_c), s		7.0		0.5		23.4		0.6				

Intersection Summary												
HCM 6th Ctrl Delay			12.4									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	45	25	5	5	10	5	150	750	40	5	175	30
Future Vol, veh/h	45	25	5	5	10	5	150	750	40	5	175	30
Conflicting Peds, #/hr	13	0	0	0	0	13	1	0	8	8	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	2	2	2	17	2	2	3	2	2	2	2
Mvmt Flow	47	26	5	5	11	5	158	789	42	5	184	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1358	1366	201	1360	1361	831	217	0	0	839	0	0
Stage 1	211	211	-	1134	1134	-	-	-	-	-	-	-
Stage 2	1147	1155	-	226	227	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.52	6.22	7.12	6.67	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.13	5.52	-	6.12	5.67	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.52	-	6.12	5.67	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.018	3.318	3.518	4.153	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	125	147	840	126	138	370	1353	-	-	796	-	-
Stage 1	789	728	-	246	260	-	-	-	-	-	-	-
Stage 2	241	271	-	777	689	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	93	113	839	85	106	363	1352	-	-	790	-	-
Mov Cap-2 Maneuver	93	113	-	85	106	-	-	-	-	-	-	-
Stage 1	615	722	-	191	202	-	-	-	-	-	-	-
Stage 2	174	210	-	739	683	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	104.8	41.3	1.3	0.2
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1352	-	-	105	120	790	-	-
HCM Lane V/C Ratio	0.117	-	-	0.752	0.175	0.007	-	-
HCM Control Delay (s)	8	0	-	104.8	41.3	9.6	0	-
HCM Lane LOS	A	A	-	F	E	A	A	-
HCM 95th %tile Q(veh)	0.4	-	-	4.1	0.6	0	-	-

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	15	5	5	35	20	30	730	50	10	210	5
Future Vol, veh/h	10	15	5	5	35	20	30	730	50	10	210	5
Conflicting Peds, #/hr	15	0	20	20	0	15	8	0	13	13	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	3	2	2	3	6	2	2	2
Mvmt Flow	11	16	5	5	38	22	32	785	54	11	226	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1180	1175	257	1170	1150	840	239	0	0	852	0	0
Stage 1	259	259	-	889	889	-	-	-	-	-	-	-
Stage 2	921	916	-	281	261	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.53	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.027	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	167	192	782	170	197	365	1328	-	-	787	-	-
Stage 1	746	694	-	338	360	-	-	-	-	-	-	-
Stage 2	324	351	-	726	690	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	123	177	761	145	181	355	1318	-	-	777	-	-
Mov Cap-2 Maneuver	123	177	-	145	181	-	-	-	-	-	-	-
Stage 1	706	677	-	318	339	-	-	-	-	-	-	-
Stage 2	254	331	-	679	673	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	30.3	29.4	0.3	0.4
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1318	-	-	174	211	777	-	-
HCM Lane V/C Ratio	0.024	-	-	0.185	0.306	0.014	-	-
HCM Control Delay (s)	7.8	0	-	30.3	29.4	9.7	0	-
HCM Lane LOS	A	A	-	D	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.7	1.2	0	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	65	745	80	10	225
Future Vol, veh/h	35	65	745	80	10	225
Conflicting Peds, #/hr	15	0	0	23	23	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	2	2	2
Mvmt Flow	38	71	819	88	11	247

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1170	886	0	0	930	0
Stage 1	886	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	213	343	-	-	736	-
Stage 1	403	-	-	-	-	-
Stage 2	764	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	202	335	-	-	720	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	394	-	-	-	-	-
Stage 2	740	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.9	0	0.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	272	720	-
HCM Lane V/C Ratio	-	-	0.404	0.015	-
HCM Control Delay (s)	-	-	26.9	10.1	0
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	1.9	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	40	50	760	195	30
Future Vol, veh/h	20	40	50	760	195	30
Conflicting Peds, #/hr	7	0	15	0	0	15
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	22	44	55	835	214	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1198	246	262	0	-	0
Stage 1	246	-	-	-	-	-
Stage 2	952	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.13	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.227	-	-	-
Pot Cap-1 Maneuver	205	793	1296	-	-	-
Stage 1	795	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	183	782	1277	-	-	-
Mov Cap-2 Maneuver	183	-	-	-	-	-
Stage 1	721	-	-	-	-	-
Stage 2	370	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.7	0.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1277	-	374	-	-
HCM Lane V/C Ratio	0.043	-	0.176	-	-
HCM Control Delay (s)	7.9	0	16.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.6	-	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	120	50	100	385	135	590
Future Volume (veh/h)	120	50	100	385	135	590
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1885	1885
Adj Flow Rate, veh/h	132	55	110	423	148	339
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	1	1
Cap, veh/h	365	152	346	789	596	530
Arrive On Green	0.29	0.29	0.29	0.29	0.33	0.33
Sat Flow, veh/h	1254	522	432	2797	1795	1598
Grp Volume(v), veh/h	0	187	292	241	148	339
Grp Sat Flow(s),veh/h/ln	0	1776	1526	1617	1795	1598
Q Serve(g_s), s	0.0	1.9	2.1	2.8	1.4	4.1
Cycle Q Clear(g_c), s	0.0	1.9	3.9	2.8	1.4	4.1
Prop In Lane		0.29	0.38		1.00	1.00
Lane Grp Cap(c), veh/h	0	517	664	470	596	530
V/C Ratio(X)	0.00	0.36	0.44	0.51	0.25	0.64
Avail Cap(c_a), veh/h	0	1419	1479	1292	1474	1312
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	6.3	7.0	6.7	5.5	6.4
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.3	0.2	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.4	0.6	0.5	0.3	0.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	6.5	7.2	7.0	5.7	7.7
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h	187			533	487	
Approach Delay, s/veh	6.5			7.1	7.1	
Approach LOS	A			A	A	

Timer - Assigned Phs	2				6	8
Phs Duration (G+Y+Rc), s	10.6				10.6	12.0
Change Period (Y+Rc), s	4.0				4.0	4.5
Max Green Setting (Gmax), s	18.0				18.0	18.5
Max Q Clear Time (g_c+I1), s	3.9				5.9	6.1
Green Ext Time (p_c), s	0.2				0.6	1.4

Intersection Summary	
HCM 6th Ctrl Delay	7.0
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	36.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	150	0	560	975	0	1220
Future Vol, veh/h	150	0	560	975	0	1220
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	163	0	609	1060	0	1326

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1935	-	0	0	-	-
Stage 1	609	-	-	-	-	-
Stage 2	1326	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	-	-
Pot Cap-1 Maneuver	~ 72	0	-	-	0	-
Stage 1	543	0	-	-	0	-
Stage 2	248	0	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 72	-	-	-	-	-
Mov Cap-2 Maneuver	~ 72	-	-	-	-	-
Stage 1	543	-	-	-	-	-
Stage 2	248	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 702.7	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	72	-
HCM Lane V/C Ratio	-	-	2.264	-
HCM Control Delay (s)	-	-	$ 702.7	-
HCM Lane LOS	-	-	F	-
HCM 95th %tile Q(veh)	-	-	15.4	-

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

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Report File: X:\...\Scenario 1 - Mit v2.pdf

Scenario 1 Scen1 - Mit
2/21/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	13th/Belmont	Roundabout	HCM 6th Edition	EB Right		33.4	D
3	13th / May	Roundabout	HCM 6th Edition	WB Left		16.5	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: 13th/Belmont

Control Type:	Roundabout	Delay (sec / veh):	33.4
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Thru	Right	Right2	Left2	Left	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	125	565	5	50	930	60	115	45	200	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	1.00	2.00	3.00	3.00	8.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	125	565	5	50	930	60	115	45	200	0	0	0
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	34	155	1	14	255	16	32	12	55	0	0	0
Total Analysis Volume [veh/h]	137	621	5	55	1022	66	126	49	220	0	0	0
Pedestrian Volume [ped/h]	2			0			5			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	235			140			1099			902		
Exiting Flow Rate [veh/h]	1269			762			206			112		
Demand Flow Rate [veh/h]	125	565	5	50	930	60	115	45	200	0	0	0
Adjusted Demand Flow Rate [veh/h]	137	621	5	55	1022	66	126	49	220	0	0	0

Lanes

Overwrite Calculated Critical Headway	No	No	No	
User-Defined Critical Headway [s]	4.00	4.00	4.00	
Overwrite Calculated Follow-Up Time	No	No	No	
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	
A (intercept)	1380.00	1380.00	1380.00	
B (coefficient)	0.00102	0.00102	0.00102	
HV Adjustment Factor	0.98	0.98	0.97	
Entry Flow Rate [veh/h]	779	1166	406	
Capacity of Entry and Bypass Lanes [veh/h]	1086	1197	451	
Pedestrian Impedance	1.00	1.00	1.00	
Capacity per Entry Lane [veh/h]	1065	1174	439	
X, volume / capacity	0.72	0.97	0.90	

Movement, Approach, & Intersection Results

Lane LOS	C	E	F	
95th-Percentile Queue Length [veh]	6.48	18.86	9.76	
95th-Percentile Queue Length [ft]	162.08	471.57	244.05	
Approach Delay [s/veh]	15.03	39.15	52.34	0.00
Approach LOS	C	E	F	A
Intersection Delay [s/veh]	33.41			
Intersection LOS	D			

Intersection Level Of Service Report
Intersection 3: 13th / May

Control Type:	Roundabout	Delay (sec / veh):	16.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	-4.50			4.50			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	125	500	10	75	625	55	50	35	80	310	145	40
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	3.00	2.00	2.00	2.00	2.00	3.00	1.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	125	500	10	75	625	55	50	35	80	310	145	40
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	33	133	3	20	166	15	13	9	21	82	39	11
Total Analysis Volume [veh/h]	133	532	11	80	665	59	53	37	85	330	154	43
Pedestrian Volume [ped/h]	10			1			9			7		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	173			631			1106			732		
Exiting Flow Rate [veh/h]	1112			641			351			131		
Demand Flow Rate [veh/h]	125	500	10	75	625	55	50	35	80	310	145	40
Adjusted Demand Flow Rate [veh/h]	133	532	11	80	665	59	53	37	85	330	154	43

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1420.00	1420.00	1380.00	1380.00
B (coefficient)	0.00102	0.00091	0.00091	0.00102	0.00102
HV Adjustment Factor	0.98	0.97	0.97	0.98	0.98
Entry Flow Rate [veh/h]	690	389	439	179	540
Capacity of Entry and Bypass Lanes [veh/h]	1157	800	800	447	654
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1133	777	777	438	639
X, volume / capacity	0.60	0.49	0.55	0.40	0.83

Movement, Approach, & Intersection Results

Lane LOS	B	B	B	C	D
95th-Percentile Queue Length [veh]	4.15	2.70	3.39	1.89	8.73
95th-Percentile Queue Length [ft]	103.63	67.41	84.65	47.25	218.17
Approach Delay [s/veh]	10.76	12.17		15.60	30.82
Approach LOS	B	B		C	D
Intersection Delay [s/veh]	16.51				
Intersection LOS	C				

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Report File: X:\...\Scenario 1 - Mit v2.pdf

Scenario 1 Scen1 - Mit
2/21/2022

Turning Movement Volume: Summary

ID	Intersection Name	Northbound			Southbound			Eastbound			Total Volume
		Thru	Right	2	2	Left	Right	Left	Thru	Right	
1	13th/Belmont	125	565	5	50	930	60	115	45	200	2095

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	13th / May	125	500	10	75	625	55	50	35	80	310	145	40	2050

Vistro File: X:\...\Scen 1_HoodRiver OR281 RABs_Mit.vistro
Report File: X:\...\Scenario 1 - Mit v2.pdf

Scenario 1 Scen1 - Mit
2/21/2022

Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Northbound			Southbound			Eastbound			Total Volume
			Thru	Right	2	2	Left	Right	Left	Thru	Right	
1	13th/Belmont	Final Base	125	565	5	50	930	60	115	45	200	2095
		Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-
		In Process	0	0	0	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0	0	0
		Future Total	**125**	**565**	**5**	**50**	**930**	**60**	**115**	**45**	**200**	**2095**

ID	Intersection Name	Volume Type	Northbound			Southbound			Eastbound			Westbound			Total Volume
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	13th / May	Final Base	125	500	10	75	625	55	50	35	80	310	145	40	2050
		Growth 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	-
		In Process	0	0	0	0	0	0	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0	0	0	0	0	0
		Future Total	**125**	**500**	**10**	**75**	**625**	**55**	**50**	**35**	**80**	**310**	**145**	**40**	**2050**

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	230	460	420	225	530	110
Future Volume (vph)	230	460	420	225	530	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1752	1881	1770	1538
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1752	1881	1770	1538
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	245	489	447	239	564	117
RTOR Reduction (vph)	0	59	0	0	0	74
Lane Group Flow (vph)	245	430	447	239	564	43
Confl. Peds. (#/hr)		2	2		1	2
Heavy Vehicles (%)	2%	2%	3%	1%	2%	5%
Turn Type	NA	pt+ov	Prot	NA	Prot	Prot
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						
Actuated Green, G (s)	17.9	54.7	26.5	48.4	32.8	32.8
Effective Green, g (s)	17.9	54.7	26.5	48.4	32.8	32.8
Actuated g/C Ratio	0.20	0.61	0.30	0.54	0.37	0.37
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	373	970	520	1020	650	565
v/s Ratio Prot	c0.13	0.27	c0.26	0.13	c0.32	0.03
v/s Ratio Perm						
v/c Ratio	0.66	0.44	0.86	0.23	0.87	0.08
Uniform Delay, d1	32.8	9.2	29.6	10.7	26.2	18.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.3	13.3	0.1	11.8	0.1
Delay (s)	37.0	9.5	42.9	10.8	38.0	18.4
Level of Service	D	A	D	B	D	B
Approach Delay (s)	18.7			31.7	34.6	
Approach LOS	B			C	C	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	89.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	0	80	335	170	540	0	0	0	0	725	55
Future Volume (veh/h)	85	0	80	335	170	540	0	0	0	0	725	55
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	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
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	0	1856	1870	1841	1885				0	1856	1900
Adj Flow Rate, veh/h	90	0	47	356	181	211				0	771	59
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	2	0	3	2	4	1				0	3	0
Cap, veh/h	0	0	0	1701	1767	1518				0	0	0
Arrive On Green	0.00	0.00	0.00	0.32	0.32	0.32				0.00	0.00	0.00
Sat Flow, veh/h		0		1781	1841	1589					0	
Grp Volume(v), veh/h		0.0		356	181	211					0.0	
Grp Sat Flow(s),veh/h/ln				1781	1841	1589						
Q Serve(g_s), s				14.7	6.9	9.5						
Cycle Q Clear(g_c), s				14.7	6.9	9.5						
Prop In Lane				1.00		1.00						
Lane Grp Cap(c), veh/h				1701	1767	1518						
V/C Ratio(X)				0.21	0.10	0.14						
Avail Cap(c_a), veh/h				1701	1767	1518						
HCM Platoon Ratio				0.33	0.33	0.33						
Upstream Filter(I)				0.65	0.65	0.65						
Uniform Delay (d), s/veh				6.6	3.7	4.8						
Incr Delay (d2), s/veh				0.2	0.1	0.1						
Initial Q Delay(d3),s/veh				0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln				3.2	0.0	0.1						
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				6.7	3.8	4.9						
LnGrp LOS				A	A	A						
Approach Vol, veh/h					748							
Approach Delay, s/veh					5.5							
Approach LOS					A							

Timer - Assigned Phs	8
Phs Duration (G+Y+Rc), s	100.0
Change Period (Y+Rc), s	4.5
Max Green Setting (Gmax), s	21.9
Max Q Clear Time (g_c+I1), s	16.7
Green Ext Time (p_c), s	1.6

Intersection Summary	
HCM 6th Ctrl Delay	5.5
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	18.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	10	10	85	40	0	0	0	0	40	1105	15
Future Vol, veh/h	0	10	10	85	40	0	0	0	0	40	1105	15
Conflicting Peds, #/hr	8	0	11	11	0	8	5	0	2	2	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	11	92	43	0	0	0	0	43	1201	16

Major/Minor	Minor2			Minor1					Major2		
Conflicting Flow All	-	1302	1225	1319	1310	-			2	0	0
Stage 1	-	1300	-	2	2	-			-	-	-
Stage 2	-	2	-	1317	1308	-			-	-	-
Critical Hdwy	-	6.52	6.22	7.12	6.52	-			4.12	-	-
Critical Hdwy Stg 1	-	5.52	-	-	-	-			-	-	-
Critical Hdwy Stg 2	-	-	-	6.12	5.52	-			-	-	-
Follow-up Hdwy	-	4.018	3.318	3.518	4.018	-			2.218	-	-
Pot Cap-1 Maneuver	0	161	218	134	159	0			1620	-	-
Stage 1	0	231	-	-	-	0			-	-	-
Stage 2	0	-	-	194	229	0			-	-	-
Platoon blocked, %										-	-
Mov Cap-1 Maneuver	-	147	217	112	145	-			1617	-	-
Mov Cap-2 Maneuver	-	147	-	112	145	-			-	-	-
Stage 1	-	211	-	-	-	-			-	-	-
Stage 2	-	-	-	160	209	-			-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	28.5	188.1	0.3
HCM LOS	D	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	175	121	1617	-	-
HCM Lane V/C Ratio	0.124	1.123	0.027	-	-
HCM Control Delay (s)	28.5	188.1	7.3	0	-
HCM Lane LOS	D	F	A	A	-
HCM 95th %tile Q(veh)	0.4	8.1	0.1	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	10	5	55	15	0	0	0	0	55	1145	10
Future Vol, veh/h	0	10	5	55	15	0	0	0	0	55	1145	10
Conflicting Peds, #/hr	8	0	4	4	0	8	3	0	7	7	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	5	58	16	0	0	0	0	58	1205	11

Major/Minor	Minor2			Minor1					Major2		
Conflicting Flow All	-	1337	1218	1346	1342	-			7	0	0
Stage 1	-	1330	-	7	7	-			-	-	-
Stage 2	-	7	-	1339	1335	-			-	-	-
Critical Hdwy	-	6.52	6.22	7.12	6.52	-			4.12	-	-
Critical Hdwy Stg 1	-	5.52	-	-	-	-			-	-	-
Critical Hdwy Stg 2	-	-	-	6.12	5.52	-			-	-	-
Follow-up Hdwy	-	4.018	3.318	3.518	4.018	-			2.218	-	-
Pot Cap-1 Maneuver	0	153	220	128	152	0			1614	-	-
Stage 1	0	224	-	-	-	0			-	-	-
Stage 2	0	-	-	188	223	0			-	-	-
Platoon blocked, %										-	-
Mov Cap-1 Maneuver	-	134	219	107	134	-			1603	-	-
Mov Cap-2 Maneuver	-	134	-	107	134	-			-	-	-
Stage 1	-	198	-	-	-	-			-	-	-
Stage 2	-	-	-	154	197	-			-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	31	84.4	0.3
HCM LOS	D	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	154	112	1603	-	-
HCM Lane V/C Ratio	0.103	0.658	0.036	-	-
HCM Control Delay (s)	31	84.4	7.3	0	-
HCM Lane LOS	D	F	A	A	-
HCM 95th %tile Q(veh)	0.3	3.4	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	80	200	15	150	0	0	0	0	20	1010	200
Future Volume (veh/h)	0	80	200	15	150	0	0	0	0	20	1010	200
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1856	1856	1781	1870	0				1870	1870	1885
Adj Flow Rate, veh/h	0	88	220	16	165	0				22	1110	220
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	3	3	8	2	0				2	2	1
Cap, veh/h	0	379	320	102	357	0				35	1827	382
Arrive On Green	0.00	0.20	0.20	0.20	0.20	0.00				0.62	0.62	0.62
Sat Flow, veh/h	0	1856	1568	76	1748	0				57	2951	617
Grp Volume(v), veh/h	0	88	220	181	0	0				725	0	627
Grp Sat Flow(s),veh/h/ln	0	1856	1568	1824	0	0				1868	0	1756
Q Serve(g_s), s	0.0	1.8	5.9	0.0	0.0	0.0				11.0	0.0	9.6
Cycle Q Clear(g_c), s	0.0	1.8	5.9	3.9	0.0	0.0				11.0	0.0	9.6
Prop In Lane	0.00		1.00	0.09		0.00				0.03		0.35
Lane Grp Cap(c), veh/h	0	379	320	459	0	0				1156	0	1088
V/C Ratio(X)	0.00	0.23	0.69	0.39	0.00	0.00				0.63	0.00	0.58
Avail Cap(c_a), veh/h	0	1147	969	1193	0	0				2638	0	2481
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	0.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	15.1	16.7	15.9	0.0	0.0				5.4	0.0	5.1
Incr Delay (d2), s/veh	0.0	0.3	2.6	0.6	0.0	0.0				0.6	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.7	2.1	1.5	0.0	0.0				2.7	0.0	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	15.4	19.3	16.4	0.0	0.0				5.9	0.0	5.6
LnGrp LOS	A	B	B	B	A	A				A	A	A
Approach Vol, veh/h		308			181						1352	
Approach Delay, s/veh		18.2			16.4						5.8	
Approach LOS		B			B						A	

Timer - Assigned Phs		4		6		8
Phs Duration (G+Y+Rc), s		13.3		32.1		13.3
Change Period (Y+Rc), s		4.0		4.0		4.0
Max Green Setting (Gmax), s		28.0		64.0		28.0
Max Q Clear Time (g_c+I1), s		7.9		13.0		5.9
Green Ext Time (p_c), s		1.1		15.1		0.9

Intersection Summary	
HCM 6th Ctrl Delay	8.9
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	23

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	25	0	0	15	5	160	1225	65	0	0	0
Future Vol, veh/h	75	25	0	0	15	5	160	1225	65	0	0	0
Conflicting Peds, #/hr	13	0	0	0	0	13	1	0	8	8	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	2	2	2	17	2	2	3	2	2	2	2
Mvmt Flow	79	26	0	0	16	5	168	1289	68	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	1003	1702	-	-	1668	700	1	0	0
Stage 1	1	1	-	-	1667	-	-	-	-
Stage 2	1002	1701	-	-	1	-	-	-	-
Critical Hdwy	7.56	6.54	-	-	6.84	6.94	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	5.84	-	-	-	-
Critical Hdwy Stg 2	6.56	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.02	-	-	4.17	3.32	2.22	-	-
Pot Cap-1 Maneuver	195	91	0	0	82	382	1620	-	-
Stage 1	-	-	0	0	130	-	-	-	-
Stage 2	258	146	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	95	51	-	-	46	379	1618	-	-
Mov Cap-2 Maneuver	95	51	-	-	46	-	-	-	-
Stage 1	-	-	-	-	73	-	-	-	-
Stage 2	112	82	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	$ 314.8	96.6	1.9
HCM LOS	F	F	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1618	-	-	78	59
HCM Lane V/C Ratio	0.104	-	-	1.35	0.357
HCM Control Delay (s)	7.5	1.3	-	$ 314.8	96.6
HCM Lane LOS	A	A	-	F	F
HCM 95th %tile Q(veh)	0.3	-	-	8.2	1.3

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

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	15	0	0	35	25	40	1140	60	0	0	0
Future Vol, veh/h	45	15	0	0	35	25	40	1140	60	0	0	0
Conflicting Peds, #/hr	15	0	20	20	0	15	8	0	13	13	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	3	2	2	3	6	2	2	2
Mvmt Flow	48	16	0	0	38	27	43	1226	65	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	1400	1398	-	-	1366	1287	8	0	0
Stage 1	8	8	-	-	1358	-	-	-	-
Stage 2	1392	1390	-	-	8	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.53	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.53	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.027	3.318	2.218	-	-
Pot Cap-1 Maneuver	118	141	0	0	146	201	1612	-	-
Stage 1	-	-	0	0	216	-	-	-	-
Stage 2	176	209	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	79	135	-	-	139	199	1600	-	-
Mov Cap-2 Maneuver	79	135	-	-	139	-	-	-	-
Stage 1	-	-	-	-	208	-	-	-	-
Stage 2	121	201	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	116.6	42.3	0.2
HCM LOS	F	E	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1600	-	-	88	159
HCM Lane V/C Ratio	0.027	-	-	0.733	0.406
HCM Control Delay (s)	7.3	-	-	116.6	42.3
HCM Lane LOS	A	-	-	F	E
HCM 95th %tile Q(veh)	0.1	-	-	3.7	1.8

Intersection	
Int Delay, s/veh	6.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	125	1200	60	0	0
Future Vol, veh/h	0	125	1200	60	0	0
Conflicting Peds, #/hr	15	0	0	23	23	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	-
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	2	2	2
Mvmt Flow	0	137	1319	66	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	1375	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	178	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	174	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	76.3	0
HCM LOS	F	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	174
HCM Lane V/C Ratio	-	-	0.789
HCM Control Delay (s)	-	-	76.3
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	5.2

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	45	0	140	1185	0	0
Future Vol, veh/h	45	0	140	1185	0	0
Conflicting Peds, #/hr	7	0	15	0	0	15
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	49	0	154	1302	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	1632	-	15	0
Stage 1	15	-	-	-
Stage 2	1617	-	-	-
Critical Hdwy	6.42	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3.518	-	2.227	-
Pot Cap-1 Maneuver	111	0	1596	-
Stage 1	-	0	-	-
Stage 2	178	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	70	-	1573	-
Mov Cap-2 Maneuver	70	-	-	-
Stage 1	-	-	-	-
Stage 2	176	-	-	-

Approach	EB	NB
HCM Control Delay, s	134.3	0.8
HCM LOS	F	

Minor Lane/Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	1573	-	70
HCM Lane V/C Ratio	0.098	-	0.706
HCM Control Delay (s)	7.5	0	134.3
HCM Lane LOS	A	A	F
HCM 95th %tile Q(veh)	0.3	-	3.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	435	635	640
Future Volume (veh/h)	0	0	0	435	635	640
Initial Q (Qb), veh			0	0	0	0
Ped-Bike Adj(A_pbT)			1.00		1.00	1.00
Parking Bus, Adj			1.00	1.00	1.00	1.00
Work Zone On Approach				No	No	
Adj Sat Flow, veh/h/ln			0	1870	1885	1885
Adj Flow Rate, veh/h			0	478	698	703
Peak Hour Factor			0.91	0.91	0.91	0.91
Percent Heavy Veh, %			0	2	1	1
Cap, veh/h			0	513	0	0
Arrive On Green			0.00	0.27	0.00	0.00
Sat Flow, veh/h			0	1870	0	
Grp Volume(v), veh/h			0	478	0.0	
Grp Sat Flow(s),veh/h/ln			0	1870		
Q Serve(g_s), s			0.0	24.9		
Cycle Q Clear(g_c), s			0.0	24.9		
Prop In Lane			0.00			
Lane Grp Cap(c), veh/h			0	513		
V/C Ratio(X)			0.00	0.93		
Avail Cap(c_a), veh/h			0	711		
HCM Platoon Ratio			1.00	1.00		
Upstream Filter(I)			0.00	1.00		
Uniform Delay (d), s/veh			0.0	35.4		
Incr Delay (d2), s/veh			0.0	13.3		
Initial Q Delay(d3),s/veh			0.0	0.0		
%ile BackOfQ(50%),veh/ln			0.0	13.1		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh			0.0	48.7		
LnGrp LOS			A	D		
Approach Vol, veh/h				478		
Approach Delay, s/veh				48.7		
Approach LOS				D		

Timer - Assigned Phs	6
Phs Duration (G+Y+Rc), s	31.4
Change Period (Y+Rc), s	4.0
Max Green Setting (Gmax), s	38.0
Max Q Clear Time (g_c+I1), s	26.9
Green Ext Time (p_c), s	0.5

Intersection Summary	
HCM 6th Ctrl Delay	48.7
HCM 6th LOS	D

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Scenario 1 Scen2 - Mit
1/13/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	13th/Belmont	Roundabout	HCM 6th Edition	EB Thru		21.6	C
2	13th/12th	Roundabout	HCM 6th Edition	NB Thru		32.4	D
3	13th/May	Roundabout	HCM 6th Edition	WB Right		16.8	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: 13th/Belmont

Control Type:	Roundabout	Delay (sec / veh):	21.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name						
Base Volume Input [veh/h]	1010	200	0	375	165	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	8.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1010	200	0	375	165	0
Peak Hour Factor	0.9100	0.9100	1.0000	0.9100	0.9100	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	277	55	0	103	45	0
Total Analysis Volume [veh/h]	1110	220	0	412	181	0
Pedestrian Volume [ped/h]	0		3		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	195		1132		0	
Exiting Flow Rate [veh/h]	0		420		1552	
Demand Flow Rate [veh/h]	1010	200	0	375	165	0
Adjusted Demand Flow Rate [veh/h]	1110	220	0	412	181	0

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1380.00	1380.00
B (coefficient)	0.00091	0.00091	0.00102	0.00102
HV Adjustment Factor	0.98	0.98	0.98	0.93
Entry Flow Rate [veh/h]	638	719	421	196
Capacity of Entry and Bypass Lanes [veh/h]	1189	1189	435	1380
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1166	1166	427	1278
X, volume / capacity	0.54	0.60	0.97	0.14

Movement, Approach, & Intersection Results

Lane LOS	A	B	F	A
95th-Percentile Queue Length [veh]	3.31	4.28	11.57	0.49
95th-Percentile Queue Length [ft]	82.73	106.89	289.17	12.33
Approach Delay [s/veh]	10.05		66.79	3.99
Approach LOS	B		F	A
Intersection Delay [s/veh]	21.63			
Intersection LOS	C			

Intersection Level Of Service Report
Intersection 2: 13th/12th

Control Type:	Roundabout	Delay (sec / veh):	32.4
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name						
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		30.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		No	

Volumes

Name						
Base Volume Input [veh/h]	160	1290	125	85	100	1385
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	160	1290	125	85	100	1385
Peak Hour Factor	0.9500	0.9500	0.9100	0.9100	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	42	339	34	23	26	364
Total Analysis Volume [veh/h]	168	1358	137	93	105	1458
Pedestrian Volume [ped/h]	0		13		0	

Intersection Settings

Number of Conflicting Circulating Lanes	2		1		1	
Circulating Flow Rate [veh/h]	107		171		0	
Exiting Flow Rate [veh/h]	1487		1492		171	
Demand Flow Rate [veh/h]	160	1290	0	0	100	1385
Adjusted Demand Flow Rate [veh/h]	168	1358	0	0	105	1458

Lanes

Overwrite Calculated Critical Headway	No	No		No	No
User-Defined Critical Headway [s]	4.00	4.00		4.00	4.00
Overwrite Calculated Follow-Up Time	No	No		No	No
User-Defined Follow-Up Time [s]	3.00	3.00		3.00	3.00
A (intercept)	1350.00	1420.00		1420.00	1420.00
B (coefficient)	0.00092	0.00085		0.00091	0.00091
HV Adjustment Factor	0.98	0.98		0.98	0.98
Entry Flow Rate [veh/h]	172	1386		750	845
Capacity of Entry and Bypass Lanes [veh/h]	1224	1297		1420	1420
Pedestrian Impedance	1.00	1.00		1.00	1.00
Capacity per Entry Lane [veh/h]	1200	1272		1393	1393
X, volume / capacity	0.14	1.07		0.53	0.60

Movement, Approach, & Intersection Results

Lane LOS	A	F		A	A
95th-Percentile Queue Length [veh]	0.49	28.65		3.23	4.16
95th-Percentile Queue Length [ft]	12.17	716.21		80.63	104.06
Approach Delay [s/veh]	56.72		0.00	8.72	
Approach LOS	F		A	A	
Intersection Delay [s/veh]	32.43				
Intersection LOS	D				

Intersection Level Of Service Report
Intersection 3: 13th/May

Control Type:	Roundabout	Delay (sec / veh):	16.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			25.00			25.00		
Grade [%]	0.00			-4.50			4.50			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	0	0	0	25	700	55	50	35	80	335	170	540
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	3.00	2.00	2.00	1.00	3.00	2.00	4.00	1.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	25	700	55	50	35	80	335	170	540
Peak Hour Factor	1.0000	1.0000	1.0000	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	7	186	15	13	9	21	89	45	144
Total Analysis Volume [veh/h]	0	0	0	27	745	59	53	37	85	356	181	574
Pedestrian Volume [ped/h]	10			1			9			7		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			2			1			
Circulating Flow Rate [veh/h]	119			551			1158			54			
Exiting Flow Rate [veh/h]	1218			634			248			65			
Demand Flow Rate [veh/h]	0	0	0	25	700	55	50	35	80	335	170	540	
Adjusted Demand Flow Rate [veh/h]	0	0	0	27	745	59	53	37	85	356	181	574	

Lanes

Overwrite Calculated Critical Headway		No	No	No	No
User-Defined Critical Headway [s]		4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time		No	No	No	No
User-Defined Follow-Up Time [s]		3.00	3.00	3.00	3.00
A (intercept)		1420.00	1420.00	1420.00	1380.00
B (coefficient)		0.00091	0.00091	0.00085	0.00102
HV Adjustment Factor		0.97	0.97	0.98	0.98
Entry Flow Rate [veh/h]		403	454	179	1131
Capacity of Entry and Bypass Lanes [veh/h]		860	860	531	1306
Pedestrian Impedance		1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]		835	835	519	1282
X, volume / capacity		0.47	0.53	0.34	0.87

Movement, Approach, & Intersection Results

Lane LOS		B	B	B	C
95th-Percentile Queue Length [veh]		2.52	3.15	1.48	12.36
95th-Percentile Queue Length [ft]		63.11	78.72	36.90	309.09
Approach Delay [s/veh]	0.00	11.06		12.11	21.83
Approach LOS	A	B		B	C
Intersection Delay [s/veh]	16.80				
Intersection LOS	C				

Vistro File: C:\...\Scen 2_HoodRiver OR281 RABs_Mit.vistro
Report File: X:\...\Scenario 2 - Mit.pdf

Scenario 1 Scen2 - Mit
1/13/2022

Turning Movement Volume: Summary

ID	Intersection Name	Southbound		Eastbound		Westbound		Total Volume
		Thru	Right	Left	Thru	Left	Thru	
1	13th/Belmont	1010	200	0	375	165	0	1750

ID	Intersection Name	Northbound		Eastbound		Total Volume
		Left	Thru	Left	Right	
2	13th/12th	160	1290	100	1385	2935

ID	Intersection Name	Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	13th/May	25	700	55	50	35	80	335	170	540	1990

Vistro File: C:\...\Scen 2_HoodRiver OR281 RABs_Mit.vistro
Report File: X:\...\Scenario 2 - Mit.pdf

Scenario 1 Scen2 - Mit
1/13/2022

Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Southbound		Eastbound		Westbound		Total Volume
			Thru	Right	Left	Thru	Left	Thru	
1	13th/Belmont	Final Base	1010	200	0	375	165	0	1750
		Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	-
		In Process	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0
		Future Total	**1010**	**200**	**0**	**375**	**165**	**0**	**1750**

ID	Intersection Name	Volume Type	Northbound		Eastbound		Total Volume
			Left	Thru	Left	Right	
2	13th/12th	Final Base	160	1290	100	1385	2935
		Growth Factor	1.00	1.00	1.00	1.00	-
		In Process	0	0	0	0	0
		Net New Trips	0	0	0	0	0
		Other	0	0	0	0	0
		Future Total	**160**	**1290**	**100**	**1385**	**2935**

ID	Intersection Name	Volume Type	Southbound			Eastbound			Westbound			Total Volume
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	13th/May	Final Base	25	700	55	50	35	80	335	170	540	1990
		Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-
		In Process	0	0	0	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0	0	0
		Future Total	**25**	**700**	**55**	**50**	**35**	**80**	**335**	**170**	**540**	**1990**

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	230	460	420	225	530	110
Future Volume (vph)	230	460	420	225	530	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1752	1881	1770	1538
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1752	1881	1770	1538
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	245	489	447	239	564	117
RTOR Reduction (vph)	0	59	0	0	0	74
Lane Group Flow (vph)	245	430	447	239	564	43
Confl. Peds. (#/hr)		2	2		1	2
Heavy Vehicles (%)	2%	2%	3%	1%	2%	5%
Turn Type	NA	pt+ov	Prot	NA	Prot	Prot
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						
Actuated Green, G (s)	17.9	54.7	26.5	48.4	32.8	32.8
Effective Green, g (s)	17.9	54.7	26.5	48.4	32.8	32.8
Actuated g/C Ratio	0.20	0.61	0.30	0.54	0.37	0.37
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	373	970	520	1020	650	565
v/s Ratio Prot	c0.13	0.27	c0.26	0.13	c0.32	0.03
v/s Ratio Perm						
v/c Ratio	0.66	0.44	0.86	0.23	0.87	0.08
Uniform Delay, d1	32.8	9.2	29.6	10.7	26.2	18.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.3	13.3	0.1	11.8	0.1
Delay (s)	37.0	9.5	42.9	10.8	38.0	18.4
Level of Service	D	A	D	B	D	B
Approach Delay (s)	18.7			31.7	34.6	
Approach LOS	B			C	C	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	89.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	35	80	310	195	140	100	650	110	25	725	55
Future Volume (veh/h)	50	35	80	310	195	140	100	650	110	25	725	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.99		0.99	1.00		0.99	1.00		0.99
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	1870	1885	1856	1870	1841	1885	1870	1870	1870	1870	1856	1870
Adj Flow Rate, veh/h	53	37	13	330	207	116	106	691	117	27	771	59
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	1	3	2	4	1	2	2	2	2	3	2
Cap, veh/h	176	116	34	542	384	215	202	905	153	170	825	63
Arrive On Green	0.19	0.20	0.19	0.15	0.46	0.46	0.06	0.58	0.58	0.48	0.49	0.48
Sat Flow, veh/h	609	581	172	1781	1102	617	1781	1557	264	675	1701	130
Grp Volume(v), veh/h	103	0	0	330	0	323	106	0	808	27	0	830
Grp Sat Flow(s),veh/h/ln	1362	0	0	1781	0	1719	1781	0	1820	675	0	1831
Q Serve(g_s), s	4.2	0.0	0.0	11.0	0.0	13.4	0.3	0.0	33.5	3.6	0.0	42.7
Cycle Q Clear(g_c), s	6.0	0.0	0.0	11.0	0.0	13.4	0.3	0.0	33.5	37.0	0.0	42.7
Prop In Lane	0.51		0.13	1.00		0.36	1.00		0.14	1.00		0.07
Lane Grp Cap(c), veh/h	319	0	0	542	0	600	202	0	1058	170	0	888
V/C Ratio(X)	0.32	0.00	0.00	0.61	0.00	0.54	0.52	0.00	0.76	0.16	0.00	0.93
Avail Cap(c_a), veh/h	319	0	0	542	0	600	202	0	1058	170	0	888
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.77	0.00	0.77	1.00	0.00	1.00	0.70	0.00	0.70
Uniform Delay (d), s/veh	34.4	0.0	0.0	27.4	0.0	21.0	43.8	0.0	15.8	38.0	0.0	24.3
Incr Delay (d2), s/veh	2.7	0.0	0.0	1.5	0.0	2.7	2.5	0.0	5.2	1.4	0.0	13.8
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	0.0	0.0	6.7	0.0	5.3	2.6	0.0	14.6	0.7	0.0	21.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.1	0.0	0.0	28.9	0.0	23.7	46.2	0.0	21.1	39.4	0.0	38.1
LnGrp LOS	D	A	A	C	A	C	D	A	C	D	A	D
Approach Vol, veh/h		103			653			914			857	
Approach Delay, s/veh		37.1			26.3			24.0			38.2	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	2	3	4	5	6	8
Phs Duration (G+Y+Rc), s	61.6	15.0	23.4	9.6	52.0	38.4
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	57.6	11.0	19.4	5.6	48.0	34.4
Max Q Clear Time (g_c+I1), s	35.5	13.0	8.0	2.3	44.7	15.4
Green Ext Time (p_c), s	6.8	0.0	0.4	0.1	1.9	2.0

Intersection Summary	
HCM 6th Ctrl Delay	29.9
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	12.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑		↰	↑	
Traffic Vol, veh/h	5	10	10	10	20	40	30	830	10	15	1105	15
Future Vol, veh/h	5	10	10	10	20	40	30	830	10	15	1105	15
Conflicting Peds, #/hr	8	0	11	11	0	8	5	0	2	2	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	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	11	11	22	43	33	902	11	16	1201	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2260	2227	1225	2239	2230	918	1222	0	0	915	0	0
Stage 1	1246	1246	-	976	976	-	-	-	-	-	-	-
Stage 2	1014	981	-	1263	1254	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	29	43	218	30	43	329	570	-	-	745	-	-
Stage 1	213	246	-	302	329	-	-	-	-	-	-	-
Stage 2	288	328	-	208	243	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	13	39	215	21	39	326	567	-	-	744	-	-
Mov Cap-2 Maneuver	13	39	-	21	39	-	-	-	-	-	-	-
Stage 1	200	239	-	284	309	-	-	-	-	-	-	-
Stage 2	217	308	-	183	236	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	242.2	291.2	0.4	0.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	567	-	-	36	63	744	-	-
HCM Lane V/C Ratio	0.058	-	-	0.755	1.208	0.022	-	-
HCM Control Delay (s)	11.7	-	-	242.2	291.2	9.9	-	-
HCM Lane LOS	B	-	-	F	F	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	2.7	6.2	0.1	-	-

Intersection	
Int Delay, s/veh	33.4

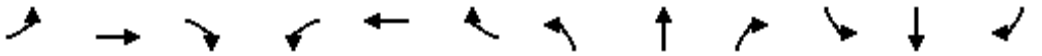
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑		↰	↑	
Traffic Vol, veh/h	5	10	5	45	15	20	5	900	5	25	1095	10
Future Vol, veh/h	5	10	5	45	15	20	5	900	5	25	1095	10
Conflicting Peds, #/hr	8	0	4	4	0	8	3	0	7	7	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	10	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	5	47	16	21	5	947	5	26	1153	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2200	2183	1166	2190	2186	965	1167	0	0	959	0	0
Stage 1	1214	1214	-	967	967	-	-	-	-	-	-	-
Stage 2	986	969	-	1223	1219	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	32	46	236	~ 33	46	309	599	-	-	717	-	-
Stage 1	222	254	-	306	333	-	-	-	-	-	-	-
Stage 2	298	332	-	219	253	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	21	44	234	~ 25	44	305	597	-	-	712	-	-
Mov Cap-2 Maneuver	21	44	-	~ 25	44	-	-	-	-	-	-	-
Stage 1	220	244	-	301	328	-	-	-	-	-	-	-
Stage 2	260	327	-	197	243	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	163	$ 849.1	0.1	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	597	-	-	41	36	712	-	-
HCM Lane V/C Ratio	0.009	-	-	0.513	2.339	0.037	-	-
HCM Control Delay (s)	11.1	-	-	163	$ 849.1	10.2	-	-
HCM Lane LOS	B	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0	-	-	1.8	9.4	0.1	-	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	45	200	0	140	5	0	855	5	50	1010	100
Future Volume (veh/h)	70	45	200	0	140	5	0	855	5	50	1010	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	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	1870	1856	1856	0	1870	1870	0	1870	1870	1870	1870	1885
Adj Flow Rate, veh/h	77	49	72	0	154	5	0	940	5	55	1110	110
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	3	3	0	2	2	0	2	2	2	2	1
Cap, veh/h	176	128	188	0	194	6	0	1242	7	327	1242	123
Arrive On Green	0.05	0.19	0.19	0.00	0.11	0.10	0.00	0.67	0.66	0.04	0.74	0.74
Sat Flow, veh/h	1781	676	994	0	1801	58	0	1859	10	1781	1674	166
Grp Volume(v), veh/h	77	0	121	0	0	159	0	0	945	55	0	1220
Grp Sat Flow(s),veh/h/ln	1781	0	1670	0	0	1860	0	0	1869	1781	0	1840
Q Serve(g_s), s	4.4	0.0	7.4	0.0	0.0	9.8	0.0	0.0	39.8	1.0	0.0	59.4
Cycle Q Clear(g_c), s	4.4	0.0	7.4	0.0	0.0	9.8	0.0	0.0	39.8	1.0	0.0	59.4
Prop In Lane	1.00		0.60	0.00		0.03	0.00		0.01	1.00		0.09
Lane Grp Cap(c), veh/h	176	0	317	0	0	200	0	0	1249	327	0	1365
V/C Ratio(X)	0.44	0.00	0.38	0.00	0.00	0.80	0.00	0.00	0.76	0.17	0.00	0.89
Avail Cap(c_a), veh/h	176	0	358	0	0	246	0	0	1249	340	0	1365
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	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.5	0.0	41.6	0.0	0.0	51.0	0.0	0.0	13.0	12.8	0.0	11.6
Incr Delay (d2), s/veh	1.7	0.0	0.8	0.0	0.0	13.5	0.0	0.0	2.7	0.2	0.0	9.3
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	3.2	0.0	0.0	5.3	0.0	0.0	16.5	0.6	0.0	24.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.2	0.0	42.4	0.0	0.0	64.5	0.0	0.0	15.8	13.0	0.0	20.8
LnGrp LOS	D	A	D	A	A	E	A	A	B	B	A	C
Approach Vol, veh/h		198			159			945			1275	
Approach Delay, s/veh		43.1			64.5			15.8			20.5	
Approach LOS		D			E			B			C	

Timer - Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	8.7	82.2		26.2		90.9	9.6	16.6				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	76.9		24.6		86.4	5.1	15.0				
Max Q Clear Time (g_c+I1), s	3.0	41.8		9.4		61.4	6.4	11.8				
Green Ext Time (p_c), s	0.0	10.1		0.5		14.0	0.0	0.2				

Intersection Summary												
HCM 6th Ctrl Delay			23.2									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	25	0	0	10	5	130	460	40	0	0	0
Future Vol, veh/h	45	25	0	0	10	5	130	460	40	0	0	0
Conflicting Peds, #/hr	13	0	0	0	0	13	1	0	8	8	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	2	2	2	17	2	2	3	2	2	2	2
Mvmt Flow	47	26	0	0	11	5	137	484	42	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	801	809	-	-	788	526	1	0	0
Stage 1	1	1	-	-	787	-	-	-	-
Stage 2	800	808	-	-	1	-	-	-	-
Critical Hdwy	7.13	6.52	-	-	6.67	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.67	-	-	-	-
Critical Hdwy Stg 2	6.13	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.018	-	-	4.153	3.318	2.218	-	-
Pot Cap-1 Maneuver	301	314	0	0	306	552	1622	-	-
Stage 1	-	-	0	0	382	-	-	-	-
Stage 2	377	394	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	262	274	-	-	267	548	1620	-	-
Mov Cap-2 Maneuver	262	274	-	-	267	-	-	-	-
Stage 1	-	-	-	-	333	-	-	-	-
Stage 2	318	344	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	23.6	16.8	1.5
HCM LOS	C	C	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1620	-	-	266	322
HCM Lane V/C Ratio	0.084	-	-	0.277	0.049
HCM Control Delay (s)	7.4	0	-	23.6	16.8
HCM Lane LOS	A	A	-	C	C
HCM 95th %tile Q(veh)	0.3	-	-	1.1	0.2

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	10	15	0	0	35	20	40	430	50	0	0	0
Future Vol, veh/h	10	15	0	0	35	20	40	430	50	0	0	0
Conflicting Peds, #/hr	15	0	20	20	0	15	8	0	13	13	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	3	2	2	3	6	2	2	2
Mvmt Flow	11	16	0	0	38	22	43	462	54	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	628	623	-	-	596	517	8	0	0
Stage 1	8	8	-	-	588	-	-	-	-
Stage 2	620	615	-	-	8	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.53	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.53	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.027	3.318	2.218	-	-
Pot Cap-1 Maneuver	395	402	0	0	416	558	1612	-	-
Stage 1	-	-	0	0	494	-	-	-	-
Stage 2	476	482	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	339	379	-	-	392	551	1600	-	-
Mov Cap-2 Maneuver	339	379	-	-	392	-	-	-	-
Stage 1	-	-	-	-	469	-	-	-	-
Stage 2	405	458	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	15.7	14.5	0.6
HCM LOS	C	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1600	-	-	362	438
HCM Lane V/C Ratio	0.027	-	-	0.074	0.135
HCM Control Delay (s)	7.3	0	-	15.7	14.5
HCM Lane LOS	A	A	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.5

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	105	450	80	0	0
Future Vol, veh/h	0	105	450	80	0	0
Conflicting Peds, #/hr	15	0	0	23	23	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	16979
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	2	2	2
Mvmt Flow	0	115	495	88	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	562	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	526	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	514	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	14	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	514
HCM Lane V/C Ratio	-	-	0.224
HCM Control Delay (s)	-	-	14
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.9

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	0	65	485	0	0
Future Vol, veh/h	20	0	65	485	0	0
Conflicting Peds, #/hr	7	0	15	0	0	15
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	16965	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	22	0	71	533	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	697	-	15	0
Stage 1	15	-	-	-
Stage 2	682	-	-	-
Critical Hdwy	6.42	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3.518	-	2.227	-
Pot Cap-1 Maneuver	407	0	1596	-
Stage 1	-	0	-	-
Stage 2	502	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	370	-	1573	-
Mov Cap-2 Maneuver	370	-	-	-
Stage 1	-	-	-	-
Stage 2	495	-	-	-

Approach	EB	NB
HCM Control Delay, s	15.3	0.9
HCM LOS	C	

Minor Lane/Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	1573	-	370
HCM Lane V/C Ratio	0.045	-	0.059
HCM Control Delay (s)	7.4	0	15.3
HCM Lane LOS	A	A	C
HCM 95th %tile Q(veh)	0.1	-	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	160	0	0	435	235	315
Future Volume (vph)	160	0	0	435	235	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	1.00			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1863			3539	1787	1599
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1863			3539	1787	1599
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	176	0	0	478	258	346
RTOR Reduction (vph)	0	0	0	0	0	84
Lane Group Flow (vph)	176	0	0	478	258	262
Confl. Peds. (#/hr)					8	
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	3	
Permitted Phases						8
Actuated Green, G (s)	16.4			16.4	75.6	75.6
Effective Green, g (s)	16.4			16.4	75.6	75.6
Actuated g/C Ratio	0.16			0.16	0.76	0.76
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	0.2			0.2	0.2	0.2
Lane Grp Cap (vph)	305			580	1350	1208
v/s Ratio Prot	0.09			c0.14	0.14	
v/s Ratio Perm						c0.16
v/c Ratio	0.58			0.82	0.19	0.22
Uniform Delay, d1	38.6			40.4	3.5	3.6
Progression Factor	1.33			1.00	1.00	1.00
Incremental Delay, d2	1.3			8.8	0.3	0.0
Delay (s)	52.6			49.2	3.8	3.6
Level of Service	D			D	A	A
Approach Delay (s)	52.6			49.2	3.7	
Approach LOS	D			D	A	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

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Scenario 1 Scen3 - Mit
1/13/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	13th/Belmont	Roundabout	HCM 6th Edition	EB Right		26.5	D
3	13th/May	Roundabout	HCM 6th Edition	WB Left		18.3	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

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Version 2021 (SP 0-6)

Intersection Level Of Service Report
Intersection 1: 13th/Belmont

Control Type:	Roundabout	Delay (sec / veh):	26.5
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Thru	Right	Right2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	120	865	5	50	1000	100	70	45	200	15	20	5
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	1.00	2.00	3.00	3.00	8.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	120	865	5	50	1000	100	70	45	200	15	20	5
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	33	238	1	14	275	27	19	12	55	4	5	1
Total Analysis Volume [veh/h]	132	951	5	55	1099	110	77	49	220	16	22	5
Pedestrian Volume [ped/h]	2			0			5			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	185			174			1194			1183		
Exiting Flow Rate [veh/h]	1365			1054			268			112		
Demand Flow Rate [veh/h]	120	865	5	50	1000	100	70	45	200	15	20	5
Adjusted Demand Flow Rate [veh/h]	132	951	5	55	1099	110	77	49	220	16	22	5

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1420.00	1420.00	1380.00	1380.00
B (coefficient)	0.00102	0.00091	0.00091	0.00102	0.00102
HV Adjustment Factor	0.98	0.98	0.98	0.97	0.96
Entry Flow Rate [veh/h]	1110	606	683	356	45
Capacity of Entry and Bypass Lanes [veh/h]	1143	1212	1212	409	413
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1120	1188	1189	398	397
X, volume / capacity	0.97	0.50	0.56	0.87	0.11

Movement, Approach, & Intersection Results

Lane LOS	E	A	A	F	B
95th-Percentile Queue Length [veh]	18.31	2.89	3.66	8.64	0.36
95th-Percentile Queue Length [ft]	457.66	72.22	91.62	215.90	9.05
Approach Delay [s/veh]	39.71	9.14		50.74	10.73
Approach LOS	E	A		F	B
Intersection Delay [s/veh]	26.55				
Intersection LOS	D				

Intersection Level Of Service Report
Intersection 3: 13th/May

Control Type:	Roundabout	Delay (sec / veh):	18.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	-4.50			4.50			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	100	650	110	25	725	55	50	35	80	310	195	140
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	3.00	2.00	2.00	1.00	3.00	2.00	4.00	1.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	100	650	110	25	725	55	50	35	80	310	195	140
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	173	29	7	193	15	13	9	21	82	52	37
Total Analysis Volume [veh/h]	106	691	117	27	771	59	53	37	85	330	207	149
Pedestrian Volume [ped/h]	10			1			9			7		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			2			1		
Circulating Flow Rate [veh/h]	119			660			1158			867		
Exiting Flow Rate [veh/h]	1218			909			384			184		
Demand Flow Rate [veh/h]	100	650	110	25	725	55	50	35	80	310	195	140
Adjusted Demand Flow Rate [veh/h]	106	691	117	27	771	59	53	37	85	330	207	149

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00	3.00
A (intercept)	1380.00	1420.00	1420.00	1420.00	1420.00	1420.00
B (coefficient)	0.00102	0.00091	0.00091	0.00085	0.00091	0.00091
HV Adjustment Factor	0.98	0.97	0.97	0.98	0.97	0.99
Entry Flow Rate [veh/h]	933	415	468	179	552	151
Capacity of Entry and Bypass Lanes [veh/h]	1223	779	779	531	646	646
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1197	757	757	519	628	639
X, volume / capacity	0.76	0.53	0.60	0.34	0.86	0.23

Movement, Approach, & Intersection Results

Lane LOS	C	B	B	B	D	A
95th-Percentile Queue Length [veh]	7.92	3.19	4.07	1.48	9.63	0.90
95th-Percentile Queue Length [ft]	198.08	79.75	101.77	36.91	240.65	22.51
Approach Delay [s/veh]	15.80	13.74		12.12	29.02	
Approach LOS	C	B		B	D	
Intersection Delay [s/veh]	18.33					
Intersection LOS	C					

Vistro File: C:\...\Scen 3_HoodRiver OR281 RABs_Mit updated.vistro

Scenario 1 Scen3 - Mit

Report File: X:\...\Scenario 3 - Mit.pdf

1/13/2022

Turning Movement Volume: Summary

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Thru	Right	2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
1	13th/Belmont	120	865	5	50	1000	100	70	45	200	15	20	5	2495

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	13th/May	100	650	110	25	725	55	50	35	80	310	195	140	2475

Vistro File: C:\...\Scen 3_HoodRiver OR281 RABs_Mit updated.vistro
Report File: X:\...\Scenario 3 - Mit.pdf

Scenario 1 Scen3 - Mit
1/13/2022

Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Northbound			Southbound			Eastbound			Westbound			Total Volume
			Thru	Right	2	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
1	13th/Belmont	Final Base	120	865	5	50	1000	100	70	45	200	15	20	5	2495
		Growth 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	-
		In Process	0	0	0	0	0	0	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0	0	0	0	0	0
		Future Total	**120**	**865**	**5**	**50**	**1000**	**100**	**70**	**45**	**200**	**15**	**20**	**5**	**2495**

ID	Intersection Name	Volume Type	Northbound			Southbound			Eastbound			Westbound			Total Volume
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	13th/May	Final Base	100	650	110	25	725	55	50	35	80	310	195	140	2475
		Growth 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	-
		In Process	0	0	0	0	0	0	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0	0	0	0	0	0
		Future Total	**100**	**650**	**110**	**25**	**725**	**55**	**50**	**35**	**80**	**310**	**195**	**140**	**2475**

APPENDIX E: SIMTRAFFIC REPORTS (MITIGATED AND TSP BUILD)

Summary of All Intervals

Run Number	1	10	2	3	4	5	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:07	8:07	8:07	8:07	8:07	8:07	8:07
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	3	3	3	3	3	3	3
# of Recorded Intervals	2	2	2	2	2	2	2
Vehs Entered	4370	4233	4319	4273	4228	4255	4363
Vehs Exited	4342	4226	4333	4231	4239	4308	4429
Starting Vehs	194	188	195	160	218	194	222
Ending Vehs	222	195	181	202	207	141	156
Travel Distance (mi)	2805	2752	2796	2723	2725	2749	2800
Travel Time (hr)	199.8	194.6	206.5	202.0	208.0	199.7	199.7
Total Delay (hr)	78.9	76.2	86.8	84.8	90.8	81.4	79.1
Total Stops	6966	7077	7866	6746	7615	7196	7301
Fuel Used (gal)	114.4	112.0	116.3	113.1	114.9	113.5	114.5

Summary of All Intervals

Run Number	9	Avg
Start Time	6:57	6:57
End Time	8:07	8:07
Total Time (min)	70	70
Time Recorded (min)	60	60
# of Intervals	3	3
# of Recorded Intervals	2	2
Vehs Entered	4265	4287
Vehs Exited	4246	4294
Starting Vehs	211	194
Ending Vehs	230	191
Travel Distance (mi)	2757	2764
Travel Time (hr)	200.9	201.4
Total Delay (hr)	82.5	82.6
Total Stops	7245	7251
Fuel Used (gal)	113.5	114.0

Interval #0 Information Seeding

Start Time	6:57
End Time	7:07
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.
No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	10	2	3	4	5	7
Vehs Entered	1156	1214	1173	1176	1193	1189	1218
Vehs Exited	1152	1181	1168	1109	1163	1156	1226
Starting Vehs	194	188	195	160	218	194	222
Ending Vehs	198	221	200	227	248	227	214
Travel Distance (mi)	719	734	722	711	734	728	751
Travel Time (hr)	51.1	53.7	53.9	48.8	60.6	56.9	58.4
Total Delay (hr)	20.0	22.2	22.9	18.2	29.0	25.5	26.0
Total Stops	1760	2014	2035	1778	2175	2005	2137
Fuel Used (gal)	29.5	30.4	30.4	28.6	31.9	31.1	31.6

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	9	Avg
Vehs Entered	1163	1183
Vehs Exited	1129	1161
Starting Vehs	211	194
Ending Vehs	245	222
Travel Distance (mi)	723	728
Travel Time (hr)	56.1	54.9
Total Delay (hr)	25.1	23.6
Total Stops	1966	1982
Fuel Used (gal)	30.6	30.5

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	10	2	3	4	5	7
Vehs Entered	3214	3019	3146	3097	3035	3066	3145
Vehs Exited	3190	3045	3165	3122	3076	3152	3203
Starting Vehs	198	221	200	227	248	227	214
Ending Vehs	222	195	181	202	207	141	156
Travel Distance (mi)	2086	2019	2074	2012	1992	2021	2050
Travel Time (hr)	148.6	140.9	152.6	153.2	147.4	142.9	141.3
Total Delay (hr)	58.8	54.0	63.9	66.6	61.8	55.8	53.0
Total Stops	5206	5063	5831	4968	5440	5191	5164
Fuel Used (gal)	84.9	81.6	86.0	84.5	82.9	82.4	82.9

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	9	Avg
Vehs Entered	3102	3104
Vehs Exited	3117	3133
Starting Vehs	245	222
Ending Vehs	230	191
Travel Distance (mi)	2034	2036
Travel Time (hr)	144.8	146.5
Total Delay (hr)	57.5	58.9
Total Stops	5279	5265
Fuel Used (gal)	82.9	83.5

Arterial Level of Service: NB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Oak St	1	41.8	63.2	0.3	19
Total		41.8	63.2	0.3	19

Arterial Level of Service: SB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
May St	2	68.6	113.0	0.3	10
	13	1.0	9.2	0.1	22
Taylor	3	0.5	9.4	0.1	24
A St	4	2.0	23.2	0.1	23
Belmont	5	8.0	14.7	0.0	11
	25	1.0	5.2	0.0	20
Total		81.0	174.7	0.7	14

Arterial Level of Service: NB 12th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Union	6	1.0	10.0	0.1	23
Wilson	7	1.2	7.8	0.0	22
Pine	8	1.7	20.0	0.1	23
Taylor	9	0.4	3.7	0.0	21
May St	10	18.4	35.8	0.1	12
Total		22.7	77.3	0.4	18

Intersection: 1: 13th St & Oak St

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	657	175	224	856	778	255
Average Queue (ft)	276	153	218	455	455	130
95th Queue (ft)	582	213	246	878	794	295
Link Distance (ft)	833			898	1624	
Upstream Blk Time (%)	1			3		
Queuing Penalty (veh)	0			0		
Storage Bay Dist (ft)		150	200			230
Storage Blk Time (%)	15	7	38	0	33	0
Queuing Penalty (veh)	71	17	87	1	36	1

Intersection: 2: 13th St & May St

Movement	EB	EB	WB	WB	SB
Directions Served	T	R	LT	R	LTR
Maximum Queue (ft)	105	98	352	280	1354
Average Queue (ft)	47	38	258	13	806
95th Queue (ft)	94	79	382	118	1379
Link Distance (ft)	804		316	316	1624
Upstream Blk Time (%)			5	0	0
Queuing Penalty (veh)			24	1	0
Storage Bay Dist (ft)		120			
Storage Blk Time (%)	0	0			
Queuing Penalty (veh)	0	0			

Intersection: 3: 13th St & Taylor

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	TR
Maximum Queue (ft)	57	164	60	69
Average Queue (ft)	18	69	8	8
95th Queue (ft)	50	127	37	39
Link Distance (ft)	591	229	271	271
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: 13th St & A St

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	TR
Maximum Queue (ft)	51	133	125	140
Average Queue (ft)	16	53	15	29
95th Queue (ft)	47	103	75	97
Link Distance (ft)	745	215	731	731
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: 13th St & Belmont

Movement	EB	EB	WB	SB	SB
Directions Served	T	R	LT	LT	TR
Maximum Queue (ft)	214	124	163	200	213
Average Queue (ft)	65	70	75	133	154
95th Queue (ft)	161	121	130	202	216
Link Distance (ft)	887		206	186	186
Upstream Blk Time (%)			0	1	3
Queuing Penalty (veh)			0	9	17
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	3	2			
Queuing Penalty (veh)	6	3			

Intersection: 6: 12th St & Belmont/Union

Movement	EB	WB	NB	NB
Directions Served	LT	TR	LT	TR
Maximum Queue (ft)	209	63	89	68
Average Queue (ft)	93	14	8	5
95th Queue (ft)	178	46	48	32
Link Distance (ft)	206	693	287	287
Upstream Blk Time (%)	2			
Queuing Penalty (veh)	4			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: 12th St & A St/Wilson

Movement	EB	WB	NB	NB
Directions Served	LT	TR	LT	TR
Maximum Queue (ft)	119	132	127	124
Average Queue (ft)	48	46	26	22
95th Queue (ft)	100	103	88	78
Link Distance (ft)	215	700	197	197
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: 12th St & Pine

Movement	WB	NB	NB
Directions Served	R	T	TR
Maximum Queue (ft)	134	65	94
Average Queue (ft)	57	8	15
95th Queue (ft)	98	36	61
Link Distance (ft)	838	616	616
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: 12th St & Taylor

Movement	EB	NB	NB
Directions Served	L	LT	T
Maximum Queue (ft)	81	75	63
Average Queue (ft)	33	7	4
95th Queue (ft)	70	39	28
Link Distance (ft)	229	64	64
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		3	1
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 10: 12th St & May St

Movement	EB	WB	WB	NB	NB
Directions Served	T	T	T	L	R
Maximum Queue (ft)	94	156	162	460	383
Average Queue (ft)	34	114	100	261	142
95th Queue (ft)	76	162	171	417	284
Link Distance (ft)	316	87	87	567	567
Upstream Blk Time (%)		29	16	0	0
Queuing Penalty (veh)		60	33	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: May St

Movement	EB	WB	SB	B27	B26
Directions Served	LT	TR	LR	T	T
Maximum Queue (ft)	141	385	267	154	116
Average Queue (ft)	33	172	141	36	20
95th Queue (ft)	117	390	266	171	146
Link Distance (ft)	87	1326	170	184	654
Upstream Blk Time (%)	3		21	7	
Queuing Penalty (veh)	22		0	0	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 14: 12th St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 396

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:07	8:07	8:07	8:07	8:07	8:07	8:07
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	3	3	3	3	3	3	3
# of Recorded Intervals	2	2	2	2	2	2	2
Vehs Entered	4595	3091	4475	4560	4510	4510	4538
Vehs Exited	4592	2820	4453	4577	4496	4518	4529
Starting Vehs	243	273	198	243	202	208	238
Ending Vehs	246	544	220	226	216	200	247
Travel Distance (mi)	2978	1767	2927	2963	2934	2925	2945
Travel Time (hr)	232.5	763.8	215.2	242.6	222.9	213.8	317.4
Total Delay (hr)	107.2	689.3	92.2	117.9	99.2	90.8	193.3
Total Stops	9021	7341	8201	9467	8289	8165	9655
Fuel Used (gal)	125.5	217.2	120.0	127.1	121.9	119.8	144.1

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:07	8:07	8:07	8:07
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	3	3	3	3
# of Recorded Intervals	2	2	2	2
Vehs Entered	4589	4655	4609	4409
Vehs Exited	4516	4619	4506	4362
Starting Vehs	222	219	206	217
Ending Vehs	295	255	309	269
Travel Distance (mi)	2938	3025	2949	2835
Travel Time (hr)	279.1	258.5	259.9	300.6
Total Delay (hr)	155.3	131.1	135.8	181.2
Total Stops	10510	8513	9026	8821
Fuel Used (gal)	134.3	131.7	130.4	137.2

Interval #0 Information Seeding

Start Time	6:57
End Time	7:07
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	1236	1167	1212	1277	1249	1250	1213
Vehs Exited	1221	1068	1159	1271	1179	1223	1187
Starting Vehs	243	273	198	243	202	208	238
Ending Vehs	258	372	251	249	272	235	264
Travel Distance (mi)	777	708	757	797	765	777	754
Travel Time (hr)	57.9	75.9	61.0	66.2	58.9	55.4	69.1
Total Delay (hr)	25.1	46.2	29.3	32.7	26.6	22.7	37.2
Total Stops	2192	2453	2207	2651	2189	2035	2442
Fuel Used (gal)	32.2	34.5	31.9	34.5	32.0	31.5	34.1

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	1254	1325	1236	1242
Vehs Exited	1224	1281	1198	1202
Starting Vehs	222	219	206	217
Ending Vehs	252	263	244	256
Travel Distance (mi)	781	816	771	770
Travel Time (hr)	66.7	67.7	54.4	63.3
Total Delay (hr)	33.7	33.4	22.2	30.9
Total Stops	2723	2344	1971	2317
Fuel Used (gal)	34.3	35.3	31.2	33.1

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	10	2	3	4	5	6
Vehs Entered	3359	1924	3263	3283	3261	3260	3325
Vehs Exited	3371	1752	3294	3306	3317	3295	3342
Starting Vehs	258	372	251	249	272	235	264
Ending Vehs	246	544	220	226	216	200	247
Travel Distance (mi)	2201	1059	2171	2166	2169	2147	2192
Travel Time (hr)	174.7	687.9	154.2	176.4	164.0	158.4	248.3
Total Delay (hr)	82.1	643.1	63.0	85.2	72.5	68.1	156.1
Total Stops	6829	4888	5994	6816	6100	6130	7213
Fuel Used (gal)	93.3	182.7	88.2	92.6	89.8	88.4	110.0

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	7	8	9	Avg
Vehs Entered	3335	3330	3373	3171
Vehs Exited	3292	3338	3308	3161
Starting Vehs	252	263	244	256
Ending Vehs	295	255	309	269
Travel Distance (mi)	2157	2209	2178	2065
Travel Time (hr)	212.3	190.8	205.5	237.2
Total Delay (hr)	121.6	97.7	113.7	150.3
Total Stops	7787	6169	7055	6492
Fuel Used (gal)	100.0	96.4	99.2	104.0

Arterial Level of Service: NB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Belmont	5	13.7	22.6	0.1	10
A St	4	2.4	9.2	0.0	18
Taylor	3	11.6	32.8	0.1	16
May St	2	31.8	49.4	0.1	9
Oak St	1	49.6	91.7	0.3	13
Total		109.1	205.7	0.7	12

Arterial Level of Service: SB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
May St	2	104.1	144.9	0.3	8
Taylor	3	9.5	26.5	0.1	16
A St	4	30.1	54.8	0.1	10
Belmont	5	9.4	16.3	0.0	11
	25	1.8	10.4	0.1	20
Total		155.0	252.8	0.7	10

Arterial Level of Service: NB 12th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Union	6	4.7	13.5	0.1	17
Wilson	7	2.6	9.6	0.0	18
Pine	8	7.2	26.8	0.1	19
Taylor	9	0.6	3.1	0.0	18
May St	10	16.6	34.2	0.1	13
Total		31.7	87.3	0.4	16

Arterial Level of Service: SB 12th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Taylor	9	4.2	22.7	0.1	19
Pine	8	1.0	3.5	0.0	16
A St	7	16.4	34.2	0.1	14
Belmont	6	7.3	14.0	0.0	12
	14	25.7	35.3	0.1	6
Total		54.7	109.9	0.4	12

Intersection: 1: 13th St & Oak St

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	629	175	225	813	757	255
Average Queue (ft)	286	150	214	467	414	133
95th Queue (ft)	594	217	251	956	751	304
Link Distance (ft)	826			892	1618	
Upstream Blk Time (%)	3			14		
Queuing Penalty (veh)	0			0		
Storage Bay Dist (ft)		150	200			230
Storage Blk Time (%)	14	14	43	0	30	0
Queuing Penalty (veh)	63	31	95	1	33	2

Intersection: 2: 13th St & May St

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	301	320	309	275	560	124	1485
Average Queue (ft)	137	244	131	167	315	66	1041
95th Queue (ft)	335	340	273	322	585	143	1774
Link Distance (ft)	812	297	297		560		1618
Upstream Blk Time (%)	2	10	2		3		5
Queuing Penalty (veh)	0	26	4		21		42
Storage Bay Dist (ft)				250		100	
Storage Blk Time (%)				11	12	3	57
Queuing Penalty (veh)				58	16	18	42

Intersection: 3: 13th St & Taylor

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	94	155	527	425
Average Queue (ft)	29	60	129	102
95th Queue (ft)	75	139	411	360
Link Distance (ft)	600	194	732	560
Upstream Blk Time (%)		3	0	4
Queuing Penalty (veh)		3	1	36
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: 13th St & A St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	80	151	178	730
Average Queue (ft)	23	59	31	453
95th Queue (ft)	64	128	130	818
Link Distance (ft)	744	191	179	732
Upstream Blk Time (%)		1	2	5
Queuing Penalty (veh)		1	11	48
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: 13th St & Belmont

Movement	EB	EB	WB	NB	B25	SB	SB
Directions Served	L	TR	TR	TR	T	L	TR
Maximum Queue (ft)	222	403	185	314	122	93	224
Average Queue (ft)	69	214	106	175	14	37	186
95th Queue (ft)	163	538	187	311	75	102	256
Link Distance (ft)		892	175	236	70	179	179
Upstream Blk Time (%)		6	3	8	6	4	16
Queuing Penalty (veh)		0	5	46	33	22	84
Storage Bay Dist (ft)	200						
Storage Blk Time (%)	0	14					
Queuing Penalty (veh)	1	10					

Intersection: 6: 12th St & Belmont/Union

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	161	75	268	111
Average Queue (ft)	73	24	86	21
95th Queue (ft)	160	63	222	99
Link Distance (ft)	175	705	268	196
Upstream Blk Time (%)	7		3	5
Queuing Penalty (veh)	7		28	10
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: 12th St & A St/Wilson

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	62	122	195	150
Average Queue (ft)	25	43	40	42
95th Queue (ft)	59	92	129	251
Link Distance (ft)	191	712	196	644
Upstream Blk Time (%)			2	4
Queuing Penalty (veh)			17	9
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: 12th St & Pine

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	322	413	35
Average Queue (ft)	102	79	12
95th Queue (ft)	303	287	39
Link Distance (ft)	848	644	35
Upstream Blk Time (%)	0	2	6
Queuing Penalty (veh)	0	14	13
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: 12th St & Taylor

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	84	43	129
Average Queue (ft)	38	17	22
95th Queue (ft)	74	47	119
Link Distance (ft)	194	35	565
Upstream Blk Time (%)		4	
Queuing Penalty (veh)		37	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 10: 12th St & May St

Movement	EB	WB	WB	NB	NB
Directions Served	TR	LT	T	L	R
Maximum Queue (ft)	172	103	104	124	310
Average Queue (ft)	67	80	76	69	128
95th Queue (ft)	135	102	105	136	257
Link Distance (ft)	297	75	75		565
Upstream Blk Time (%)		21	10		0
Queuing Penalty (veh)		52	25		0
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				3	9
Queuing Penalty (veh)				18	12

Intersection: 11: May St

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	92	252	669
Average Queue (ft)	9	97	362
95th Queue (ft)	47	265	881
Link Distance (ft)	75	664	891
Upstream Blk Time (%)	0	1	12
Queuing Penalty (veh)	1	0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 14: 12th St

Movement	WB	NB	NB	SB
Directions Served	L	T	R	T
Maximum Queue (ft)	165	489	576	76
Average Queue (ft)	72	120	133	22
95th Queue (ft)	161	653	674	63
Link Distance (ft)	268	1032	1032	70
Upstream Blk Time (%)	5	8	8	0
Queuing Penalty (veh)	9	0	0	2
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 1007

Summary of All Intervals

Run Number	10	2	4	5	6	7	8
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:07	8:07	8:07	8:07	8:07	8:07	8:07
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	3	3	3	3	3	3	3
# of Recorded Intervals	2	2	2	2	2	2	2
Vehs Entered	4134	4198	1990	4083	4063	4096	3841
Vehs Exited	4050	4082	1711	4010	4002	4084	3711
Starting Vehs	208	218	196	244	215	224	250
Ending Vehs	292	334	475	317	276	236	380
Travel Distance (mi)	2361	2366	983	2318	2306	2363	2140
Travel Time (hr)	348.0	340.7	1160.1	444.6	415.7	324.8	541.4
Total Delay (hr)	245.5	237.6	1117.4	344.2	315.5	222.4	448.7
Total Stops	9336	9397	3787	9022	9750	8605	10237
Fuel Used (gal)	138.5	137.4	288.8	159.3	153.5	133.6	178.1

Summary of All Intervals

Run Number	9	Avg
Start Time	6:57	6:57
End Time	8:07	8:07
Total Time (min)	70	70
Time Recorded (min)	60	60
# of Intervals	3	3
# of Recorded Intervals	2	2
Vehs Entered	4112	3813
Vehs Exited	4075	3718
Starting Vehs	179	218
Ending Vehs	216	312
Travel Distance (mi)	2359	2150
Travel Time (hr)	303.5	484.9
Total Delay (hr)	200.9	391.5
Total Stops	7975	8512
Fuel Used (gal)	128.1	164.7

Interval #0 Information Seeding

Start Time	6:57
End Time	7:07
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.
No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	10	2	4	5	6	7	8
Vehs Entered	1151	1134	927	1119	1144	1129	1130
Vehs Exited	1059	1058	880	1021	1018	1060	1030
Starting Vehs	208	218	196	244	215	224	250
Ending Vehs	300	294	243	342	341	293	350
Travel Distance (mi)	613	601	505	598	595	609	583
Travel Time (hr)	69.4	72.8	78.3	78.8	70.7	74.9	87.5
Total Delay (hr)	42.8	46.5	56.2	52.9	44.9	48.4	62.5
Total Stops	2449	2243	1760	2349	2398	2488	2651
Fuel Used (gal)	31.4	31.7	30.8	33.1	30.9	32.6	34.8

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	9	Avg
Vehs Entered	1140	1108
Vehs Exited	1037	1018
Starting Vehs	179	218
Ending Vehs	282	301
Travel Distance (mi)	594	587
Travel Time (hr)	58.7	73.9
Total Delay (hr)	32.8	48.4
Total Stops	2008	2289
Fuel Used (gal)	28.3	31.7

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	10	2	4	5	6	7	8
Vehs Entered	2983	3064	1063	2964	2919	2967	2711
Vehs Exited	2991	3024	831	2989	2984	3024	2681
Starting Vehs	300	294	243	342	341	293	350
Ending Vehs	292	334	475	317	276	236	380
Travel Distance (mi)	1748	1765	479	1719	1711	1754	1557
Travel Time (hr)	278.6	267.9	1081.9	365.8	345.0	249.9	453.9
Total Delay (hr)	202.7	191.1	1061.2	291.3	270.6	173.9	386.2
Total Stops	6887	7154	2027	6673	7352	6117	7586
Fuel Used (gal)	107.1	105.6	257.9	126.3	122.5	101.0	143.3

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	9	Avg
Vehs Entered	2972	2708
Vehs Exited	3038	2692
Starting Vehs	282	301
Ending Vehs	216	312
Travel Distance (mi)	1765	1562
Travel Time (hr)	244.7	411.0
Total Delay (hr)	168.0	343.1
Total Stops	5967	6224
Fuel Used (gal)	99.8	133.0

Arterial Level of Service: NB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Oak St	1	18.0	29.7	0.3	40
Total		18.0	29.7	0.3	40

Arterial Level of Service: SB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
May St	2	131.4	172.3	0.3	7
	13	5.1	13.6	0.1	15
Taylor	3	8.1	18.6	0.1	13
A St	4	20.6	43.7	0.1	13
Belmont	5	9.9	17.2	0.0	10
	25	1.0	5.6	0.0	20
Total		176.1	271.0	0.7	9

Arterial Level of Service: NB 12th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Union	6	14.1	28.7	0.1	10
Wilson	7	4.9	11.7	0.0	15
Pine	8	17.5	40.6	0.1	13
Taylor	9	1.3	3.7	0.0	15
May St	10	26.6	52.0	0.1	10
Total		64.6	136.7	0.4	11

Intersection: 1: 13th St & Oak St

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	772	175	225	915	566	255
Average Queue (ft)	387	161	221	710	286	103
95th Queue (ft)	794	215	239	1184	509	258
Link Distance (ft)	833			898	1603	
Upstream Blk Time (%)	11			40		
Queuing Penalty (veh)	0			0		
Storage Bay Dist (ft)		150	200			230
Storage Blk Time (%)	16	22	60	0	18	0
Queuing Penalty (veh)	76	51	133	1	19	1

Intersection: 2: 13th St & May St

Movement	EB	EB	WB	WB	WB	SB
Directions Served	L	R	L	T	R	TR
Maximum Queue (ft)	259	139	223	315	218	1593
Average Queue (ft)	106	59	156	136	104	1266
95th Queue (ft)	351	120	244	277	187	1927
Link Distance (ft)	816			316	316	1603
Upstream Blk Time (%)	3			7	0	10
Queuing Penalty (veh)	0			38	0	83
Storage Bay Dist (ft)		120	200			
Storage Blk Time (%)	2	6	12	0		
Queuing Penalty (veh)	2	5	20	1		

Intersection: 3: 13th St & Taylor

Movement	EB	WB	SB	B13
Directions Served	TR	LT	LTR	T
Maximum Queue (ft)	107	210	322	224
Average Queue (ft)	30	96	95	44
95th Queue (ft)	96	194	319	204
Link Distance (ft)	603	229	271	234
Upstream Blk Time (%)		2	11	9
Queuing Penalty (veh)		3	126	102
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: 13th St & A St

Movement	EB	WB	SB
Directions Served	TR	LT	LTR
Maximum Queue (ft)	67	126	569
Average Queue (ft)	17	45	225
95th Queue (ft)	52	99	735
Link Distance (ft)	743	209	732
Upstream Blk Time (%)			11
Queuing Penalty (veh)			126
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: 13th St & Belmont

Movement	EB	EB	WB	SB	SB
Directions Served	T	R	LT	LT	TR
Maximum Queue (ft)	371	174	177	219	236
Average Queue (ft)	199	71	76	133	134
95th Queue (ft)	710	163	161	221	237
Link Distance (ft)	886		196	186	186
Upstream Blk Time (%)	14		0	12	4
Queuing Penalty (veh)	0		1	73	25
Storage Bay Dist (ft)		200			
Storage Blk Time (%)	17	1			
Queuing Penalty (veh)	33	1			

Intersection: 6: 12th St & Belmont/Union

Movement	EB	WB	NB	NB
Directions Served	LT	TR	LT	TR
Maximum Queue (ft)	205	188	325	335
Average Queue (ft)	114	73	112	169
95th Queue (ft)	226	220	336	382
Link Distance (ft)	196	693	287	287
Upstream Blk Time (%)	22		13	17
Queuing Penalty (veh)	22		91	119
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: 12th St & A St/Wilson

Movement	EB	WB	NB	NB
Directions Served	LT	TR	L	TR
Maximum Queue (ft)	203	451	112	228
Average Queue (ft)	102	264	7	95
95th Queue (ft)	218	640	64	239
Link Distance (ft)	209	706	196	196
Upstream Blk Time (%)	9	11	1	3
Queuing Penalty (veh)	6	0	4	21
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: 12th St & Pine

Movement	WB	NB
Directions Served	R	TR
Maximum Queue (ft)	874	631
Average Queue (ft)	767	252
95th Queue (ft)	1133	623
Link Distance (ft)	850	650
Upstream Blk Time (%)	77	1
Queuing Penalty (veh)	0	16
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: 12th St & Taylor

Movement	EB	NB
Directions Served	L	LT
Maximum Queue (ft)	177	82
Average Queue (ft)	68	28
95th Queue (ft)	173	70
Link Distance (ft)	229	30
Upstream Blk Time (%)	2	9
Queuing Penalty (veh)	1	113
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: 12th St & May St

Movement	WB	NB	NB
Directions Served	T	L	R
Maximum Queue (ft)	109	560	125
Average Queue (ft)	88	319	111
95th Queue (ft)	99	603	166
Link Distance (ft)	74	558	
Upstream Blk Time (%)	50	6	
Queuing Penalty (veh)	219	69	
Storage Bay Dist (ft)			100
Storage Blk Time (%)		22	6
Queuing Penalty (veh)		140	39

Intersection: 11: May St

Movement	EB	WB	SB	B27	B26
Directions Served	LT	TR	LR	T	T
Maximum Queue (ft)	66	270	313	314	405
Average Queue (ft)	5	104	272	270	340
95th Queue (ft)	32	311	305	332	469
Link Distance (ft)	74	664	183	184	331
Upstream Blk Time (%)	0	3	99	97	87
Queuing Penalty (veh)	0	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 14: 12th St

Movement	NB	NB	B25
Directions Served	T	T	T
Maximum Queue (ft)	175	198	7
Average Queue (ft)	73	90	0
95th Queue (ft)	207	223	7
Link Distance (ft)	151	151	102
Upstream Blk Time (%)	22	28	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1779

Summary of All Intervals

Run Number	1	10	2	3	5	7	8
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:07	8:07	8:07	8:07	8:07	8:07	8:07
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	3	3	3	3	3	3	3
# of Recorded Intervals	2	2	2	2	2	2	2
Vehs Entered	4289	4156	4120	4198	4280	4324	4272
Vehs Exited	4190	4006	4063	4149	4167	4275	4192
Starting Vehs	206	230	220	216	232	231	238
Ending Vehs	305	380	277	265	345	280	318
Travel Distance (mi)	2606	2486	2523	2595	2640	2643	2602
Travel Time (hr)	341.7	371.5	318.8	262.8	377.1	288.6	375.5
Total Delay (hr)	229.5	264.4	210.4	151.0	263.7	174.8	263.6
Total Stops	10101	9350	9299	7515	11636	9995	10306
Fuel Used (gal)	142.1	146.9	135.5	124.6	151.9	130.9	151.1

Summary of All Intervals

Run Number	9	Avg
Start Time	6:57	6:57
End Time	8:07	8:07
Total Time (min)	70	70
Time Recorded (min)	60	60
# of Intervals	3	3
# of Recorded Intervals	2	2
Vehs Entered	4297	4242
Vehs Exited	4242	4161
Starting Vehs	214	213
Ending Vehs	269	299
Travel Distance (mi)	2649	2593
Travel Time (hr)	345.1	335.1
Total Delay (hr)	231.2	223.6
Total Stops	10551	9847
Fuel Used (gal)	144.0	140.9

Interval #0 Information Seeding

Start Time	6:57
End Time	7:07
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.
No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	10	2	3	5	7	8
Vehs Entered	1176	1202	1114	1159	1229	1153	1127
Vehs Exited	1083	1135	1013	1132	1133	1113	1067
Starting Vehs	206	230	220	216	232	231	238
Ending Vehs	299	297	321	243	328	271	298
Travel Distance (mi)	672	697	642	693	706	686	638
Travel Time (hr)	68.4	58.3	70.9	61.4	70.0	63.4	77.3
Total Delay (hr)	39.4	28.4	43.3	31.5	39.6	33.8	49.8
Total Stops	2551	2150	2538	2003	2762	2314	2523
Fuel Used (gal)	32.3	30.7	32.1	31.4	33.4	31.1	33.6

Interval #1 Information Recording1

Start Time	7:07
End Time	7:22
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	9	Avg
Vehs Entered	1219	1170
Vehs Exited	1115	1098
Starting Vehs	214	213
Ending Vehs	318	294
Travel Distance (mi)	696	679
Travel Time (hr)	72.5	67.8
Total Delay (hr)	42.5	38.6
Total Stops	2721	2444
Fuel Used (gal)	33.4	32.2

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	10	2	3	5	7	8
Vehs Entered	3113	2954	3006	3039	3051	3171	3145
Vehs Exited	3107	2871	3050	3017	3034	3162	3125
Starting Vehs	299	297	321	243	328	271	298
Ending Vehs	305	380	277	265	345	280	318
Travel Distance (mi)	1934	1789	1881	1902	1935	1956	1964
Travel Time (hr)	273.3	313.2	247.9	201.4	307.1	225.2	298.2
Total Delay (hr)	190.1	236.1	167.1	119.5	224.1	140.9	213.8
Total Stops	7550	7200	6761	5512	8874	7681	7783
Fuel Used (gal)	109.8	116.2	103.4	93.2	118.5	99.8	117.5

Interval #2 Information Recording2

Start Time	7:22
End Time	8:07
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	9	Avg
Vehs Entered	3078	3064
Vehs Exited	3127	3063
Starting Vehs	318	294
Ending Vehs	269	299
Travel Distance (mi)	1953	1914
Travel Time (hr)	272.6	267.4
Total Delay (hr)	188.7	185.0
Total Stops	7830	7397
Fuel Used (gal)	110.5	108.6

Arterial Level of Service: NB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Belmont	5	9.9	15.7	0.0	9
A St	4	2.0	8.8	0.0	19
Taylor	3	8.5	29.4	0.1	18
	13	10.1	19.1	0.1	12
May St	2	19.2	27.1	0.1	8
Oak St	1	38.1	83.9	0.3	14
Total		87.7	184.0	0.7	13

Arterial Level of Service: SB 13th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
May St	2	109.0	151.4	0.3	8
	13	4.4	12.8	0.1	16
Taylor	3	9.2	19.0	0.1	12
A St	4	34.7	58.7	0.1	10
Belmont	5	9.8	17.3	0.0	10
	25	1.5	7.5	0.0	19
Total		168.6	266.7	0.7	9

Arterial Level of Service: NB 12th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Union	6	12.0	21.0	0.1	11
Wilson	7	12.1	19.4	0.0	9
Pine	8	35.8	69.7	0.1	9
Taylor	9	0.4	2.8	0.0	20
May St	10	11.6	28.5	0.1	15
Total		71.9	141.4	0.4	11

Intersection: 1: 13th St & Oak St

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	790	175	225	898	622	255
Average Queue (ft)	370	160	217	557	341	126
95th Queue (ft)	772	215	253	1087	590	291
Link Distance (ft)	826			892	1618	
Upstream Blk Time (%)	5			24		
Queuing Penalty (veh)	0			0		
Storage Bay Dist (ft)		150	200			230
Storage Blk Time (%)	22	12	48	0	22	0
Queuing Penalty (veh)	100	28	108	1	24	1

Intersection: 2: 13th St & May St

Movement	EB	WB	WB	NB	NB	B13	SB	SB
Directions Served	LTR	L	TR	L	TR	T	L	TR
Maximum Queue (ft)	850	326	321	175	328	335	123	1545
Average Queue (ft)	752	214	210	115	275	162	42	1158
95th Queue (ft)	984	333	336	205	397	375	113	1926
Link Distance (ft)	810	310	310		235	271		1618
Upstream Blk Time (%)	62	4	2		23	6		3
Queuing Penalty (veh)	0	12	7		206	52		27
Storage Bay Dist (ft)				150			100	
Storage Blk Time (%)				7	26		7	47
Queuing Penalty (veh)				55	26		55	12

Intersection: 3: 13th St & Taylor

Movement	EB	WB	NB	NB	SB	SB	B13
Directions Served	LTR	LTR	L	TR	L	TR	T
Maximum Queue (ft)	147	206	119	524	102	360	273
Average Queue (ft)	57	123	30	119	13	183	59
95th Queue (ft)	132	243	84	411	58	422	230
Link Distance (ft)	597	211		732		271	235
Upstream Blk Time (%)		20		0		9	2
Queuing Penalty (veh)		13		2		99	19
Storage Bay Dist (ft)			100		100		
Storage Blk Time (%)			0	7	0	15	
Queuing Penalty (veh)			2	2	0	2	

Intersection: 4: 13th St & A St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	220	208	34	170	119	754
Average Queue (ft)	98	128	5	30	24	610
95th Queue (ft)	268	237	24	116	75	930
Link Distance (ft)	751	197		180		732
Upstream Blk Time (%)		17		0		4
Queuing Penalty (veh)		13		1		44
Storage Bay Dist (ft)			10		100	
Storage Blk Time (%)			4	1	0	29
Queuing Penalty (veh)			40	0	0	7

Intersection: 5: 13th St & Belmont

Movement	EB	EB	WB	NB	B25	SB	SB
Directions Served	L	TR	TR	TR	T	L	TR
Maximum Queue (ft)	124	543	196	236	240	124	219
Average Queue (ft)	71	244	113	197	131	47	202
95th Queue (ft)	144	472	204	296	292	112	239
Link Distance (ft)		892	187	146	149		180
Upstream Blk Time (%)		0	3	19	11		22
Queuing Penalty (veh)		0	5	165	93		248
Storage Bay Dist (ft)	100					100	
Storage Blk Time (%)	4	46				2	26
Queuing Penalty (veh)	9	32				17	13

Intersection: 6: 12th St & Belmont/Union

Movement	EB	WB	NB
Directions Served	LT	TR	LTR
Maximum Queue (ft)	148	70	243
Average Queue (ft)	55	18	98
95th Queue (ft)	123	55	299
Link Distance (ft)	187	705	266
Upstream Blk Time (%)	2		15
Queuing Penalty (veh)	2		97
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: 12th St & A St/Wilson

Movement	EB	WB	NB
Directions Served	LT	TR	LTR
Maximum Queue (ft)	77	187	209
Average Queue (ft)	23	67	82
95th Queue (ft)	61	178	242
Link Distance (ft)	197	712	197
Upstream Blk Time (%)			17
Queuing Penalty (veh)			86
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: 12th St & Pine

Movement	WB	NB
Directions Served	R	TR
Maximum Queue (ft)	275	464
Average Queue (ft)	109	183
95th Queue (ft)	294	632
Link Distance (ft)	850	650
Upstream Blk Time (%)		12
Queuing Penalty (veh)		53
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: 12th St & Taylor

Movement	EB	NB
Directions Served	L	LT
Maximum Queue (ft)	45	66
Average Queue (ft)	17	20
95th Queue (ft)	46	63
Link Distance (ft)	211	30
Upstream Blk Time (%)		18
Queuing Penalty (veh)		97
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: 12th St & May St

Movement	EB	WB	WB	NB	NB
Directions Served	T	T	T	L	R
Maximum Queue (ft)	121	92	101	297	125
Average Queue (ft)	51	65	77	92	79
95th Queue (ft)	97	96	105	226	138
Link Distance (ft)	310	74	74	566	
Upstream Blk Time (%)		7	12		
Queuing Penalty (veh)		14	26		
Storage Bay Dist (ft)					100
Storage Blk Time (%)				4	2
Queuing Penalty (veh)				12	4

Intersection: 11: May St

Movement	EB	WB	SB	B27	B26
Directions Served	LT	TR	LR	T	T
Maximum Queue (ft)	58	120	255	114	3
Average Queue (ft)	4	57	114	8	0
95th Queue (ft)	26	97	219	63	2
Link Distance (ft)	74	664	169	184	331
Upstream Blk Time (%)	0		8	0	
Queuing Penalty (veh)	0		0	0	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

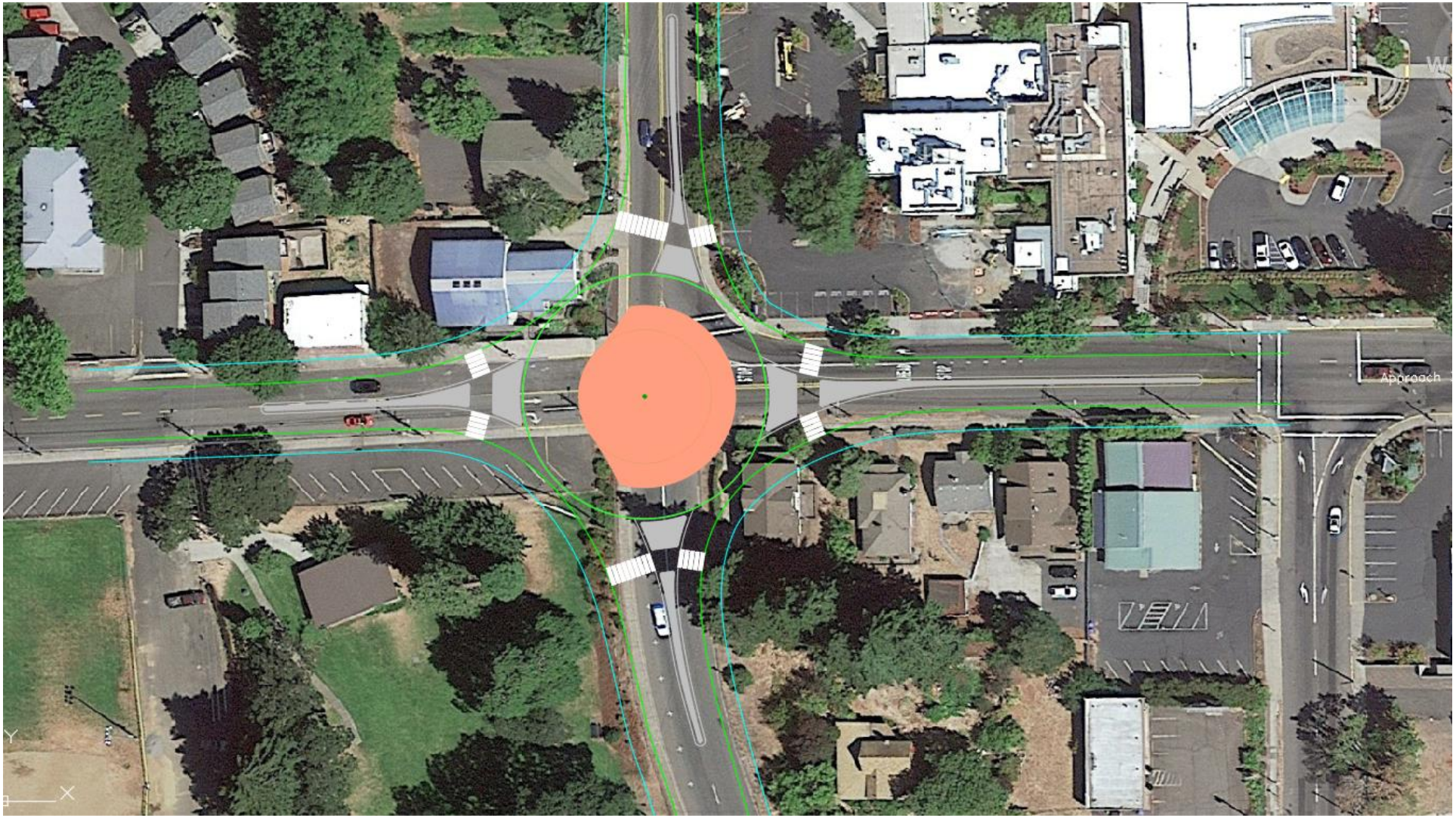
Intersection: 14: 12th/12th St

Movement	NB	NB	SE
Directions Served	L	T	R
Maximum Queue (ft)	459	467	7
Average Queue (ft)	220	197	0
95th Queue (ft)	601	597	7
Link Distance (ft)	503	503	149
Upstream Blk Time (%)	13	13	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1931

APPENDIX F: MITIGATED ROUNDABOUT CONCEPT



- Hybrid multi-lane (dual SBT, single lane all other lanes)
- 140’ ICD
    - ODOT standard single lane: 165’
    - 140’ provides minimal opportunity for central landscaped island. Changing May St. design vehicle to WB-40 would increase central island landscape/art opportunity.
- Design Vehicle: WB-67
- Footprint offset of 12’ for bike/ped
- *Does not show bike facility transitions on approaches

APPENDIX G: NCHRP 562 PEDESTRIAN CROSSING EVALUATION

GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

This spreadsheet combines Worksheet 1 and Worksheet 2 (Appendix A, pages 69-70) of TCRP Report 112/NCHRP Report 562 (*Improving Pedestrian Safety at Unsignalized Intersections*) into an electronic format. This spreadsheet should be used in conjunction with, and not independent of, Appendix A documentation.

This spreadsheet is still under development, please inform TTI if errors are identified.

Key

Blue fields contain descriptive information.
Green fields are required and must be completed.
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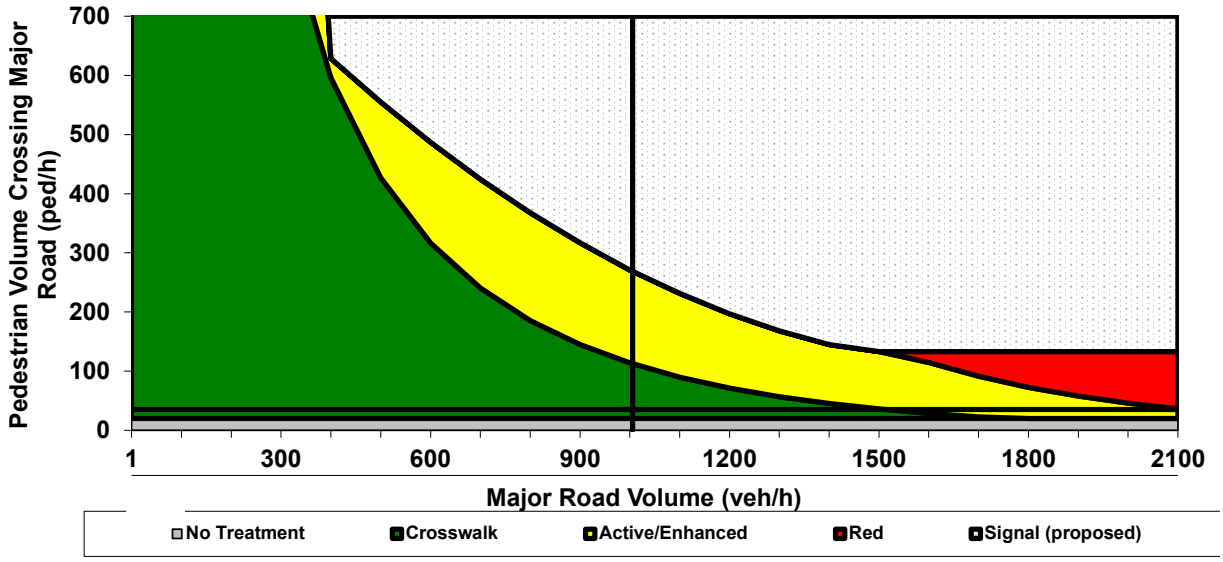
Analyst and Site Information			
Analyst	ALC	Major Street	12th St - Scenario 1
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:		
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)	*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)	*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?		
Peak-hour pedestrian volume (ped/h), V_p	*2a*	35
Result: Go to step 3.		
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?		
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$	*3a*	1006
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant	*3b*	269
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant	*3c*	269
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)	*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — % rate of reduction for *3c* (up to 50%)	*3e*	0%
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — Reduced value or *3c*	*3f*	269
Result: The signal warrant is not met. Go to step 4.		
Step 4: Estimate pedestrian delay.		
Pedestrian crossing distance, curb to curb (ft), L	*4a*	24
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)	*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)	*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c	*4d*	10
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$	*4e*	1006
Major road flow rate (veh/s), v	*4f*	0.28
Average pedestrian delay (s/person), d_p	*4g*	43
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.	*4h*	0.4
	4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.		
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***	*5a*	LOW
Treatment Category:		**CROSSWALK**



This worksheet provides general recommendations on pedestrian crossing treatments to consider at unsignalized intersections; in all cases, engineering judgment should be used in selecting a specific treatment for installation. This worksheet does not apply to school crossings. In addition to the results provided by this worksheet, users should consider whether a pedestrian treatment could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex geometrics, or nearby traffic signals.

GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

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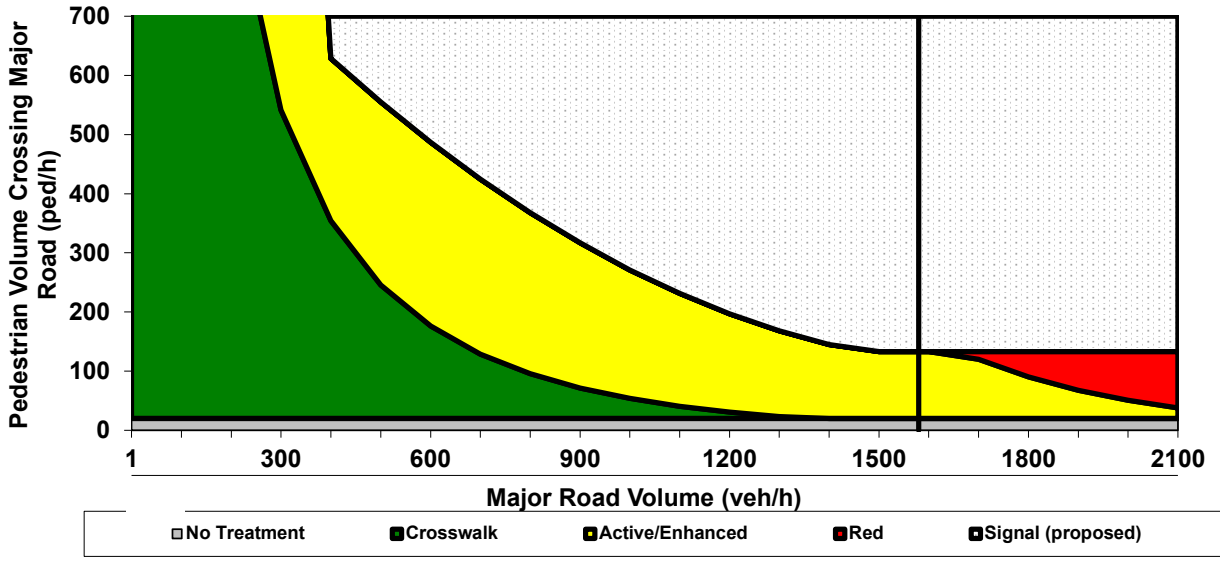
Analyst and Site Information			
Analyst	ALC	Major Street	13th St - Scenario 1
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:			
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)		*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)		*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?			
Peak-hour pedestrian volume (ped/h), V_p		*2a*	20
Result: Go to step 3.			
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?			
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$		*3a*	1580
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant		*3b*	133
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant		*3c*	133
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)		*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%.	% rate of reduction for *3c* (up to 50%)	*3e*	0%
	Reduced value or *3c*	*3f*	133
Result: The signal warrant is not met. Go to step 4.			
Step 4: Estimate pedestrian delay.			
Pedestrian crossing distance, curb to curb (ft), L		*4a*	32
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)		*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)		*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c		*4d*	12
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$		*4e*	1580
Major road flow rate (veh/s), v		*4f*	0.44
Average pedestrian delay (s/person), d_p		*4g*	461
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.		*4h*	2.6
		4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.			
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***		*5a*	HIGH
Treatment Category:	**ACTIVE OR ENHANCED**		



This worksheet provides general recommendations on pedestrian crossing treatments to consider at unsignalized intersections; in all cases, engineering judgment should be used in selecting a specific treatment for installation. This worksheet does not apply to school crossings. In addition to the results provided by this worksheet, users should consider whether a pedestrian treatment could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex geometrics, or nearby traffic signals.

GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

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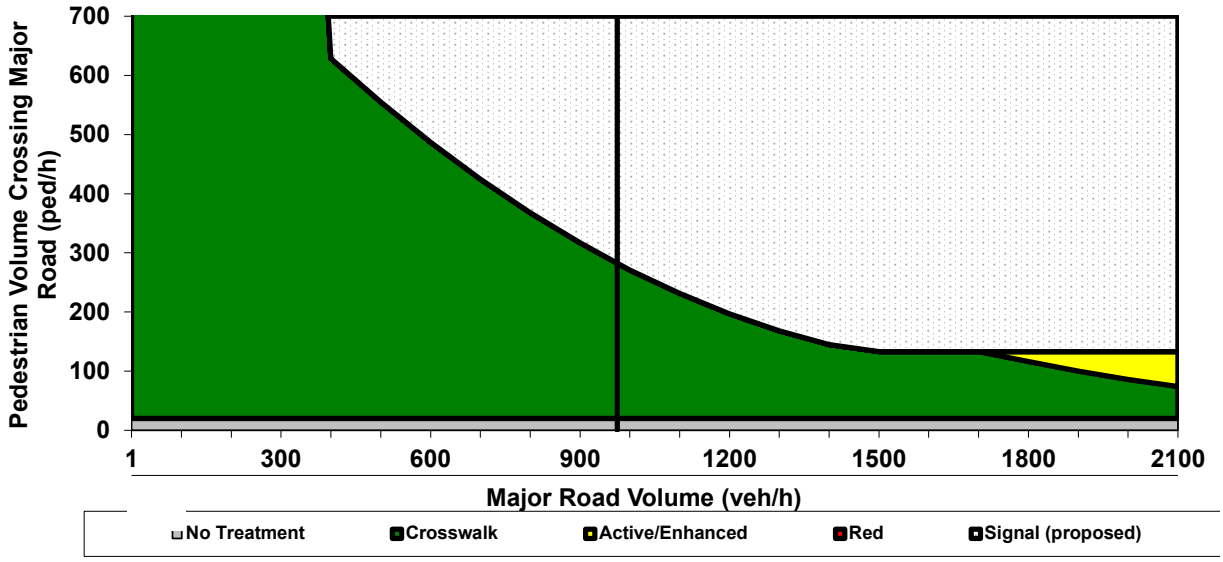
Analyst and Site Information			
Analyst	ALC	Major Street	13th St - Scenario 1 (Two Stage)
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:		
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)	*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)	*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?		
Peak-hour pedestrian volume (ped/h), V_p	*2a*	20
Result: Go to step 3.		
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?		
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$	*3a*	1580
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant	*3b*	133
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant	*3c*	133
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)	*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — % rate of reduction for *3c* (up to 50%)	*3e*	0%
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — Reduced value or *3c*	*3f*	133
Result: The signal warrant is not met. Go to step 4.		
Step 4: Estimate pedestrian delay.		
Pedestrian crossing distance, curb to curb (ft), L	*4a*	12
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)	*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)	*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c	*4d*	6
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$	*4e*	975
Major road flow rate (veh/s), v	*4f*	0.27
Average pedestrian delay (s/person), d_p	*4g*	11
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.	*4h*	0.1
	4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.		
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***	*5a*	HIGH

Treatment Category:	**CROSSWALK**



Because the volume in Step 4e is different from the volume in Step 3a, the graph may show a different result than the Treatment Category above.

This worksheet provides general recommendations on pedestrian crossing treatments to consider at unsignalized intersections; in all cases, engineering judgment should be used in selecting a specific treatment for installation. This worksheet does not apply to school crossings. In addition to the results provided by this worksheet, users should consider whether a pedestrian treatment could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex geometrics, or nearby traffic signals.

GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

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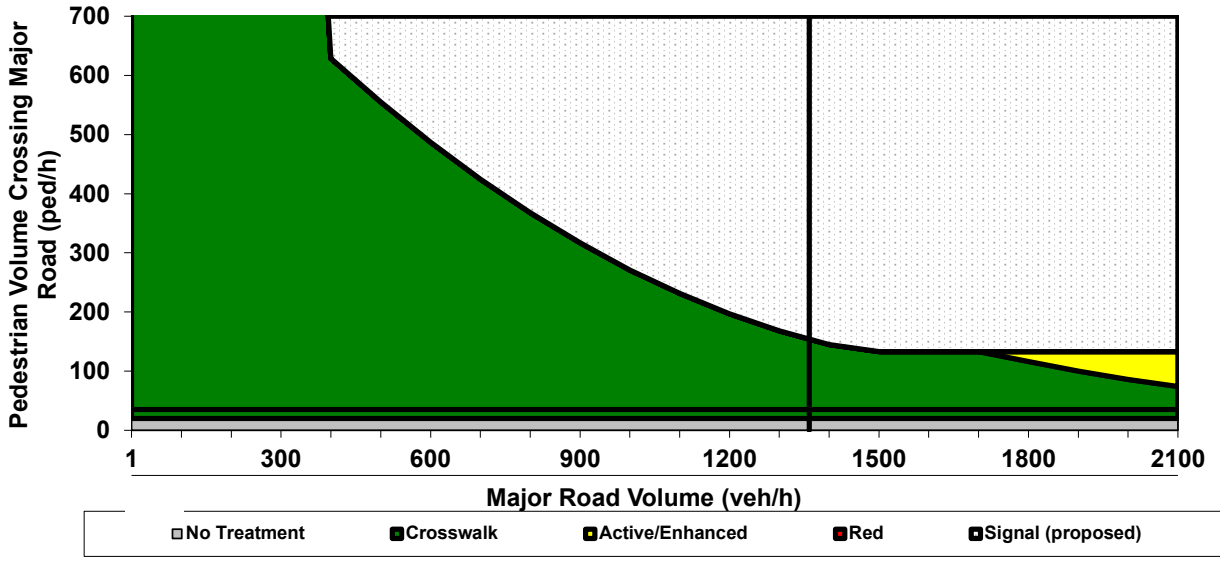
Analyst and Site Information			
Analyst	ALC	Major Street	12th St - Scenario 2
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:			
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)		*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)		*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?			
Peak-hour pedestrian volume (ped/h), V_p		*2a*	35
Result: Go to step 3.			
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?			
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$		*3a*	1360
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant		*3b*	154
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant		*3c*	154
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)		*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%.	% rate of reduction for *3c* (up to 50%)	*3e*	0%
	Reduced value or *3c*	*3f*	154
Result: The signal warrant is not met. Go to step 4.			
Step 4: Estimate pedestrian delay.			
Pedestrian crossing distance, curb to curb (ft), L		*4a*	12
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)		*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)		*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c		*4d*	6
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$		*4e*	1360
Major road flow rate (veh/s), v		*4f*	0.38
Average pedestrian delay (s/person), d_p		*4g*	21
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.		*4h*	0.2
		4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.			
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***		*5a*	HIGH
Treatment Category:	**CROSSWALK**		



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GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

This spreadsheet combines Worksheet 1 and Worksheet 2 (Appendix A, pages 69-70) of TCRP Report 112/NCHRP Report 562 (*Improving Pedestrian Safety at Unsignalized Intersections*) into an electronic format. This spreadsheet should be used in conjunction with, and not independent of, Appendix A documentation.

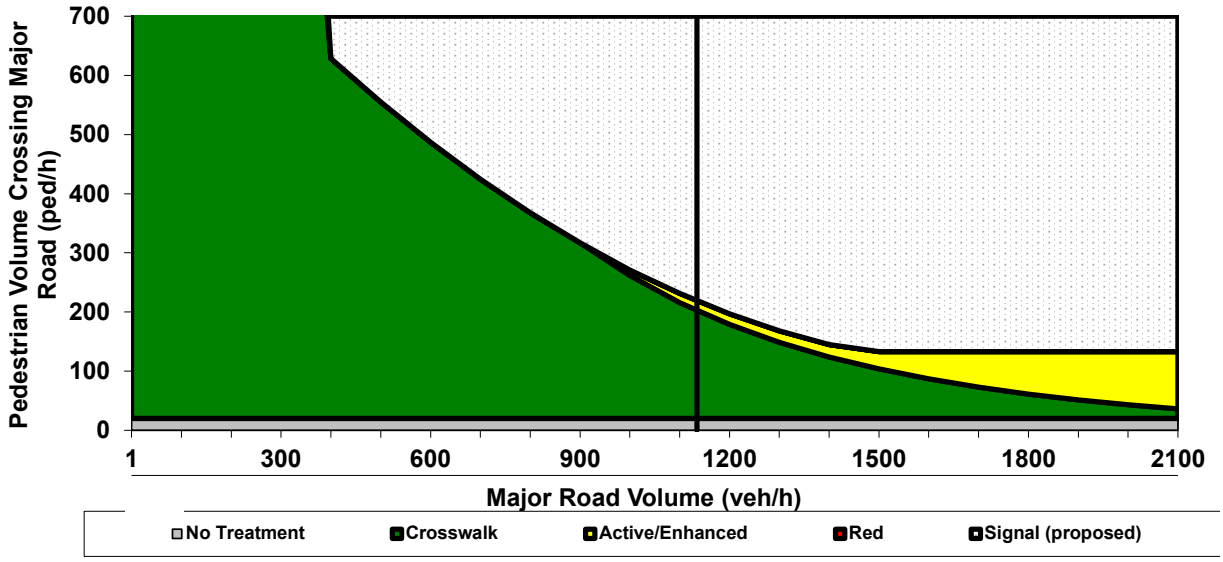
This spreadsheet is still under development, please inform TTI if errors are identified.

Key

Blue fields contain descriptive information.
Green fields are required and must be completed.
Tan fields are adjustments that are filled out only under certain conditions (follow instructions to the left of the cell).
Gray fields are automatically calculated and should not be edited.

Analyst and Site Information			
Analyst	ALC	Major Street	13th St - Scenario 2
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:			
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)		*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)		*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?			
Peak-hour pedestrian volume (ped/h), V_p		*2a*	20
Result: Go to step 3.			
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?			
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$		*3a*	1135
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant		*3b*	219
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant		*3c*	219
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)		*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%.	% rate of reduction for *3c* (up to 50%)	*3e*	0%
	Reduced value or *3c*	*3f*	219
Result: The signal warrant is not met. Go to step 4.			
Step 4: Estimate pedestrian delay.			
Pedestrian crossing distance, curb to curb (ft), L		*4a*	16
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)		*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)		*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c		*4d*	8
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$		*4e*	1135
Major road flow rate (veh/s), v		*4f*	0.32
Average pedestrian delay (s/person), d_p		*4g*	25
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.		*4h*	0.1
		4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.			
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***		*5a*	HIGH
Treatment Category:	**CROSSWALK**		



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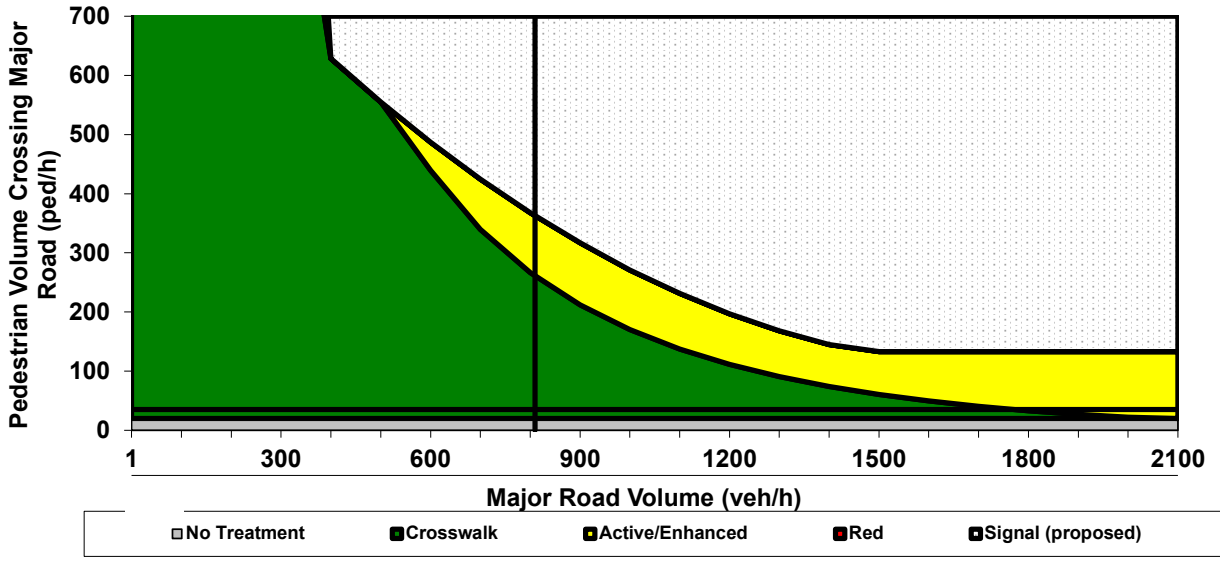
Analyst and Site Information			
Analyst	ALC	Major Street	12th St - Scenario 3
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:		
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)	*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)	*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?		
Peak-hour pedestrian volume (ped/h), V_p	*2a*	35
Result: Go to step 3.		
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?		
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$	*3a*	810
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant	*3b*	363
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant	*3c*	363
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)	*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — % rate of reduction for *3c* (up to 50%)	*3e*	0%
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — Reduced value or *3c*	*3f*	363
Result: The signal warrant is not met. Go to step 4.		
Step 4: Estimate pedestrian delay.		
Pedestrian crossing distance, curb to curb (ft), L	*4a*	20
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)	*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)	*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c	*4d*	9
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$	*4e*	810
Major road flow rate (veh/s), v	*4f*	0.23
Average pedestrian delay (s/person), d_p	*4g*	19
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.	*4h*	0.2
	4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.		
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***	*5a*	HIGH
Treatment Category:		**CROSSWALK**



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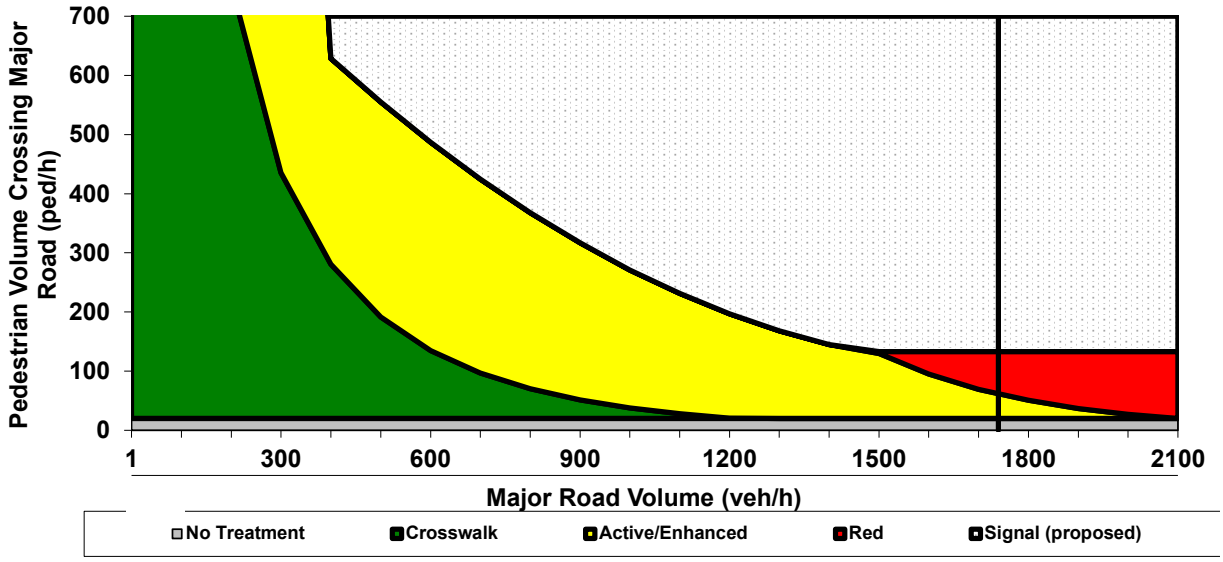
Analyst and Site Information			
Analyst	ALC	Major Street	13th St - Scenario 3
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:			
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)		*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)		*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?			
Peak-hour pedestrian volume (ped/h), V_p		*2a*	20
Result: Go to step 3.			
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?			
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$		*3a*	1740
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant		*3b*	133
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant		*3c*	133
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)		*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%.	% rate of reduction for *3c* (up to 50%)	*3e*	0%
	Reduced value or *3c*	*3f*	133
Result: The signal warrant is not met. Go to step 4.			
Step 4: Estimate pedestrian delay.			
Pedestrian crossing distance, curb to curb (ft), L		*4a*	36
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)		*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)		*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c		*4d*	13
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$		*4e*	1740
Major road flow rate (veh/s), v		*4f*	0.48
Average pedestrian delay (s/person), d_p		*4g*	1210
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.		*4h*	6.7
		4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.			
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***		*5a*	HIGH
Treatment Category:	**ACTIVE OR ENHANCED**		



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GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

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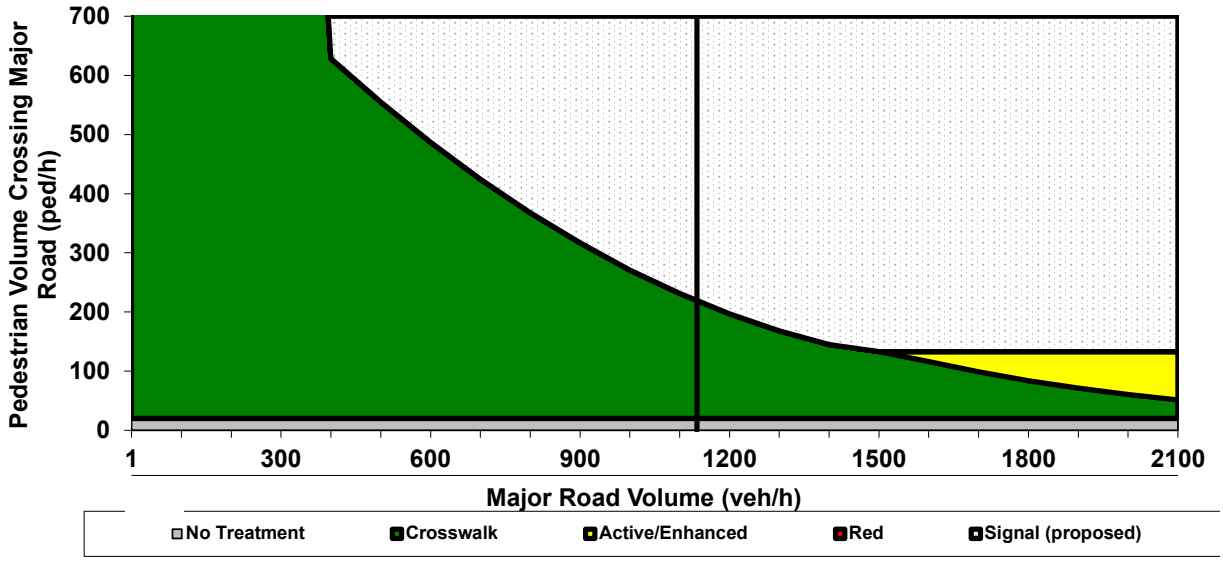
Analyst and Site Information			
Analyst	ALC	Major Street	13th St - Scenario 3 (Two Stage)
Analysis Date	Dec-21	Minor Street or Location	Varies
Data Collection Date	N/A	Peak Hour	N/A

Step 1: Select worksheet:		
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)	*1a*	25
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)	*1b*	NO
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?		
Peak-hour pedestrian volume (ped/h), V_p	*2a*	20
Result: Go to step 3.		
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?		
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$	*3a*	1740
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant	*3b*	133
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant	*3c*	133
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)	*3d*	NO
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — % rate of reduction for *3c* (up to 50%)	*3e*	0%
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — Reduced value or *3c*	*3f*	133
Result: The signal warrant is not met. Go to step 4.		
Step 4: Estimate pedestrian delay.		
Pedestrian crossing distance, curb to curb (ft), L	*4a*	14
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)	*4b*	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)	*4c*	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c	*4d*	7
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$	*4e*	1135
Major road flow rate (veh/s), v	*4f*	0.32
Average pedestrian delay (s/person), d_p	*4g*	19
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.	*4h*	0.1
	4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.		
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***	*5a*	HIGH

Treatment Category:	**CROSSWALK**



Because the volume in Step 4e is different from the volume in Step 3a, the graph may show a different result than the Treatment Category above.

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APPENDIX C

Heights Streetscape Plan - Full Evaluation of Preliminary Design Alternatives

MIG #15174.01

2/8/2021

Evaluation Rating Key
Very good alignment with project goals
Good alignment with project goals
Average alignment with project goals
Poor alignment with project goals
Undesirable alignment with project goals

		Goal #1			Goal #2				Goal #3		
Evaluation Criteria		Provides traffic calming	Accommodates vehicular traffic	Improves intersections	Accommodates parking	Supports the local economy	Supports livability	Adapts Seasonally	Opportunity for creating identity	Supports the Heights as a local destination	Opportunity for enhanced landscape
Evaluation Metric		1. Based on how street cross section reinforces target speed (20-25 mph) 2. Potential for additional traffic calming measures	1. Intersection Operations - v/c ratios, Levels of Service, seconds of delay 2. Travel time from end to end (through the corridor) 3. Accommodates emergency services access based on feedback from police and fire	1. Truck accessibility (ability to make turns) 2. Improved pedestrian visibility and locations of crosswalks at intersections 3. Relative improvements in safety - qualitative assessment, reference Crash Reduction Factors where available, ability to address past crash trends/issues	1. Based on quantity (compared to TSP) and location of parking	1. Based on visibility of storefronts 2. Ease of parking and delivery access 3. Ease of access for people walking and biking 4. Impacts to property access	1. How the design contributes to traffic reduction 2. Potential diversion of traffic through neighborhoods and lower classified streets. 3. Access to low-stress crossings (frequency)	1. How the cross section might function/be used in winter 2. How the cross section might be maintained in winter	1. Based on opportunities or areas created to enhance community identity	1. How the alternative improves local access	1. How the alternative enhances opportunities for street trees, planting and GSI
Design Alternative 1: Two-way, two-lane traffic	12th Street										
	13th Street										
Design Alternative 2: One-way, one-lane traffic	12th Street										
	13th Street										
Design Alternative 3: Hybrid traffic	12th Street										
	13th Street										

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Heights Streetscape Plan - Full Evaluation of Preliminary Design Alternatives

MIG #15174.01

2/8/2021

Evaluation Rating Key	
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	Good alignment with project goals
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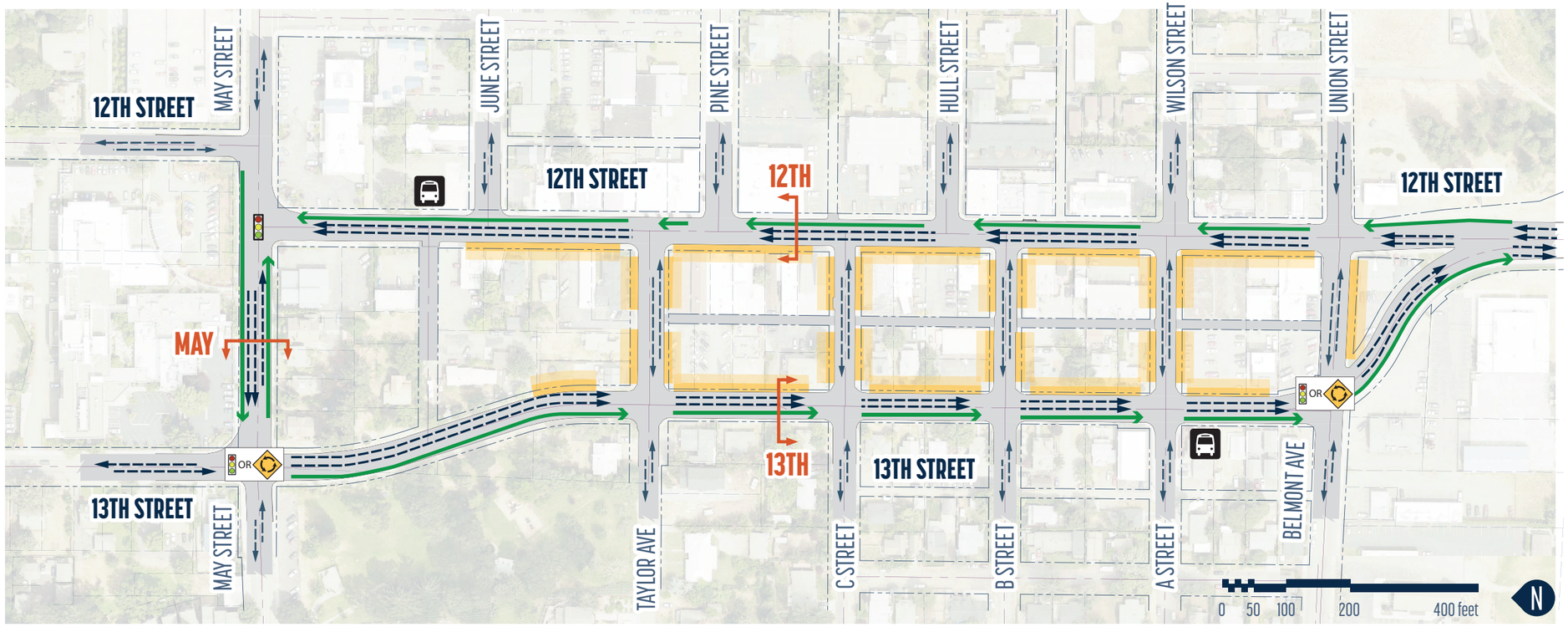
Goal #4					Goal #5	Goal #7	Feasibility Criteria				
Provides comfortable places for walking	Provides comfortable places for biking	Aligns with SRTS goals	Improves connections	Connects to planned bike routes	Impacts to utility infrastructure	Creates opportunities for placemaking	Potential cost and funding opportunities for implementation	Potential implementation considerations and construction impacts	Ability to maintain proposed improvements	Ease of obtaining ODOT design approval	Property impacts/ROW acquisition
1. Based on space available 2. Separation from traffic and people biking 3. Pedestrian crossing distances on 12th and 13th Streets	1. Based on facility type provided and predictability for non-bike users 2. Based on space available 3. Separation from traffic and people walking	1. How the alternative aligns with project recommendations (and goals) from the City's SRTS project	1. Based on how the system improves connections to parks/schools/trails 2. Ability to accommodate transit stop amenities (geometric) 3. Bus stop accessibility - proximity to enhanced crossings	1. Based on transitions to existing/planned bike routes	1. Potential implications for replacing and maintaining utilities based on where/how infrastructure is located	1. Based on the number and size of potential gatherings areas (supports lingering, public "third places") 2. Creates/supports opportunities for street closures/festival streets	1. Higher potential cost is lower rated 2. Higher potential for outside funding is higher rated	1. General feasibility and ability to implement and phase construction over time 2. Potentially longer construction would be more impactful and lower rated	1. Does the alternative create unique/additional maintenance needs? (lower maintenance need is rated more favorably)	1. Potential for easier/simper design approval to be rated more favorably 2. Based on how permittable improvements are through ODOT	1. Based on how much right of way would be needed to implement the design (more area is rated less favorably; implantability) 2.Higher impact to properties and access is rated less favorably
	n/a			n/a							n/a (just a single total score)
	n/a			n/a							n/a (just a single total score)
											n/a (just a single total score)
	n/a			n/a							

THE HEIGHTS STREETSCAPE PLAN

CURRENT ADOPTED PLAN - TRANSPORTATION SYSTEM PLAN CIRCULATION + STREET SECTIONS

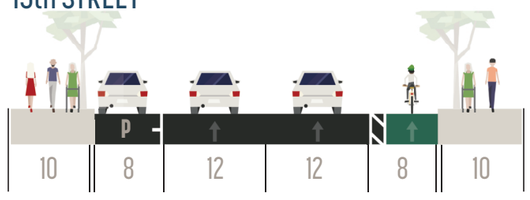
This diagram illustrates traffic patterns, planned bicycle facilities, and proposed intersection improvements from the City's Transportation System Plan (October 2011, amended April 2021). This plan has been adopted by the city as the future direction for OR 281 through the Heights and has been approved by ODOT.



LEGEND

- Right of Way
- Parcels
- Travel Lane - City Street
- Travel Lane - ODOT
- Bike Lane
- Parallel Street Parking
- Traffic Signal
- OR The adopted TSP notes intersection control could be a traffic signal or roundabout
- Possible Future Bus Stop Location. See Transit Discussion.

13th STREET

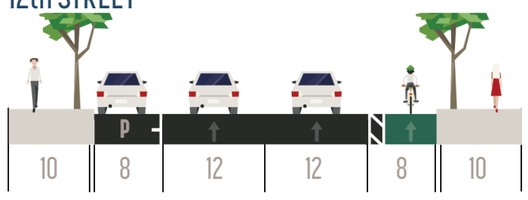


(50' R/W + 5' Utility Easements)

TRANSIT DISCUSSION - Accommodating bus stops in the Heights

Columbia Area Transit (CAT) does not currently have bus stops on 12th and 13th Streets within the Heights project area. The project team has coordinated with CAT to identify potential locations for future bus stops in the Heights. The locations shown are one example for how bus stops might be located; bus stops outside of the project area are not shown. Any changes to current bus stops will be coordinated with CAT and the specific location, configuration, and design of bus stops will be developed as future street improvements are designed.

12th STREET

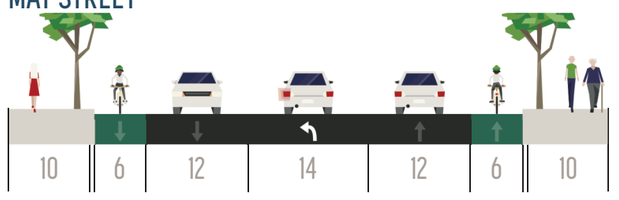


(60' R/W + 10' Easement)

EXAMPLE OF BUFFERED BIKE LANE - 12TH & 13TH STREETS

Source: MIG

MAY STREET



(60' R/W + 10' Easement)

EXAMPLE OF CONVENTIONAL BIKE LANE - MAY STREET

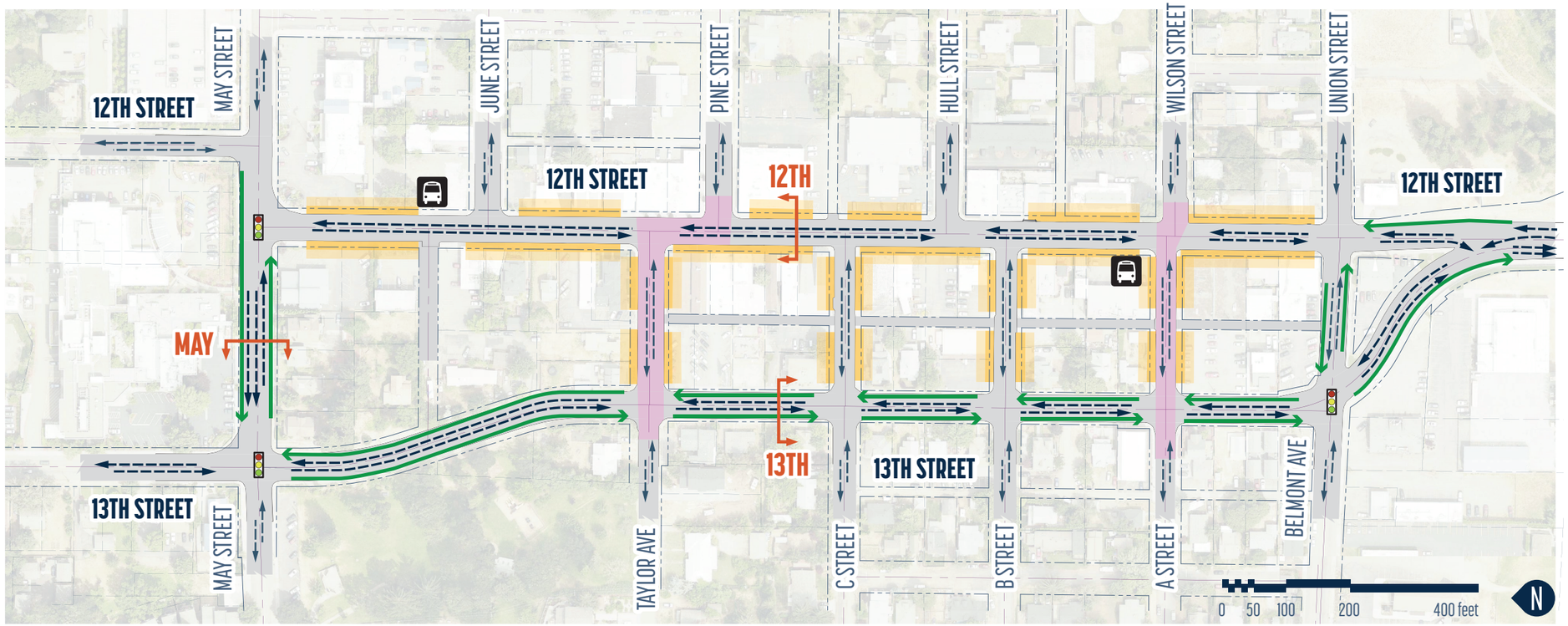
Source: pedbikeimages.com, Dan Burden

MIG

February 2022

THEHEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 1 - TWO LANE, TWO-WAY CIRCULATION + STREET SECTIONS



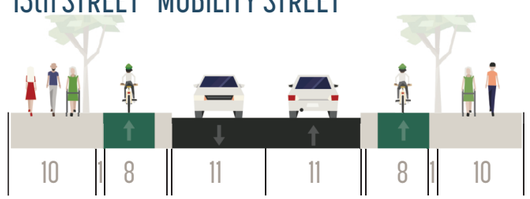
LEGEND

- Right of Way
- Parcels
- Travel Lane - City Street
- Travel Lane - ODOT
- Bike Lane
- Parallel Street Parking
- Traffic Signal, See Note 1
- Enhancement to Improve East/West Connections
- Possible Future Bus Stop Location. See Transit Discussion.

NOTES

1. See intersection concepts for channelization at intersections.

13th STREET "MOBILITY STREET"

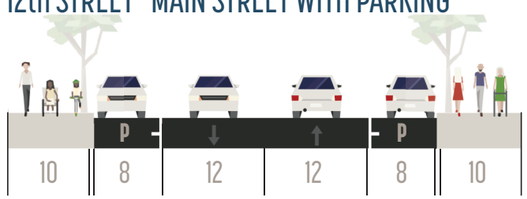


(50' R/W + [2] 5' Utility Easements)

EXAMPLE OF RAISED SEPARATED BIKE LANE - 13TH STREET

Source: MIG

12th STREET "MAIN STREET WITH PARKING"

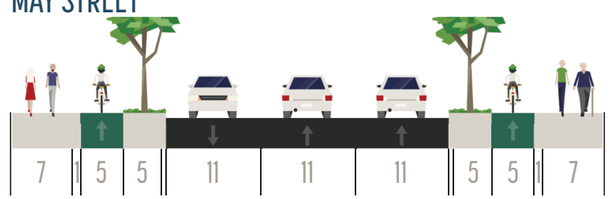


(60' R/W)

TRANSIT DISCUSSION - Accommodating bus stops in the Heights

Columbia Area Transit (CAT) does not currently have bus stops on 12th and 13th Streets within the Heights project area. The project team has coordinated with CAT to identify potential locations for future bus stops in the Heights. The locations shown are one example for how bus stops might be located; bus stops outside of the project area are not shown. Any changes to current bus stops will be coordinated with CAT and the specific location, configuration, and design of bus stops will be developed as future street improvements are designed.

MAY STREET



(60' R/W + 10' Easement)

EXAMPLE OF RAISED SEPARATED BIKE LANE - MAY STREET

Source: pedbikeimages.com, Carl Sundstrom

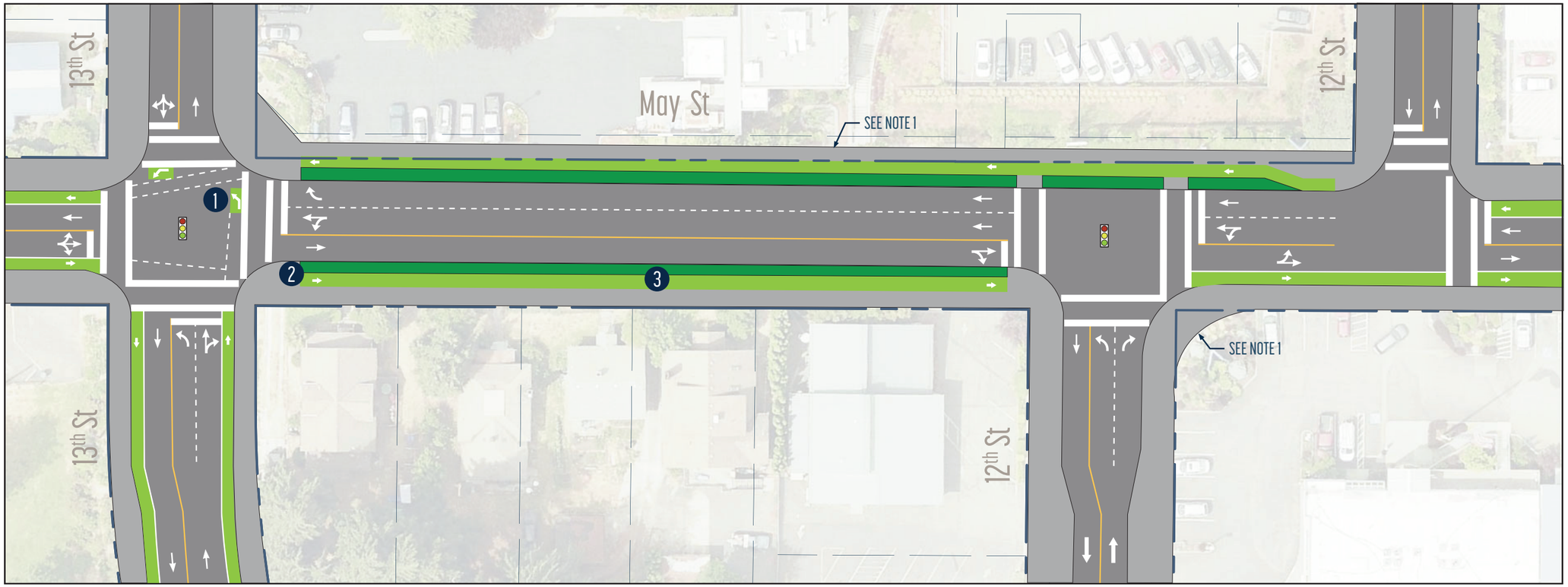
MIG

February 2022

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 1 - TWO LANE, TWO-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT MAY STREET



0 10 20 30 40 50 feet

N

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.

1 Two Stage Bicycle Turn Box

Source: Creative Commons

2 Separated Bike Lane at Intersection

Source: Google Maps

3 Raised, Vegetation Separated Bike Lane

Source: MIG

MIG

February 2022

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 1 - TWO LANE, TWO-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT BELMONT AVENUE

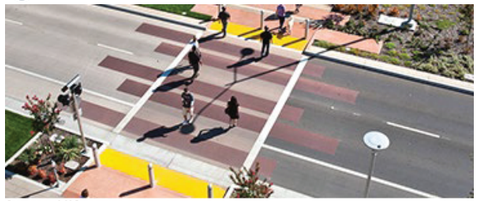
1 Raised, Vegetated Separated Bike Lane

Source: MIG

2 Bike Box

Source: bikepedimages.org, Toole Group

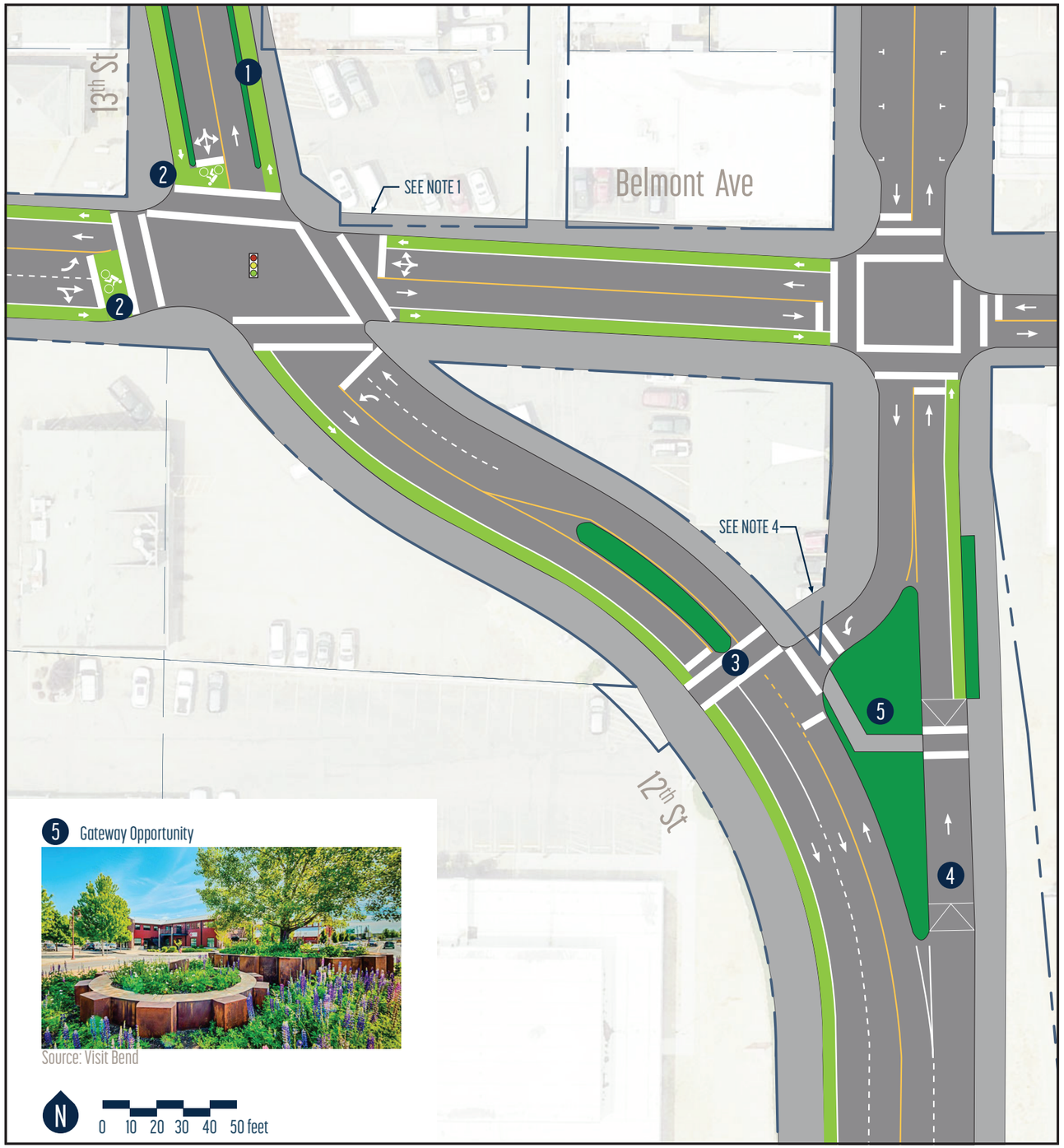
3 Enhanced Crosswalk



Source: MIG

4 Traffic Calming Opportunity

Source: The Urbanist



5 Gateway Opportunity

Source: Visit Bend

N 0 10 20 30 40 50 feet

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane

NOTES

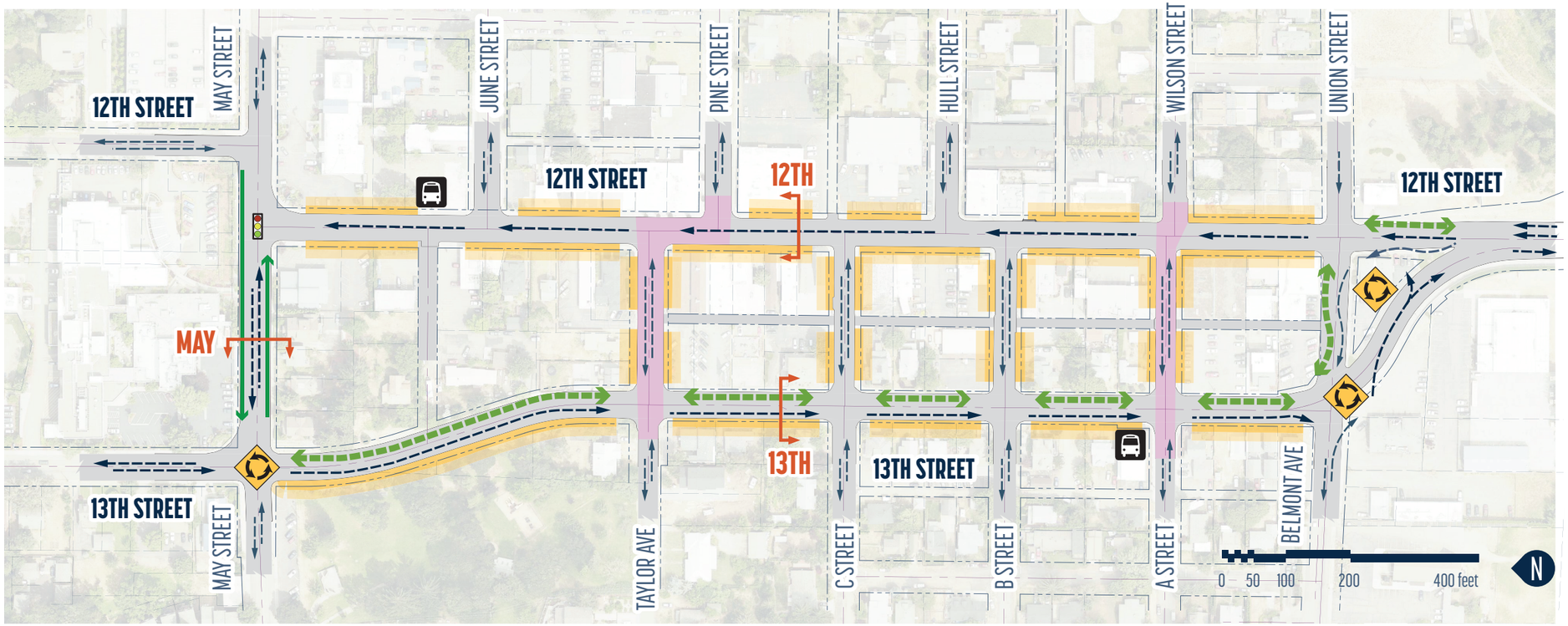
1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.
4. Property acquisition required. Extents of property acquisition to be determined during design.

MIG

February 2022

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 2 - ONE LANE, ONE-WAY CIRCULATION + STREET SECTIONS



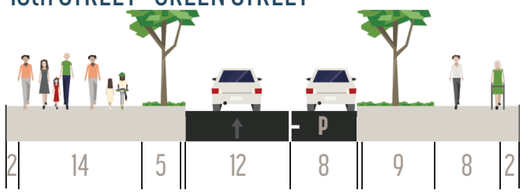
LEGEND

- Right of Way
- Parcels
- Center Line
- Travel Lane - City Street
- Travel Lane - ODOT
- Traffic Signal, See Note 1
- Bike Lane
- Shared Use Path
- Parallel Street Parking
- Roundabout
- Enhancement to Improve East/West Connections
- Possible Future Bus Stop Location. See Transit Discussion.

NOTES

1. See intersection concepts for channelization at intersections.

13th STREET "GREEN STREET"



(50' R/W + (2) 5' Utility Easements)

EXAMPLE OF SHARED USE PATH- 13TH STREET

Source: MAG

12th STREET "PARKING STREET"

(60' R/W)

TRANSIT DISCUSSION - Accommodating bus stops in the Heights

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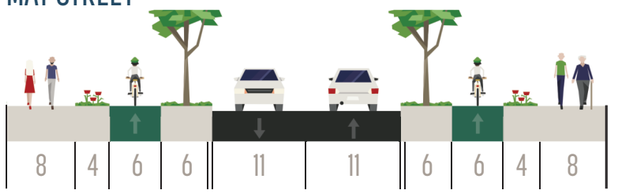
MAY STREET



(60' R/W + 10' Easement)

EXAMPLE OF RAISED VEGETATION SEPARATED BIKE LANE - MAY STREET

Source: Google Maps

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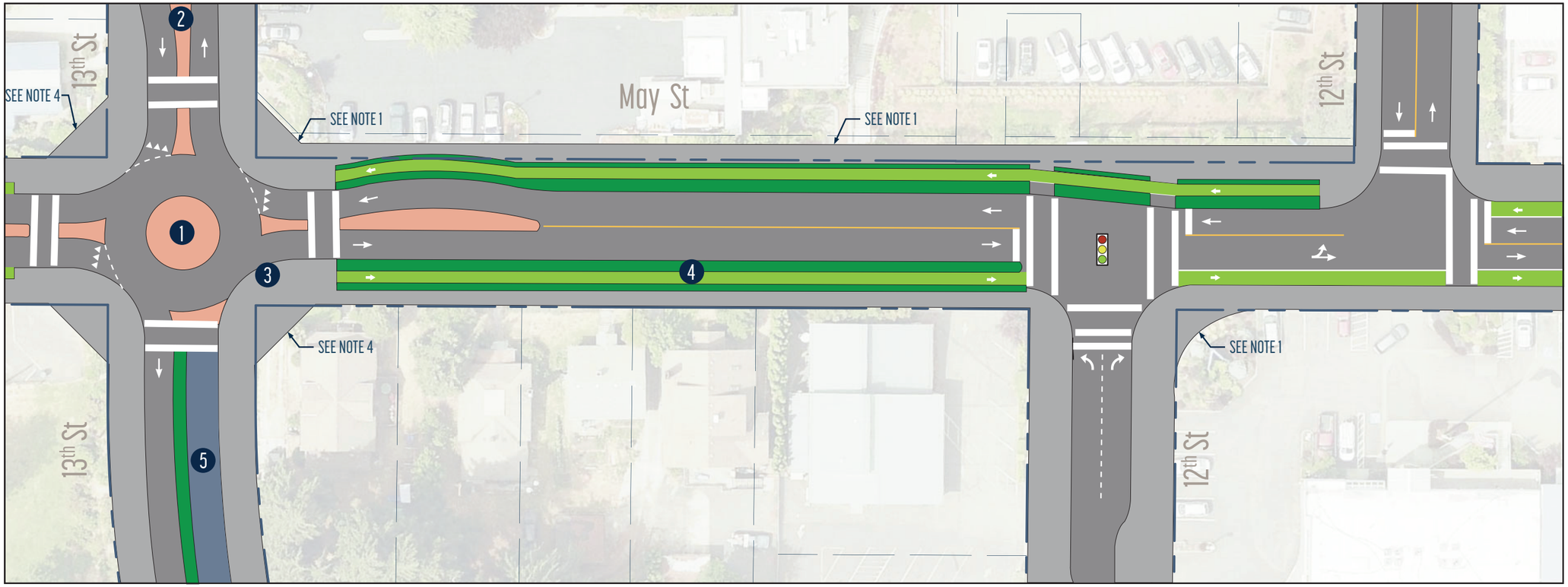
February 2022

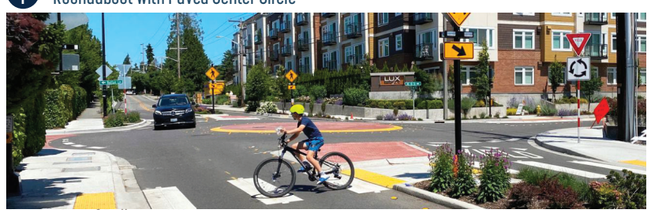
THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 2 - ONE LANE, ONE-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT MAY STREET



1 Roundabout with Paved Center Circle

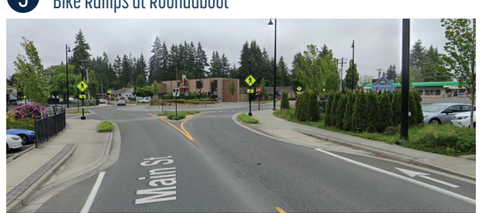


Source: City of Bellevue, WA

2 Paved Splitter Island at Roundabout to Accommodate Truck/ Bus Access

Source: City of Bellevue, WA

3 Bike Ramps at Roundabout



Source: Google Maps

4 Raised, Vegetation Separated Bike Lane

Source: Google Maps

5 Shared Use Path Along Road

Source: MAG

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Raised Pavement for Truck Access
- Sidewalk
- Planting
- Bike Lane
- Shared Use Path

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
2. Trees to be located in a later design phase.
3. Existing driveway locations are not shown and will be incorporated in a later design phase.
4. Property acquisition required. Extents of property acquisition to be determined during design.

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February 2022

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 2 - ONE LANE, ONE-WAY INTERSECTION CONCEPT

12TH AND 13TH STREETS AT BELMONT AVENUE

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Raised Pavement for Truck Access
- Sidewalk
- Planting
- Bike Lane
- Shared Use Path

NOTES

1. Trees to be located in a later design phase.
2. Existing driveway locations are not shown and will be incorporated in a later design phase.

1 Double Roundabout (See discussion below)

Source: MassDOT

2 Placemaking Opportunity

Source: DeepRoot

3 Bike Ramps at Roundabout

Source: Google maps streetview

4 Rectangular Rapid Flash Beacon (RRFB) at Crosswalk

Source: Carmanah.com

5 Shared Use Path Along Road

Source: MAG

ROUNDABOUT DISCUSSION

1. The design shown for the double roundabout is conceptual and should only be considered an illustration of potential traffic flow. The actual extents of the roundabout design and potential property impacts will be refined if recommended as part of a refined concept and traffic analysis.

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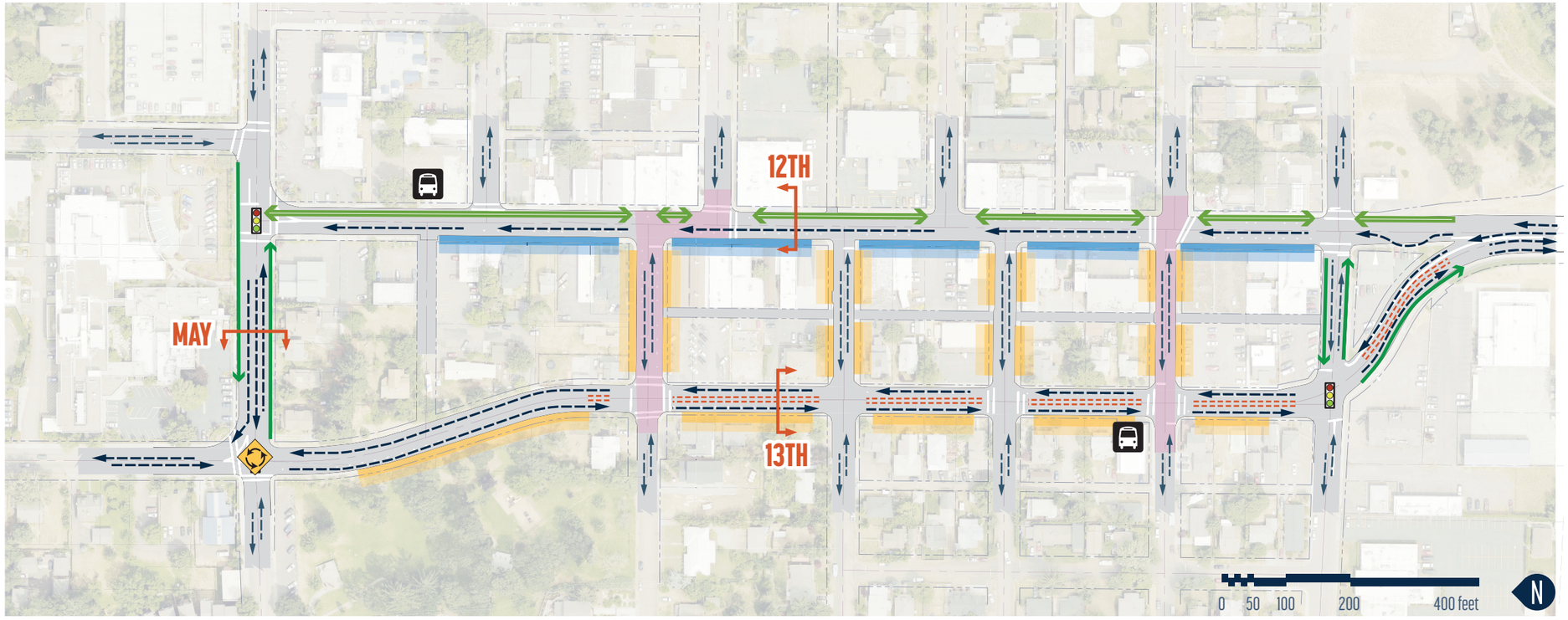
DESIGN ALTERNATIVE 3 - HYBRID CIRCULATION + STREET SECTIONS



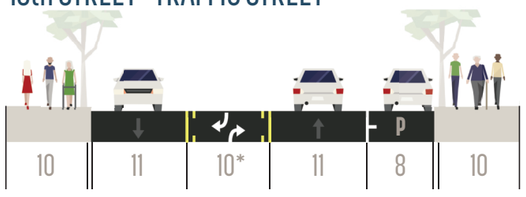
LEGEND

- Right of Way
- Parcels
- Center Line
- Travel Lane - City Street
- Travel Lane - ODOT
- Center Turn Lane
- Bike Lane
- Cycle Track (Two-Way)
- Traffic Signal, See Note 1
- Parallel Street Parking
- Angled Street Parking
- Enhancement to Improve East/West Connections
- Possible Future Bus Stop Location. See Transit Discussion.
- Roundabout. See Note 1.

NOTES

1. See intersection concepts for channelization at intersections.

13th STREET "TRAFFIC STREET"



(50' R/W + [2] 5' Utility Easements) * Provide center median between May St and Taylor Ave

TRANSIT DISCUSSION - Accommodating bus stops in the Heights

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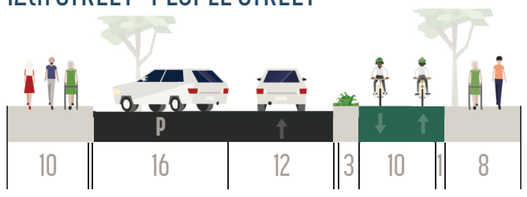
12th STREET "PEOPLE STREET"

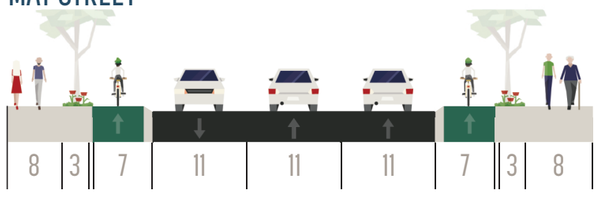


(60' R/W)

EXAMPLE OF TWO WAY CYCLE TRACK - 12TH STREET

Source: Philadelphia magazine, NV5

MAY STREET



(60' R/W + 10' Easement)

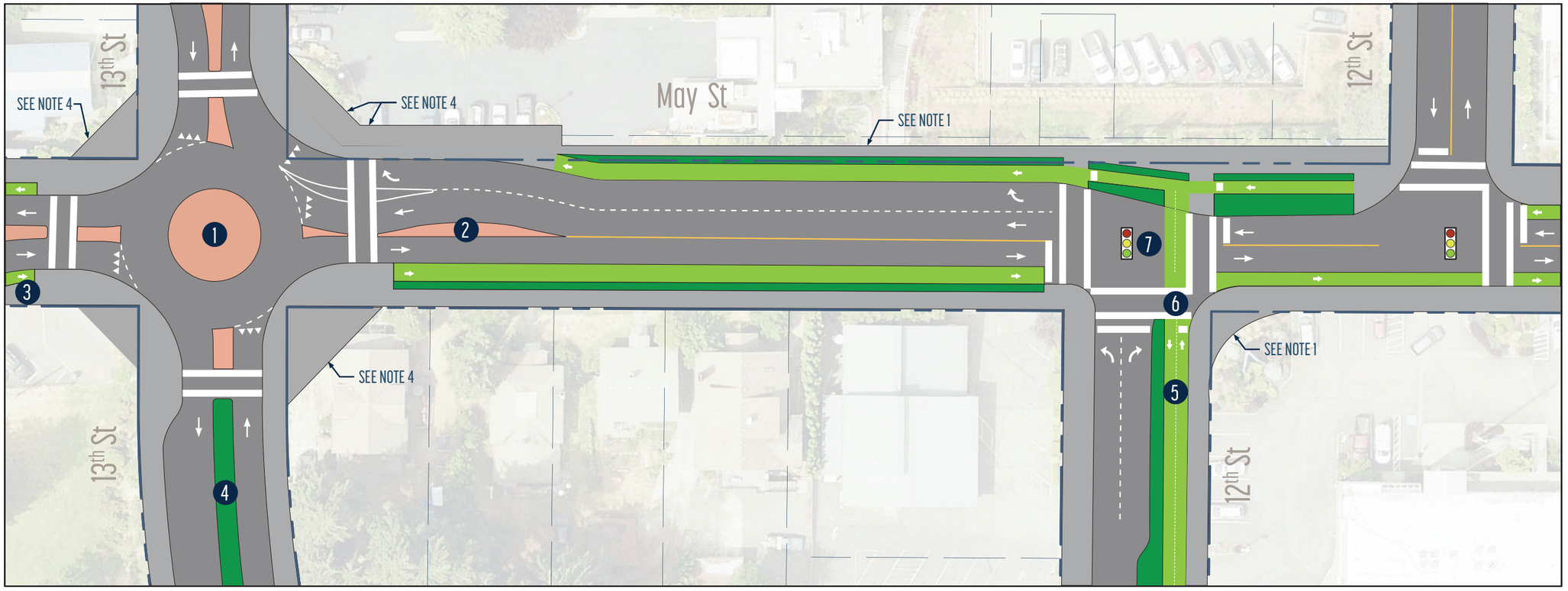
EXAMPLE OF RAISED BIKE LANE - MAY STREET

Source: City of Toronto, CA

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 3 - HYBRID INTERSECTION CONCEPT

12TH AND 13TH STREETS AT MAY STREET



0 10 20 30 40 50 feet

N

LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane
- Raised Pavement for Truck Access

NOTES

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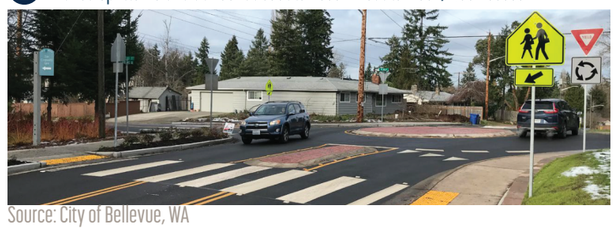


Source: City of Bellevue, WA

3 Bike Ramps at Roundabout

Source: Google Maps

4 Planted Median

Source: MIG

5 Two Way Cycle Track

Source: Philadelphia Magazine, NV5

6 Two-Way Cycle Track at Intersection

Source: Roy Symons

7 Bicycle Traffic Signal

Source: SDOT

MIG

February 2022

THE HEIGHTS STREETSCAPE PLAN

DESIGN ALTERNATIVE 3 - HYBRID INTERSECTION CONCEPT

12TH AND 13TH STREETS AT BELMONT AVENUE

1 Two Way Cycle Track

Source: Philadelphia Magazine, NV5

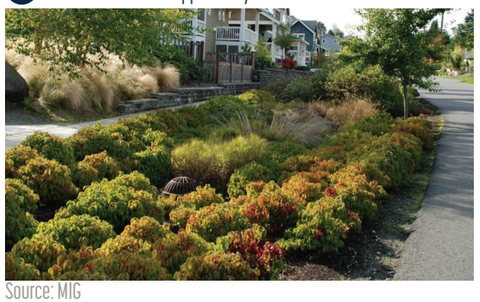
2 Traffic Calming - Chicane

Source: Creative Commons

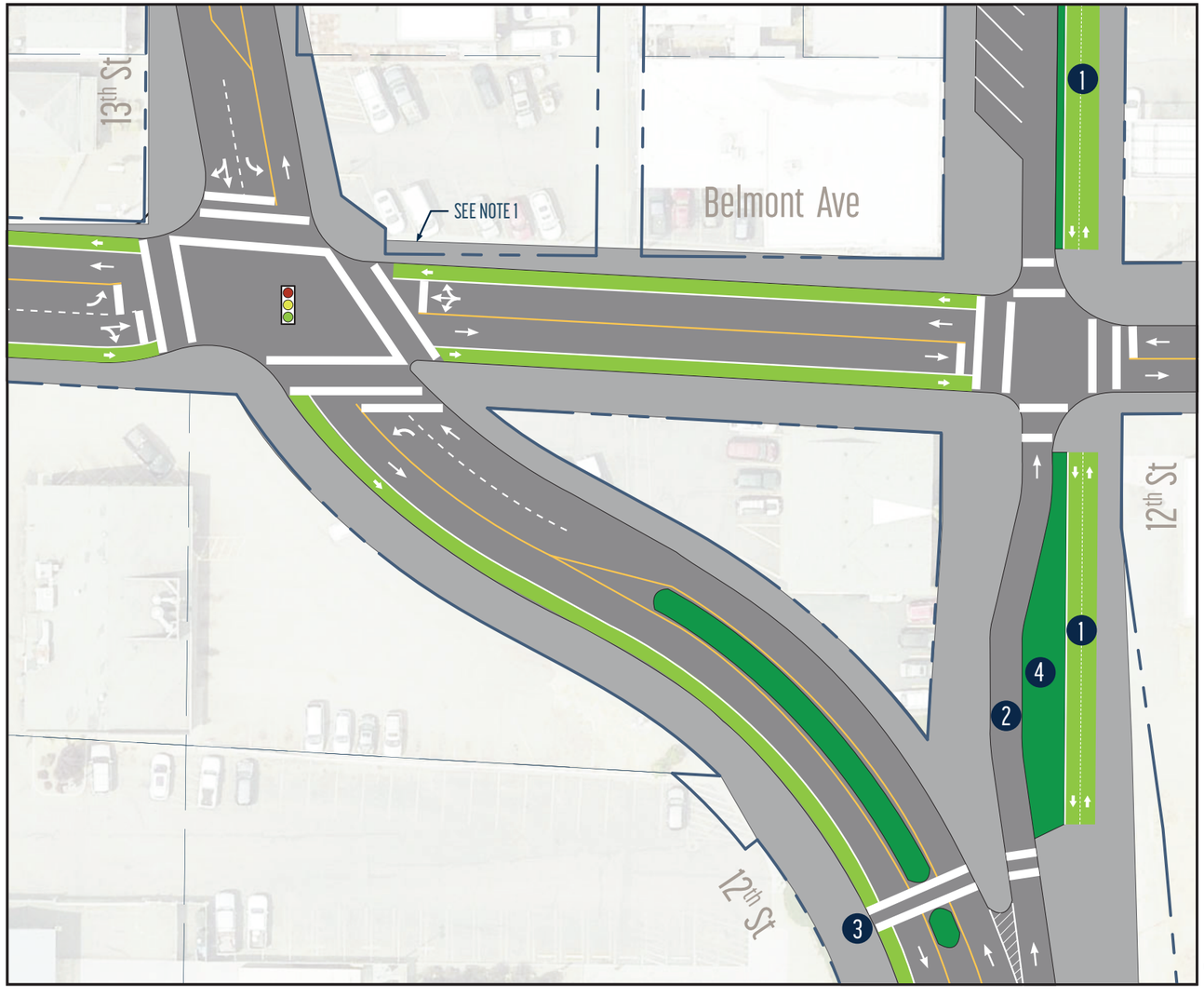
3 Enhanced Crosswalk at Planted Median

Source: MIG

4 Green Stormwater Opportunity



Source: MIG



LEGEND

- Right of Way
- Parcel Lines
- Roadway
- Sidewalk
- Planting
- Bike Lane

NOTES

1. Limits of sidewalk extend to R/W or existing back of walk, whichever is further.
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N

0 10 20 30 40 50 feet

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