

City of Richland Resolution No. 100-20 temporarily designates virtual locations for all municipal meetings. This meeting will be held remotely via Zoom. Members of the public may attend this meeting by selecting the Zoom link or by calling the phone numbers provided.



Agenda
Hearing Examiner Meeting
Monday, June 14, 2021
Join the Zoom meeting [here](#)
Public Telephone Access: (206) 337-9723 or (253) 215-8782
Meeting ID No. 872 2126 7401

Hearing Examiner: Gary McLean

Liaisons: Staff Liaison: Planning Manager Stevens

Public Hearing - 6:00 p.m.

Public Hearing Explanation:

New Business - Public Hearing:

1. S2021-102 Villa Vista Townhomes
Nor Am Investment LLC (Geoff Clark)
2. S2021-103 Fairhaven Townhome Estates
Bethel Church

Adjournment

The next Hearing Examiner Meeting will be scheduled as needed.

This meeting is broadcast live on CityView Channel 192 and online at ci.richland.wa.us

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HEARING EXAMINER AGENDA ITEM COVERSHEET

Meeting Date: 6/14/2021

Agenda Category: New Business - Public Hearing

Prepared By: Shane O'Neill, Senior Planner

Subject:

S2021-102 Villa Vista Townhomes

Nor Am Investment LLC (Geoff Clark)

Department:

Development Services

Recommended Motion:

Approval subject to the conditions contained in the June 14 staff report

Summary:

The preliminary plat of Villa Vista Townhomes proposes to subdivide 13.31 acres within the Badger Mountain South master planned community, into 68 residential lots allowing for the development of attached single-family townhomes

Attachments:

1. FULL Staff Report - Villa Vista Townhomes

**CITY OF RICHLAND DEVELOPMENT SERVICES DIVISION
STAFF REPORT TO THE HEARING EXAMINER**

GENERAL INFORMATION:

PROPOSAL NAME: Villa Vista Townhomes - Preliminary Plat

LOCATION: North side of Trowbridge Boulevard, approximately 1,050-feet east of Dallas Road in the Badger Mountain South master planned community (APN 1-32982BP4732021)

APPLICANT: Nor Am Investment, LLC c/o Geoff Clark

FILE NO.: S2021-102

DESCRIPTION: Request to subdivide 13.31 acres into 68 residential lots allowing for the development of attached single-family townhomes

PROJECT TYPE: Type III Preliminary Plat

HEARING DATE: June 14, 2021

REPORT BY: Shane O'Neill, Senior Planner

RECOMMENDED
ACTION: Approval subject to completion of proposed conditions

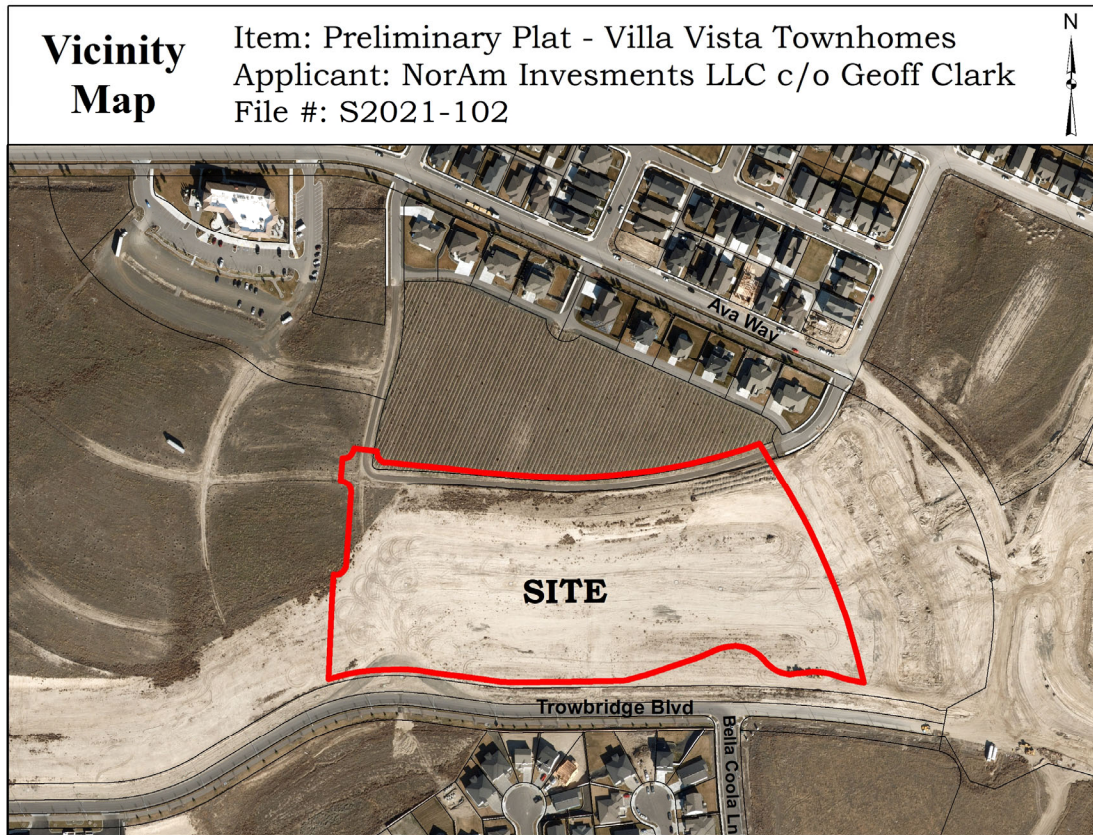


Figure 1 - Vicinity Map

DESCRIPTION OF PROPOSAL

South Richland Communities LLC has filed a preliminary plat application (Exhibit 1) to divide approximately 13.31 acres into 68 single-family residential lots and four (4) tracts, to be known as the plat of Villa Vista Townhomes (File#: S2021-102). The plat proposes creating four residential blocks with two (2) looped private shared-driveways together with four (4) tracts for small parking lots designated for guest parking.

The Villa Vista Townhomes site lies north of Trowbridge Blvd. and south of the future westerly extension of Bellaview Street. This location is applied with the Specialty Retail (BMS_SR) Badger Mountain South zoning district. All lots are planned to be served by a contiguous network of public roadways. The dividing east/west roadway (Sotto Street) dead-ends in a cul-de-sac on the east end; thereby providing no connection to the adjacent plat of BMS 4-Plexes.

VILLA VISTA TOWNHOMES LAND USE DATA

Gross planning area = 13.31 acres

Net planning area = 9.5 acres

Area of ROW's = 3.81 acres

Area of tracts = 0.46 acres
Average lot size = 5,791 square feet
Smallest lot = 4,108 square feet
Largest lot = 13,043 square feet

LOCATION

The Villa Vista preliminary plat site is located within the southwesterly-most portion of Richland known as Badger Mountain South. Describing the broader locational context, the Badger Mountain South area (Figure 3 – LUDR Map, below) appears as an appendage of the Richland city limits boundary generally in the southwest sector of the City which, as the name implies, is on the south side of Badger Mountain.

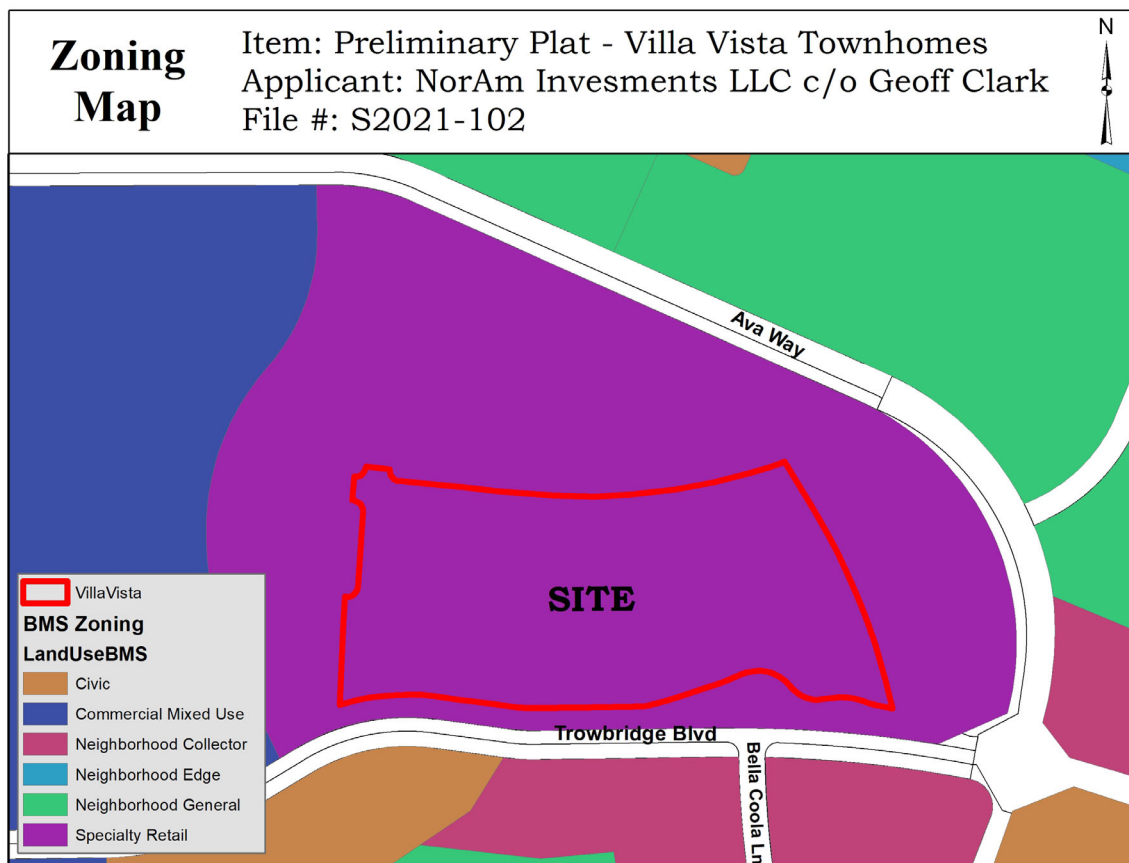


Figure 2 – Land Use/Zoning Map

LAND USE

The subject property is part of the Badger Mountain South Subarea Plan, which was developed in 2010. The plan calls for the development of a master planned community known as Badger Mountain South which is intended to be a mixed use, walkable and sustainable community of up to 5,000 dwelling units. The plan calls for small lot residential development with some multi-family, commercial and office uses with generous open spaces and extensive pedestrian trails. In

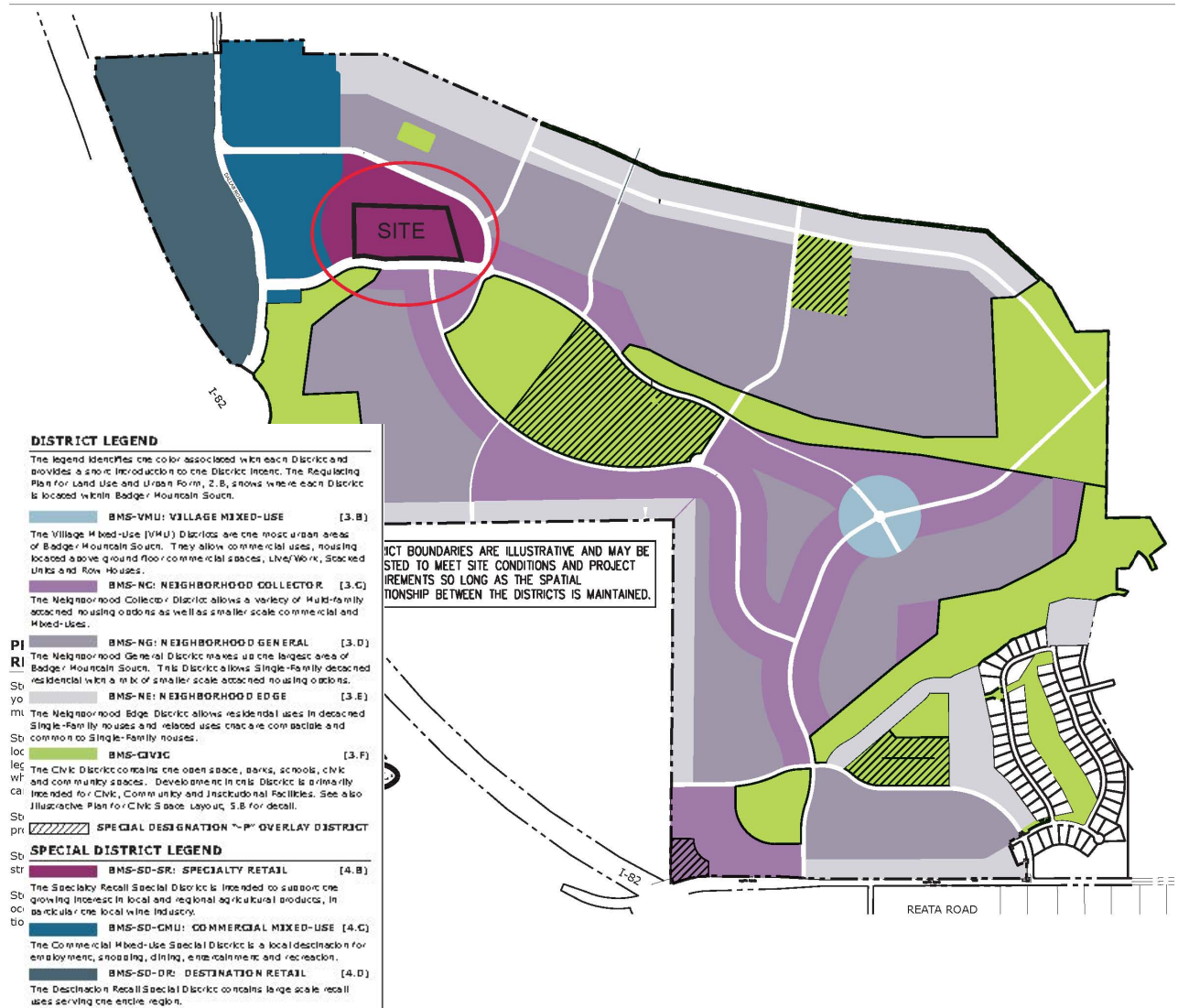
recognition of the intended unique character of the master planned area, the City worked with Nor Am Investment, LLC to adopt a set of development regulations which specifically apply to the Badger Mountain South Subarea Plan known as the Land Use and Development Regulations (LUDR). The City also adopted a Planned Action Ordinance (RMC 19.50.030) for the subarea based on a supplemental environmental impact statement which was prepared for the master planned community.

LUDR PROVISIONS

Because it belongs to a master planned community, the plat of Villa Vista Townhomes benefits from previous planning efforts aimed at streamlining the platting process and environmental review procedures discussed further in this report. The subject property and all immediate surrounding properties included in the Badger Mountain South Subarea are subject to the master plan and LUDR regulations. The proposed plat is assigned the Specialty Retail District as described in Section 4.B of the LUDR:

Specialty Retail (BMS-SD-SR): The Specialty Retail District is intended to support the growing interest in local and regional agricultural products, in particular the local wine industry. The Specialty Retail zone lacks many of the regulatory categories common to most zones. The SR zone does not apply minimum setback requirements or building height limits.

2.B REGULATING PLAN FOR LAND USE AND URBAN FORM



**Figure 3 – Regulating Plan for Land Use and Urban Form
(Section 2.B, BMS LUDR)**

The land use table on page 2-3 of the LUDR lists permitted uses in each BMS zone. Permitted uses in the Specialty Retail zone include single-family & multi-family residential developments, retail businesses, offices, public facilities, parking lots amongst other uses. Villa Vista Townhomes is classified as a single-family residential development.

Page 4-2 of the LUDR provides a limited list of development standards to guide development in the Specialty Retail zone. This list does not include dimensional requirements such as minimum setbacks, maximum building heights or other restrictions commonly set forth in municipal zoning codes. Lack of dimensional

limitation provides a greater degree of flexibility for siting buildings and their associated on-site features.

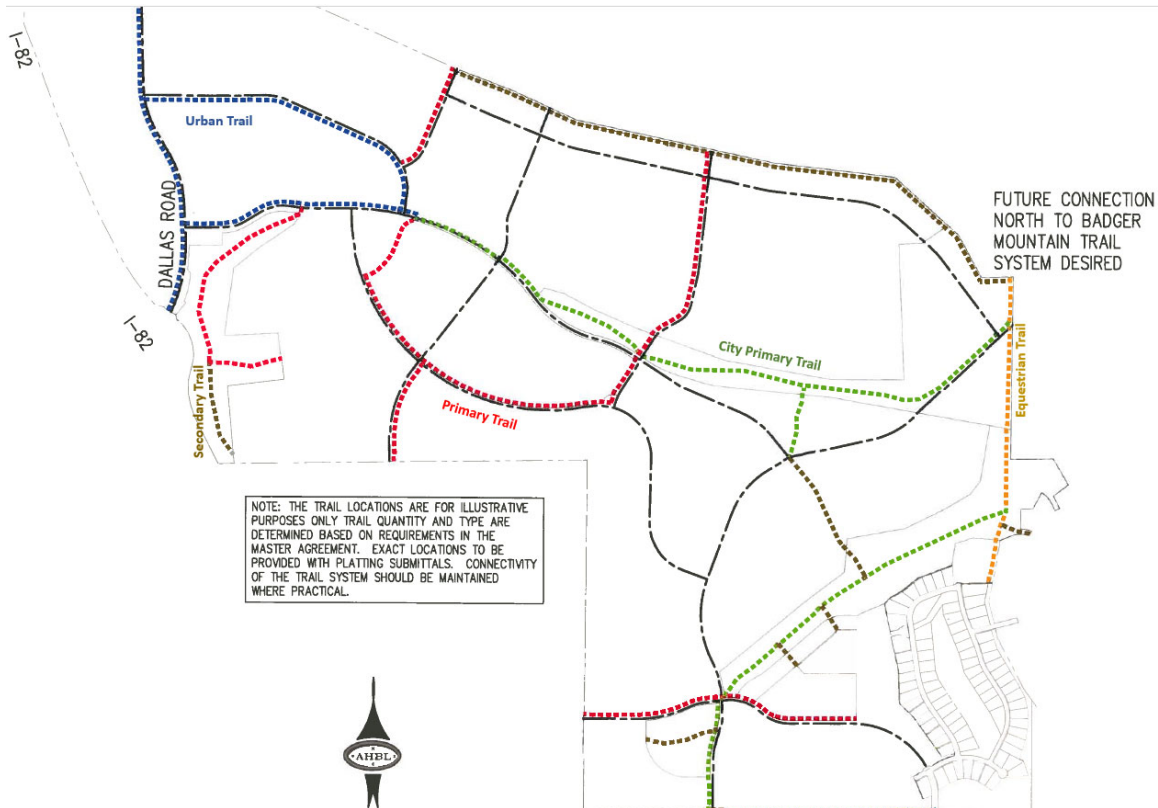


Figure 4 – Trail Layout Plan

Trail Standards

The LUDR identifies a system of pedestrian trails throughout the master planned area. Villa Vista Townhomes proposes a 1,225.7-foot trail segment located along the proposed extension of Trowbridge Blvd., this segment of trail is designated as Urban Trail. The design standards for urban trails (refer to Section 5.1 of the LUDR) requires a 12-foot-wide concrete or asphalt surface. Page 5 of the Master Agreement Consistency Recommendation (MACR – Exhibit 4) outlines green infrastructure concurrency calculations in fulfilling the plats' obligation schedule for installing green infrastructure. In this case construction of the new segment of urban trail along Trowbridge Blvd. fulfills and exceeds the plats' green infrastructure obligations. The improvement schedule is outlined in Exhibit D of the BMS master agreement.

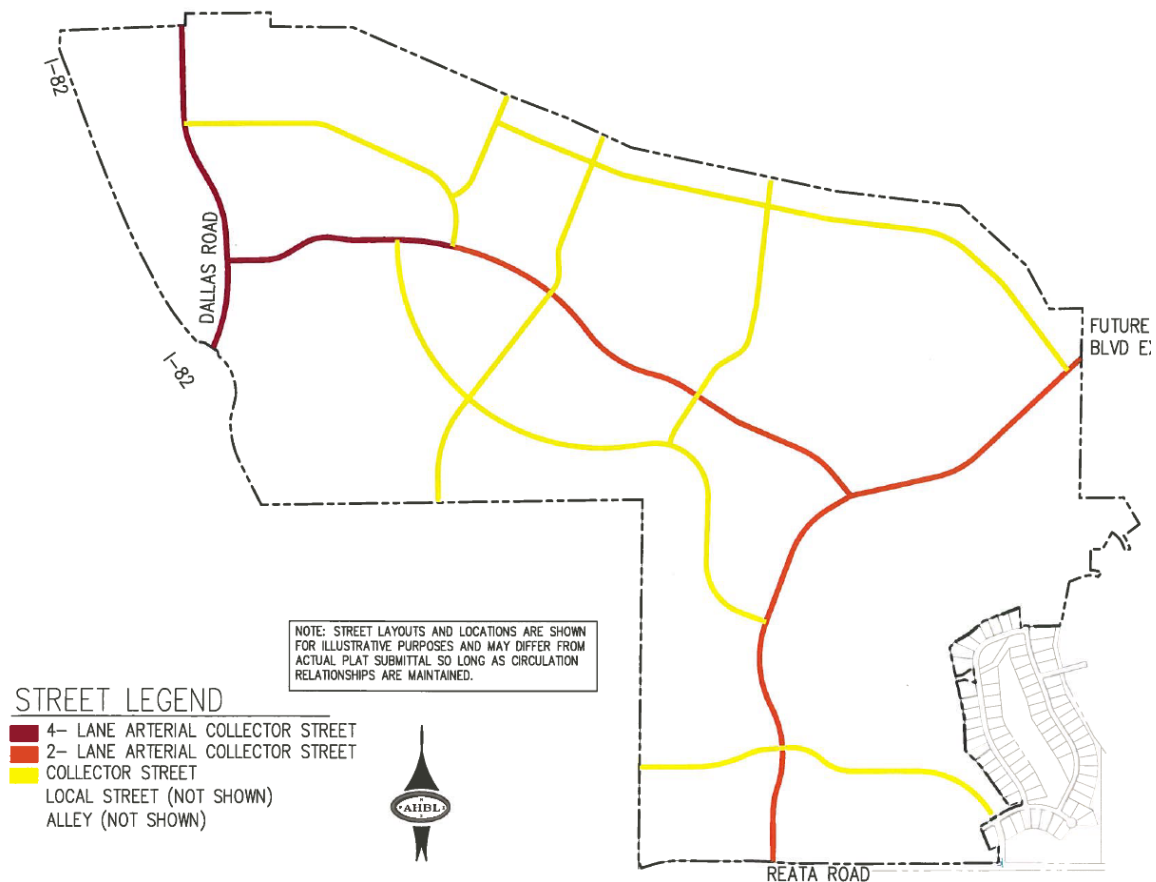


Figure 5 – Regulating Plan for Streets

Street Standards

Trowbridge Boulevard, the primary entrance into the community, extends from Dallas Road to the east boundary of the project site. Trowbridge Boulevard is planned to be a four-lane arterial collector street along the southern boundary of the proposed plat; continuing east to the plat of West Vineyard Phase 2. Development of this arterial collector street requires extension of an urban trail; both of which are currently under construction.

Block Standards

Section 7.B of the LUDR establishes requirements for the configuration of blocks. This section of the LUDR restricts block length from exceeding 1,000 feet. The maximum block length proposed by Villa Vista Townhomes falls below 700-feet. As allowed in Section 7.B.3 of the LUDR, portions of the site include non-orthogonal street networks in response to topographical and site constraints.

Density Requirements

The Villa Vista Townhomes project will result in 68 residential units. Chapter 7.C of the LUDR establishes density targets for each of the neighborhoods within the Badger Mountain South community. The Villa Vista Townhomes site falls within the West Vineyard neighborhood (page 7-3 of the LUDR). The West Vineyard

neighborhood targets a minimum of 430 units and a maximum of 510 units with at least 10% of the areas designated as Neighborhood Collector to be used as multi-family or commercial space. The adjacent (east) BMS-4-plex preliminary plat, with 48-units, is the only West Vineyard development contributing to the multi-family target.

Exhibit D (page D-2) of the Badger Mountain South Master Agreement, estimates that the West Vineyard neighborhood will contain 900 residential units. This differs from the LUDR target by approximately two-fold. Staff offers no explanation for this discrepancy.

The MACR indicates lots will only be developed with single-family homes to be constructed in the form of attached townhomes. The townhome configuration is not required by the LUDR because the LUDR allows for a variety of development styles. Pursuant to the LUDR Section 1.G(5), final plats must identify housing types allowed on each lot. Section 7.C of the LUDR set an overall BMS-wide community goal of achieving a composition of 60 percent single-family housing and 40 percent multi-family housing. Currently a majority of the BMS area is comprised of single-family homes; development of this plat will not contribute toward meeting the stated 40 percent multi-family housing goal.

Procedural Requirements

Section 1H of the LUDR together with 19.50 RMC, require that a Master Agreement Consistency Determination (MACD) be issued by the Planning Manager for any development proposal located within the Badger Mountain South master planned community. This determination is made after consultation with the Badger Mountain South Master Plan Administrator. A Master Agreement Consistency Recommendation was included with the plat application. Staff has reviewed this recommendation and has issued a Master Agreement Consistency Determination (MACD, Exhibit 5) confirming the proposal meets concurrency requirements outlined in the BMS Master Agreement and thereby fulfilling SEPA requirements for planned actions (19.50 RMC).

SITE DESCRIPTION & ADJACENT LAND USES

The site consists of gently rolling hills; which were previously but are not presently under agricultural production. Preliminary site development immediately abuts the subject property to the east. This is the BMS 4-Plex subdivision site. Planning staff is currently processing the BMS 4-plex final plat application.

Previously cleared for agriculture, the site is currently devoid of significant vegetation. As depicted in the site photos taken by city staff (Exhibit 12) in April of 2021, the site is exposed soil lacking any notable vegetation. The site contains no trees or other woody plant species including sagebrush.

All immediately adjacent properties surrounding the subject site are currently vacant with exception of the BMS 4-plex site located to the east which contains a paved private road but no structures yet. The development potential of the surrounding vacant land is outlined in the BMS LUDR.

CRITERIA FOR PRELIMINARY PLAT APPROVAL

Section 24.12.053 of the RMC sets forth the criteria that must be met before a preliminary plat application can be approved. It states:

The hearing examiner shall not recommend approval of any preliminary plat application, unless the approval is accompanied by written findings that:

- A. The preliminary plat conforms to the requirements of this title (Title 24 Plats and Subdivisions);
- B. Appropriate provisions are made for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys, other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features which assure safe walking conditions for students who only walk to and from school;
- C. The public use and interest will be served by the platting of such subdivision and dedication; and
- D. The application is consistent with the requirements of RMC 19.60.095

RMC Section 24.12.050 designates the Hearing Examiner as the hearing body responsible for conducting the review of preliminary plat applications.

PUBLIC NOTICE

Application Date:	January 28, 2021
Notice of Hearing Mailed:	May 10, 2021
Notice of Hearing Posted:	May 10, 2021
Notice of Hearing Published:	May 16, 2021
Public Hearing:	June 14, 2021

A combined notice of application and public hearing was provided by mailing notices to property owners within 300 feet. Public hearing notices were distributed through posting of the property, mailing of notice to property owners within 300 feet of the site and publication in the *Tri-City Herald* newspaper. Copies of the notices and affidavits are included in Exhibit 8.

SEPA

A Supplemental Final Environmental Impact Statement was completed for this site at the time the City adopted a subarea plan for the Badger Mountain South area in 2010. The property was annexed at that time and the City adopted a Planned Action Ordinance (19.50 RMC, Exhibit 7). The effect of the Planned

Action Ordinance is that standard SEPA review is not required, provided that any project proposed within the boundaries of the master planned community is consistent with the master plan and with the mitigation measures identified in the adopted SEPA documents. Projects determined to be consistent with the subarea plan, the master agreement between the City and Nor Am Investment and the mitigation measures enumerated in the adopted SEPA documents are issued a Planned Action Consistency Determination (PACD) (Exhibit 6).

PUBLIC COMMENTS

Owners of all properties within 300-feet of the plat site were directly notified of the project by way of USPS mailing. At the time this report was prepared, city staff received two comment letters from the general public regarding the proposed plat. Public comments are incorporated into this report as Exhibit 9. The comment from Matt Tuttle opposes the Villa Vista Development on the basis of traffic nuisance and on the basis of the noticeable divergence of the BMS community from the vision sold to home-buyers in BMS at the time of purchase. Planning staff notes similar comments have been raised by BMS residents in response to previous project applications.

AGENCY COMMENTS

A variety of public agencies and City departments were given an opportunity to comment on the proposal. Comments from the Richland Public Works and Energy Services Departments have been incorporated into the list of approval conditions inserted at the end of this report. Richland Energy Services commented that 10' utility easements are needed in two additional locations, one on the west side of Lot 59, the other on the west side of Lot 52 and extending to the south side of Lot 52. An electrical utility layout plan designed by Richland Energy Services is provided as Exhibit 10.

Other agencies submitted written comments in response to the city's referral. Comments from the Washington State Department of Archaeology and Historic Preservation (DAHP), Washington State Department of Ecology, the Washington State Department of Transportation (WSDOT) and the City of West Richland. The Washington State Department of Archaeology and Historic Preservation requested an inadvertent (artifact) discovery plan be prepared and provided to the Department. Comments from the City of West Richland and WSDOT raise similar concerns over increasing traffic impacts. They have both been provided with the recently prepared traffic impact analysis (Exhibit 3).

UTILITY AVAILABILITY

The project will be served by City domestic water, sewer and electrical power services. Utilities will serve the plat by way of extension from Trowbridge Blvd right-of-way. Site specific development conditions address extension of off-site utilities to the site and construction of private on-site utilities.

TRANSPORTATION

Access to the project will be provided through the construction of an extension of Trowbridge Boulevard (along the southern plat boundary), an extension of Bellaview Avenue (along the northern plat boundary) and an extension of Syrah Ave (private) leading to the northwest corner of the plat. Syrah Avenue is a narrow, 20-foot-wide roadway lacking striping. These roads will tie into the interior road system serving the plat. Under the provisions of the master plan (6.B), Trowbridge Boulevard is a four-lane arterial street east of Dallas Road. The Trowbridge Blvd. extension project is currently in-progress. The Trowbridge project includes a round-about intersection at Bella Coola Lane. Lots in the proposed plat have been designed around the widened round-about right-of-way.

The BMS Master Agreement outlines the need to evaluate and improve the performance of certain roadway intersections, many of which focus on the westerly boundary of the overall community where Dallas Road and highway I-82 interact. The Master Agreement uses peak PM vehicle trip-count triggers at certain intervals (i.e. 600 trips and 1,000 trips) as the basis for these road performance studies and their associated improvements. Currently the BMS community generates approximately 861 peak PM vehicle trips. Because this platting request comes at a point when the 600-trip trigger has been surpassed, plat development is conditioned herein upon making the roadway improvements outlined in the Master Agreement.

Included in this report is a traffic impact analysis by TENW (Exhibit 3). The City and other affected agencies are currently in the process of evaluating the TIA to determine the details surrounding each roadway and intersection improvement category.

ANALYSIS

Preliminary plat application approval criteria (RMC 24.12.053) are reprinted here, with a summary of how the application complies with each standard:

A. The preliminary plat conforms to the requirements of this title (RMC Title 24);
The City's subdivision regulations set forth specific requirements for the filing of an application, how notice of the application is to be provided and requires that the Hearing Examiner conduct a public hearing and make recommendation to the City Council. These steps have been followed to date.

Section 24.04.060 of the RMC specifies that when the City enters into a development agreement governing the development of a master planned community of over 1,000 acres, the provisions of the agreement supersede the provisions of the City's subdivision regulations. In this case, the Badger Mountain South LUDR takes precedence over the standards contained in the subdivision regulations. The LUDR requires the City to issue a Master Agreement Consistency Determination (MACD) (Exhibit 5), which has been

completed and which demonstrates that the project is consistent with the provisions of the Master Agreement.

Certain LUDR provisions can only be addressed at the time home building permits applications are received by the City. Notice of the these LUDR requirements will be provided through notes on the final plat document, thereby informing future lot purchasers that homes constructed within the plat will have to be provided with fire sprinkler systems; that home builders will be subject to park mitigation fees; and that future construction will have to meet the sustainability standards contained in Section 12 of the LUDR and with the design requirements established within Sections 3 and 8 of the LUDR.

B. Appropriate provisions are made for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys, other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facets, including sidewalks and other planning features which assure safe walking conditions for students who only walk to and from school;

- The proposed plat does not propose open spaces. Instead, each home will contribute to development of parks through payment of parks impact fees.
- The plat includes a plan for grading and drainage. The provisions of the planned action for Badger Mountain South requires that the Department of Ecology Stormwater Management Manual for Eastern Washington be used in the design of drainage plans.
- The proposed street system will provide access from Trowbridge Boulevard and Syrah Avenue. Trowbridge is a minor arterial roadway in the Badger Mountain South community. Syrah Ave is a private roadway. All streets within the project will be public streets built to the standards identified in the LUDR.
- The site is located within the Ben Franklin Transit service area, but no bus service is currently provided to the neighborhood. The transit service was given an opportunity to comment on the preliminary plat proposal but did not provide any comments to the City.
- The plat will be served by City domestic water. Capacity is available within the City's system to provide for both domestic water and fire flow needs.
- The plat will be served by Badger Mountain Irrigation District. In the recent past, the district provided water to the agricultural uses on-site. Conversion of the property from agricultural to residential uses will not result in an increase in the amount of irrigation water usage.
- The plat will be served by City sewer. The City system has capacity to serve the proposed development.
- The plat will be served by City electrical energy. The City system has adequate capacity to serve the project.

- The plat includes provisions for recreation in the form of developing 1,225 linear feet of urban pedestrian trail located within a green space tract previously created as a separate parcel. All roadways within the plat will be developed with sidewalks built to city standards. A contiguous sidewalk network throughout the Badger Mountain South area will contribute to recreational opportunities for residents. The LUDR regulations call for the payment of a park mitigation fee for each dwelling unit constructed within the plat. Additionally, page 5 of the Master Agreement Consistency Recommendation (MACR) (Exhibit 4) specifies a schedule for green infrastructure improvements which result in the construction of 1,225 linear feet of urban trail tied to development of this plat.
- The project provides for walking paths and sidewalks throughout the subdivision which will accommodate and provide safe walking routes and conditions for school children walking to and from the future planned school site.
- The site is located within the Richland School District. The District owns property immediately southeast of the site which it intends for development as a future school. The District was given the opportunity to comment on the preliminary plat proposal but did not provide any comments to the City.

C. The public use and interest will be served by the platting of such subdivision and dedication;

The proposed project is consistent with the comprehensive plan, Badger Mountain South Subarea Plan and with the provisions of the LUDR.

D. The application is consistent with the requirements of RMC 19.60.095, which states: No development application for a Type II or Type III permit shall be approved by the city of Richland unless the decision to approve the permit application is supported by the following findings and conclusions:

A. The adopted comprehensive plan and meets the requirements and intent of the Richland Municipal Code.

The proposal is consistent with the subarea plan and with the provisions of the LUDR and the applicable requirements of the municipal code as outlined above.

B. Impacts of the development have been appropriately identified and mitigated under Chapter 22.09 RMC.

Chapter 22.09 is the City's adoption of the State Environmental Policy Act provisions. The project falls under the Planned Action Ordinance (RMC 19.50.030) (Exhibit 7) adopted by the City in 2010, which is based on the Supplemental Final Environmental Impact Statement prepared for the Badger Mountain South Subarea Plan. The project is implementing all the applicable environmental mitigation measures as identified in the master agreement consistency recommendation submitted for this project.

C. The development application is beneficial to the public health, safety and welfare and is in the public interest.

The project is consistent with the City's comprehensive plan and development regulations and therefore would be considered beneficial to public health, safety and welfare and will be in the public interest.

D. The development does not lower the level of service of transportation facilities below the level of service D, as identified in the comprehensive plan; provided, that if a development application is projected to decrease the level of service lower than level of service D, the development may still be approved if improvements or strategies to raise the level of service above the minimum level of service are made concurrent with development. For the purposes of this section, "concurrent with development" means that required improvements or strategies are in place at the time of occupancy of the project, or a financial commitment is in place to complete the required improvements within six years of approval of the development.

The project will follow the environmental mitigation as specified in the City's adopted planned action and are tasked with improving transportation facilities to prevent affected roadways from falling below a level of service D. The BMS Master Agreement, Exhibit B, lists a series of transportation-related improvements and study requirements and their associated triggers in terms of peak p.m. vehicle trip volumes. To date, development BMS-wide, is generating 861 peak p.m. trips. This number surpasses the 600-trip count trigger used in three of the transportation improvement triggers; they are: widening the Dallas Road left turn lane for southbound to eastbound turns onto the I-82 freeway ramp, installation of a right-turn lane for westbound off-ramp approach and left turn lane for eastbound Dallas Road approach, and improvements to the Dallas Road/Trowbridge Blvd intersection. The specific design of each improvement is to be based on the recommendations of a comprehensive traffic impact analysis (TIA) prepared at the developer's (NorAm) expense. This TIA has recently been provided to the City and is under review by the City and other affected agencies. Villa Vista Townhomes preliminary plat conditions of approval require completion of said transportation improvements prior to final plat application acceptance.

E. Any conditions attached to a project approval are as a direct result of the impacts of the development proposal and are reasonably needed to mitigate the impacts of the development proposal.

The conditions of approval recommended for this project are as a direct result of imposing City design standards and development standards as contained in the LUDR and in the environmental mitigation conditions identified in the modified environmental checklist and are directly related to the impacts of the proposed development.

RECOMMENDED CONDITIONS

A list of recommended conditions prepared by city staff, are inserted at the end of this report.

FINDINGS AND CONCLUSIONS

Staff has completed its review the preliminary plat application for the Villa Vista Townhomes preliminary plat (S2021-102) and recommends approval of the request subject to conformance with the conditions of approval included at the end of this report based on the following findings:

Findings of Fact:

1. The Richland Comprehensive Plan for this area is the Badger Mountain South Subarea plan and the project site is located within the Badger Mountain South Master Planned Community. The property is subject to the provisions of the Land Use and Development Regulations (LUDR) adopted for this planned community, which designate the project site as part of the Specialty Retail land uses.
2. The proposed plat lies within West Vineyard neighborhood area identified in section 7.D of the Badger Mountain South LUDR.
3. The provisions of the LUDR establish target densities for each neighborhood within the Badger Mountain South planned community. All phases of the West Vineyard neighborhood allow for a minimum of 430 units and a maximum of 510 units.
4. The proposed preliminary plat consists of a 13.31 acre site into 68 residential lots and four (4) tracts for guest parking.
5. The Master Agreement Consistency Recommendation (MACR) anticipates 68 single-family dwellings within the Villa Vista Townhomes development, resulting in a total of 68 dwelling units.

Conclusion of Law:

The proposed preliminary plat is consistent with and would provide for development of the subject property in conformance with the density and type of land use envisioned in the land use and transportation elements of the adopted comprehensive plan.

Findings of Fact:

6. The site is subject to both the provisions of the Land Use and Development Regulations (LUDR) for the Badger Mountain South Master Planned Community and the Master Agreement between the City of Richland and Nor Am Investment, LLC.
7. All proposed developments subject to the Badger Mountain LUDR regulations are required to be reviewed by the Badger Mountain South Master Plan Administrator. The Administrator has issued a Master Agreement Consistency Recommendation (as provided for in Section 1.H of the LUDR) stating that the application meets the terms and obligations of the approved Master Agreement and the requirements of the LUDR.

8. City staff reviewed the application and the Master Agreement Consistency Recommendation and has issued a Master Agreement Consistency Determination as required by the LUDR.

Conclusion of Law:

The lots within the proposed subdivision are consistent with the provisions of the City's residential zoning regulations.

Findings of Fact:

9. Section 24.12.053 of the RMC sets forth standards for review of preliminary plats which require the Hearing Examiner to consider whether appropriate provisions are made for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features which assure safe walking conditions for students who only walk to and from school.
10. As conditioned herein the proposed preliminary plat provides for the development of a street network which is consistent with the regulating street plan contained in the LUDR.
11. The proposed preliminary plat includes provisions for the extension of domestic and irrigation water lines, electrical power lines, and sewer lines to serve the project.
12. The proposed improvements to serve the preliminary plat are consistent with the standards and requirements contained in the LUDR and in the Master Agreement between the City and Nor Am Investment, LLC,
13. The preliminary plat includes provisions for the construction of an urban pedestrian trail system along the northeasterly and southerly boundaries of the proposed project which is consistent with the trail layout plan set forth in the LUDR.
14. The project calls for the development of urban trails in a schedule which is consistent with the green infrastructure improvements called for in the Master Agreement between the City and Nor Am investment, LLC.
15. According to Municipal Code (Chapter 22.12), the project is subject to payment of park mitigation fees, which will be used to fund future park improvements within the Badger Mountain South Master Planned Community.
16. The Badger Mountain Subarea Plan identifies sites for future public schools. The Richland School District has purchased a site within the nearby plat of West Village and has plans to construct both an elementary school and a middle school on this site.
17. The proposed plat includes provisions for sidewalks and trails bordering the site and as conditioned.

18. No bus service is currently provided in the vicinity of the project site. The Benton Franklin Transit Authority was given an opportunity to comment on the project but did not provide any comments.
19. City staff and other utility providers reviewed the project and have recommended specific conditions of approval as set forth in the Technical Advisory Committee report.

Conclusion of Law:

As conditioned, the proposed preliminary plat makes appropriate provisions for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys, other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features which assure safe walking conditions for students who only walk to and from school.

Findings of Fact:

20. The City has adopted a Planned Action Ordinance for the Badger Mountain South Master Planned Community.
21. Under the provisions of the Planned Action Ordinance, projects are not reviewed through standard State Environmental Policy Act provisions. Rather, review is conducted to determine if the proposed project is consistent with the mitigation measures enumerated in the master agreement.
22. A Planned Action Consistency Determination (PACD) was issued by Planning staff on May 28, 2021.
23. On May 28, 2021, the City issued a letter of consistency, finding that the proposal is consistent with the mitigation measures included in the master agreement (MACD).

Conclusion of Law:

Pursuant to Chapters 22.09 and 22.10 of the RMC, the procedures required under the State Environmental Policy Act and the City's Sensitive Areas Ordinance have been completed.

Findings of Fact:

24. RMC 19.60.095(D) requires that development not lower the level of service standard for transportation facilities below a level of service D.
25. The provisions of the planned action ordinance call for the applicant to conduct traffic studies at the time that Badger Mountain South project generates 500 peak hour trips at the intersection of Dallas Road and the Trowbridge Blvd. The ordinance further calls for the applicants to construct improvements as identified in future traffic studies.
26. A traffic study has been submitted to the City and is currently under review.
27. The set of recommended approval conditions listed herein requires the applicant to make transportation improvements listed in the BMS master

agreement and as further recommended in the traffic study and by city Public Works staff.

Conclusion of Law:

The proper processes are underway to ensure consistency with the provisions of RMC 19.60.095. Subsequent final plat application(s) will not be accepted by the City until all of the associated transportation improvements have been fully constructed in accordance with the traffic impact analysis and as further recommended by Public Works staff.

Overall Conclusion:

Based on the above findings and conclusions, approval of the proposed preliminary plat of Villa Vista Townhomes is warranted because the project conforms to the City's adopted comprehensive plan, the applicable Land Use and Development Regulations and Master Agreement provisions, is consistent with the requirements of the City's subdivision regulations and is consistent with the City's Planned Action Ordinance.

CONDITIONS OF APPROVAL

Pre-Plat Specific Conditions:

1. This preliminary plat is not currently a separate parcel from the parent parcel. Prior to acceptance of the pre-plat a segregation action is needed that will separate this parcel from its parent parcel.
2. The preliminary plat is not showing any phase lines. Phasing is not required but if the project is to be phased during construction phasing lines need to be shown on the pre-plat map.
3. Street names are not reviewed or vested until construction plans are submitted for review. The street names included on the pre-plat may not be approved or available during the construction plan review process.

General Conditions:

4. All final, approved plans for public improvements shall be submitted prior to pre-con on a 24" x 36" hardcopy format and also electronically in .dwg format compatible with the City's standard CAD software. Addendums are not allowed, all information shall be supplied in full size (and electronic) format. Electronic copies of the construction plans are required prior to the pre-con meeting along with the multiple sets of paper drawings. When construction of the public infrastructure has been substantially completed, the applicant shall provide paper and electronic record drawings in accordance with the City's "Record Drawing Requirements". The electronic record drawings shall be submitted in an AutoCAD format compatible with the City's standard CAD software. The final record drawings shall be submitted and approved by the City before the final punchlist inspection will be performed. All final punchlist items shall be completed or financially guaranteed prior to recording of the final plat.

5. A copy of the construction drawings shall be submitted for review to the appropriate jurisdictions by the developer and his engineer. All required comments / conditions from all appropriate reviewing jurisdictions (e.g.: Benton County, any appropriate irrigation districts, other utilities, etc.) shall be incorporated into one comprehensive set of drawings and resubmitted (if necessary) for final permit review and issuance. Any and all necessary permits that may be required by jurisdictional entities outside of the City of Richland shall be the responsibility of the developer to obtain.
6. Any work within the public right-of-way or easements or involving public infrastructure will require the applicant to obtain a right-of-way construction permit prior to beginning work, per RMC Chapter 12.08. The applicant shall pay a plan review fee based on a cost-per-sheet of engineering infrastructure plans. This public infrastructure plan review fee shall apply each time a project is submitted for review. This fee will be different for commercial projects versus subdivision projects. Please visit the Public Works Private Development page on the City's webpage to find the current per-sheet fee. A permit fee in the amount equal to 3% of the construction costs of the work within the right-of-way or easement will be collected at the time the construction permit is issued. A stamped, itemized Engineers estimate (Opinion of probable cost) and a copy of the material submittals shall be submitted along with the approved plan submittal.
7. Public utility infrastructure located on private property will require recording of a City standard form easement prior to acceptance of the infrastructure and release of the final plat. The City requires preparation of the easement legal description by the developer two weeks prior to the scheduled date of plat acceptance. Once received, the City will prepare the easement document and provide it to the developer. The developer shall record the easement at the Benton County Assessor and return a recorded original document to the City prior to application for final plat acceptance.
8. A pre-construction conference will be required prior to the start of any work within the public right-of-way or easement. Contact the Public Works Engineering Division at 942-7500 to schedule a pre-construction conference.
9. All plan sheets involving construction of public infrastructure shall have the stamp of a current Washington State licensed professional engineer.
10. A copy of the preliminary plat shall be supplied to the Post Office and all locations of future mailbox clusters approved prior to final platting.

Design Standards:

11. Public improvement design shall follow the following general format:
 - A. All materials and workmanship shall be in conformance with the latest revision of the City of Richland Standard Specifications and Details, Public Infrastructure Design Guidelines and the current edition of the State of Washington Standard Specifications for Road, Bridge, and Municipal Construction. Please confirm that you have the latest set of standard specs and details by visiting the City's web page.
 - B. Water lines shall be aligned on the south and east side of street centerlines.
 - C. Sanitary sewer shall be aligned on the north and west side of street centerlines.
 - D. Storm sewer shall be aligned on the south and east side of street centerlines.
 - E. Any sewer or storm manholes that are installed outside of public Right of Way shall have an acceptable 12-foot wide gravel access road (minimum) provided from a public street for maintenance vehicles.
 - F. 10-foot horizontal spacing shall be maintained between domestic water and sanitary sewer mainlines and service lines.
 - G. Watermains larger than 8-inches in diameter shall be ductile iron.
 - H. Watermains installed outside of the City Right of Way or in very rocky native material, shall be ductile iron and may need restrained joints.
 - I. All watermains outside areas zoned R1 shall be ductile iron.
 - J. Fire hydrant location shall be reviewed and approved by the City Fire Marshal.
 - K. All utilities shall be extended to the adjacent property (properties) at the time of construction.
 - L. The minimum centerline finish grade shall be no less than 0.30% and the maximum centerline finish grade shall be no more than 10.0% for local streets. 12% can be allowed for local streets for short distances.
 - M. The minimum centerline radius for local streets shall be 100-feet.
 - N. Any filling of low areas that may be required within the public Right of Way shall be compacted to City standards.
 - O. An overall, composite utility plan shall be included in the submitted plan set if the project is phased. This comprehensive utility plan benefits all departments and maintenance groups involved in the review and inspection of the project.
 - P. A detailed grading plan shall be included in the submitted plan set.
 - Q. For public utilities not located within public street rights-of-way the applicant shall provide maintenance access acceptable to the City

- and the applicant shall provide an exclusive 10-foot wide public utility easement (minimum) to be conveyed to the City of Richland.
- R. Final design of the public improvements shall be approved at the time of the City's issuance of a Right-of-way Construction Permit for the proposed construction.
 - S. All public improvements shall comply with the State of Washington and City of Richland requirements, standards and codes.
 - T. All curb returns at minor intersections shall have a minimum radius of 25-feet. Curb returns at major intersections should have minimum radius of 30-feet but should be evaluated on a case by case basis.
 - U. All public streets shall meet design requirements for sight distance (horizontal, vertical and intersectional).
 - V. The final engineered construction plans shall identify locations for irrigation system, street lighting, gas service, power lines, telephone lines, cable television lines, street trees and mail boxes. All electrical appurtenances such as transformers, vaults, conduit routes, and street lights (including their circuit) need to be shown in the plan view.
 - W. Construction plans shall reference all City of Richland standard details necessary to construct all public improvements which will be owned, operated, maintained by the City or used by the general public.
 - X. The contractor shall be responsible for any and all public infrastructure construction deficiencies for a period of one year from the date of the letter of acceptance by the City of Richland.
12. If the project will be built in phases the applicant shall submit a master plan for the sanitary sewer, domestic water, storm drainage, electrical, street lighting and irrigation system for the entire project prior to submitting plans for the first phase to assure constructability of the entire project. This includes the location and size of any storm retention ponds that may be required to handle runoff.
13. If the City Fire Marshal requires a secondary emergency vehicle access, it shall be included in the construction plan set and be designed to the following standards:
- A. 2-inches compacted gravel, minimum (temp. SEVAs only).
 - B. 2% cross-slope, maximum.
 - C. 5% slope, maximum. Any access road steeper than 5% shall be paved or be approved by the Fire Marshal.
 - D. Be 20-feet in width.
 - E. Have radii that are accommodating with those needed for City Fire apparatus.

Secondary emergency vehicles accesses (SEVA's) shall be 20-feet wide, as noted. Longer secondary accesses can be built to 12-feet wide with the approval of the City of Richland Fire Marshal, however turn-outs are required at a spacing acceptable to the Fire Dept. Temporary SEVA's shall be constructed with 2-inches of compacted gravel, at a minimum. Permanent SEVA's shall be paved with 2-inches of asphalt over 4-inches of gravel, at a minimum.

Survey Monument Destruction:

14. All permanent survey monuments existing on the project site shall be protected. If any monuments are destroyed by the proposed construction the applicant shall retain a professional land surveyor to replace the monuments and file a copy of the record survey with the City.
 - A. No survey monument shall be removed or destroyed (*the physical disturbance or covering of a monument such that the survey point is no longer visible or readily accessible*) before a permit is obtained from the Department of Natural Resources (DNR). WAC 332-120-030(2) states "It shall be the responsibility of the governmental agency or others performing construction work or other activity (including road or street resurfacing projects) to adequately search the records and the physical area of the proposed construction work or other activity for the purpose of locating and referencing any known or existing survey monuments." (RCW 58.09.130).
 - B. Any person, corporation, association, department, or subdivision of the state, county or municipality responsible for an activity that may cause a survey monument to be removed or destroyed shall be responsible for ensuring that the original survey point is perpetuated. (WAC 332-120-030(2)).
 - C. Survey monuments are those monuments marking local control points, geodetic control points, and land boundary survey corners. (WAC 332-120-030(3)).

When a monument must be removed during an activity that might disturb or destroy it, a licensed Engineer or Land Surveyor must complete, sign, seal and file a permit with the DNR.

It shall be the responsibility of the designing Engineer to identify the affected monuments on the project plans and include a construction note directing them to the DNR permit.

Traffic & Streets:

15. The Villa Vista Townhomes Townhome preliminary plat is subject to the City's traffic impact fee program (RMC 12.03). Since this property is included within the traffic impact fee program, and since staff analysis indicates the project will create no unusual or unanticipated traffic impacts, it is exempt from the SEPA-related traffic study requirement (TIA).
16. As shown on the preliminary plat application, both Bellaview Avenue and Syrah Avenue within the preliminary plat boundaries appear to be intended to be public streets, based on the right of way widths indicated. The City supports this approach as the best approach to providing a well-designed system of public street access to this and adjacent parcels. At their connections to Ava Way both Bellaview Ave. and Syrah Ave. are, however, currently established as privately owned tracts with no known dedication for public access purposes. These tracts currently include improvements as private shared driveways to a group of ten single family residential lots fronting on Ava Way. The City will not accept dedications of these two proposed rights of way as public streets without an acceptable plan of dedications and improvements. Said plan shall include conceptual engineering plans for meeting the public access needs of adjacent parcels in addition to this project.
17. A note will be shown on the face of the final plat stating that Trowbridge Blvd. is classified as a "Minor Arterial Street". Subsequently, no driveways accessing single family lots will be allowed directly onto it.
18. Any roads narrower than 34-feet shall have parking restricted on one side, and any roads narrower than 27-feet shall have parking restricted on both sides. Street signs indicating restricted parking shall be installed prior to final platting at the developer's expense. The restricted parking areas shall be indicated on the construction plans and the final plat. All signage will be installed by the developer prior to final platting.
19. At the time of the writing of these conditions the Trowbridge Blvd. road improvements were not complete. Any deficient frontage improvements along Trowbridge shall be completed to City standards at the time that the phase which constructs the lots adjacent to it are developed.
20. Sidewalks shall be installed along all public right-of-way frontages that building lots do not front on during construction of those phases (e.g., storm drainage ponds, parks, parking areas, etc.).
21. The developer and his engineer shall demonstrate on the construction plans that all future driveway entrances, sidewalks and pedestrian ramps

- will meet City and ADA requirements, and also provide at least 5-feet of separation between driveways and/or pedestrian ramp transitions.
22. Pedestrian ramps shall be designed to current City standard details and A.D.A. standards. Adequate right-of-way shall be provided at corners to allow for at least 1-foot of ROW behind the ped. ramp landing. Crosswalks between pedestrian ramps shall be designed to City standards. Crosswalks at stop-controlled intersections shall have cross-slopes less than 2%. Crosswalks crossing thru-streets shall have cross-slopes less than 5%. The road profile shall be designed to accommodate this.
 23. The vision-clearance triangle needs to be shown on all corner lots on both the construction plans and the final plat document, in accordance with RMC Chapter 12.11.020. If the intersection is in a curve, it will have to be evaluated per AASHTO guidelines. This information may need to be designed by the engineer of record and supplied to the surveyor of record for inclusion into the final plat document.
 24. All roads shall be constructed to provide for adequate fire truck & solid waste collection truck access & turnaround movements.
 25. If the project is to be constructed in phases, all dead-end streets longer than 150-feet that will be continued later need to have temporary turnarounds built at the end of them. If the temporary turnaround is not located within the final plat an easement with a 50-foot radius will be required.

Domestic Water:

26. The closest available watermain is located in Trowbridge Blvd. to the south, and in the 4-Plex project to the east. It shall be the responsibility of the developer to extend a watermain from both of these locations onto this property to serve domestic water at the time of plat construction. This water main shall be sized to adequately supply domestic water and fire flows to the proposed development and other, future developments to the west and north.
27. In accordance with municipal code, domestic water mains shall be extended to the adjoining properties adjacent to the preliminary plat, provided they are in the correct pressure zone.
28. The developer will be required to demonstrate that all phases are capable of delivering adequate fire flows prior to construction plans being accepted for review. This may require looping of the watermain from off-site locations, or oversizing of the main where needed.

29. The fire hydrant layout shall be approved by the City Fire Marshal.
30. In accordance with Richland Municipal Code Chapter 18.16.080, an irrigation source and distribution system, entirely separate from the City's domestic water system, shall be provided for this development. *Construction plans will not be accepted for review until adequate and viable proof of an irrigation source is made available by the developer.* The designing Engineer shall submit plans for the proposed irrigation system to the Irrigation District with jurisdiction over the property at the same time that they are submitted to the City for construction review. Plans shall be reviewed and accepted by said irrigation district prior to issuance of a Right-of-Way permit by the City. Easements shall be provided on the final plat for this system where needed.

Sanitary Sewer:

31. There is an existing sanitary sewer main crossing this proposed development. It shall be the responsibility of the developer to provide easements where necessary, and to adjust all existing sewer appurtenances to finished grade per city standards. A 10-foot wide exclusive sanitary sewer easement shall be provided for any sewer main that is outside of the public Right-of-Way. Wider easements are required for mains that are buried deeper than 10-feet. If any manholes are located outside of the public Right-of-Way, maintenance truck access to said structure may be required.
32. Sanitary sewer shall be extended to the adjoining properties adjacent to the preliminary plat.

Storm Water:

33. All construction projects that don't meet the exemption requirements outlined in Richland Municipal Code, Section 16.06 shall comply with the requirements of the Washington State Department of Ecology issued Eastern Washington NPDES Phase II Municipal Stormwater Permit. The Developer shall be responsible for compliance with the permit conditions. All construction activities subject to this title shall be required to comply with the standards and requirements set forth in the Stormwater Management Manual for Eastern Washington (SWMMEW) and prepare a Stormwater Site Plan. In addition, a Stormwater Pollution Prevention Plan (SWPPP) or submission of a completed erosivity waiver certification is required at the time of plan submittal. The City has adopted revised standards affecting the construction of new stormwater facilities in order to comply with conditions of its NPDES General Stormwater Permit program. This project, and each phase thereof, shall comply with the requirements of the City's stormwater program in place at the time each phase is engineered. The project will require detailed erosion control plans.

34. All public storm drainage systems shall have their flow rate and storage capacity designed by a professional engineer following the core elements defined in the latest editions of the Stormwater Management Manual for Eastern Washington, the current Richland municipal codes, the Phase II Municipal Stormwater Permit, and the City's "Public Infrastructure Construction Plan Requirements and Design Guidelines". The storm water calculations shall be stamped by a professional engineer and shall include a profile of the storm system showing the hydraulic grade line. The calculations should include an accurate delineation of the contributing drainage area to accurately size the stormwater facilities. Passing the storm water downhill to an existing storm system will require an analysis of the downstream storm system to determine its capability of accepting the storm water without being overwhelmed. The applicant's design shall provide runoff protection to downstream property owners.
35. If any existing storm drainage or ground water seepage drains onto the proposed site, said storm drainage shall be considered an existing condition, and it shall be the responsibility of the property developer to design a system to contain or treat and release the off-site storm drainage.
36. If there are any natural drainage ways across the proposed pre-plat, the engineered construction plans shall address it in accordance with Richland Municipal code 24.16.170 ("Easements-watercourses").
37. Any proposed storm drainage retention facilities within the boundary of the proposed preliminary plat shall not adversely affect neighboring properties.
38. Prior to or concurrent with the submittal of the first phase the developer shall provide a Geotechnical report including the percolation rate of the soils in the area of any storm retention ponds. If the project constructs a storm retention pond then the engineer will need to demonstrate that the pond will drain itself within 72 hours after the end of a storm event, and not have standing water in it longer than that. Engineering solutions are available for retention ponds that do not percolate within 72 hours.
39. As per RMC chapter 24.20.070 and the City of Richland's Comprehensive Stormwater Management Plan, the storm drainage system installed as part of this plat may need to be oversized in order to handle the additional flow from future developments in the vicinity. The storm drainage system for this development, both its conveyance and retention / infiltration components, shall be designed to effectively manage runoff from upstream properties that can be anticipated to convey stormwater onto this property because of a pre-development runoff condition, or as a result of flows discharged that are in excess of the design storm from the

- upstream property. Additionally, as this property is upslope of developed properties the stormwater system shall include provisions for possible discharge of runoff onto downslope properties from storms in excess of the design storm as described above. Those provisions may be required to include off-site downslope conveyance facilities and/or flowage easements allowing for the conveyance of stormwater to and across downslope properties.
40. The amount of post-development storm runoff from the proposed site shall be in compliance with RMC Chapter 16.06.
 41. Stormwater collection pipes may need to be extended to the adjoining properties adjacent to the plat.
 42. The parcel occupied by the stormwater basin shall be identified as a separate parcel or tract on the final plat and shall be dedicated to the City stormwater utility. The design of the basin shall include access features meeting the city's needs for maintenance.
 43. The developer shall consider the long-term appearance of the storm basin, particularly if it will occupy a prominent location in the development. The City's typical storm pond maintenance practices consist of semi-annual vegetation trimming and silt and debris removal. If the pond location is deemed by City staff as being in a prominent location the developer shall design and install fencing and/or landscaping to mitigate the pond's visible character for the surrounding properties. If the City requires this type of treatment to the pond site the developer may propose landscaping treatments consistent with the development and establish maintenance responsibilities to remain with the development. These maintenance responsibilities shall be noted on the final plat. Basins designed as detention and evaporative basins need to include plantings that will tolerate or thrive in standing water. Planting designs for areas not routinely exposed to water shall include plants that will thrive without irrigation unless the developer intends to maintain an irrigated pond site. At a minimum the landscaping plan should be consistent with the City's intended maintenance standard as described above.
 44. The developer shall be responsible for landscaping the storm pond and for its maintenance and the plantings through the one-year infrastructure warranty period. At 11 months after the final acceptance date the developer shall clean the storm system and basin of all accumulated oil, sediment, and debris. After this maintenance is completed and inspected the City will begin routine maintenance of the system and basin. The developer shall replace any plantings that have failed to survive the warranty period. The developer shall also perform trimmings required to

control weeds in excess of 18-inches in height for the 12-months following the date of final plat acceptance.

Solid Waste:

45. Due to limited space and tight corners, all lots that take access off of a private drive may have to transport their garbage cans to a location acceptable for solid waste pick-up.

Final Platting Requirements:

46. When the construction is substantially complete a paper set of "record drawings" shall be prepared by a licensed surveyor and include all changes and deviations. Please reference the Public Works document "RECORD DRAWING REQUIREMENTS & PROCEDURES" for a complete description of the record drawing process. All final punchlist items shall be completed or financially guaranteed prior to recording of the final plat.
47. Public utility infrastructure located on private property will require recording of a City standard form easement prior to acceptance of the infrastructure and release of a certificate of occupancy. The City requires preparation of the easement legal description by the developer two weeks prior to the scheduled date of final acceptance. Off-site ("third party") easements or right-of-ways for City infrastructure are the responsibility of the developer to obtain. Once received, the City will prepare the easement document and provide it to the developer. The developer shall record the easement at the Benton County Assessor and return a recorded original document to the City prior to application for final occupancy.
48. Any off-site easements or permits necessary for this project shall be obtained and secured by the applicant and supplied to the City at the time of plat construction and prior to final plat acceptance by the City.
49. Ten-foot wide public utility easements will be required on the final plat along both sides of all right-of-ways within the proposed plat. They will also be required where the plat is adjacent to an existing right-of-way.
50. The vision-clearance triangle needs to be shown on all corner lots on the final plat document, in accordance with RMC Chapter 12.11.020. If the intersection is in a curve, it will have to be evaluated per AASHTO guidelines. This information may need to be designed by the engineer of record and supplied to the surveyor of record for inclusion into the final plat document.
51. The final plat shall include notes identifying all common areas including the private streets and tracts and acknowledging the ownership and

maintenance responsibility by the homeowners association. A note shall be added to the face of the final plat stating:

“Private drives are for the use and benefit of homeowners of properties abutting private drives, and shall be maintained by the adjacent property owners, respectively. The City of Richland accepts no maintenance responsibility for these private drives”.

52. A note shall be added to the face of the plat stating:

“Private drives within this plat are fire lanes; parking is restricted thereon. The required no-parking signs shall be installed by the developer where applicable.”

53. Any roads narrower than 34-feet shall have parking restricted on one side, and any roads narrower than 27-feet shall have parking restricted on both sides. Street signs indicating restricted parking shall be installed prior to final platting at the developers expense. The restricted parking areas shall be indicated on the final plats.
54. All landscaped areas within the plat that are in the public Right of Way shall be the responsibility of the property owners to maintain.
55. A one-foot “No access / screening easement” will be required along the Trowbridge Blvd. Right of Way.
56. The intended use and ownership of all tracts within the plat shall be noted on the final plat.
57. Property with an unpaid L.I.D. assessment towards it must be paid in full or segregated per Richland Municipal Code 3.12.095.
58. Any restricted parking areas shall be indicated on the final plats.
59. Prior to final plat acceptance, transportation improvement items: 5.1.3, 5.1.4, 5.15 as listed in the Badger Mountain South Master Agreement shall be completed as recommended by the Richland Traffic Engineer, Public Works Director and the respective traffic impact analysis.
60. Prior to final plat application acceptance, all tracts identified for guest parking shall be fully paved and landscaped up to each tracts respective property boundaries.

61. Prior to final plat application acceptance, the north side of Trowbridge Blvd adjacent to the Villa Vista site shall be developed with 12-foot-wide concrete or asphalt primary trail as required by Section 5.I of the LUDR.
62. Subsequent final plat(s) shall contain a note identifying the allowed home building type for each lot or plat-wide.
63. Construction of each new dwelling unit shall include a residential fire sprinkler system.
64. Development of homes within the plat will be subject to park mitigation fees.
65. Future construction shall meet the sustainability standards contained in Section 12 of the LUDR and with the design requirements established within Sections 3 and 8 of the LUDR.

EXHIBIT LIST

1. Application
2. Preliminary Plat Survey
3. Traffic Impact Analysis
4. Master Agreement Consistency Recommendation (MACR)
5. Master Agreement Consistency Determination (MACD)
6. Planned Action Consistency Determination (PACD)
7. Planned Action Ordinance
8. Public Notices & Affidavits
9. Public Comments
10. Agency Comments
11. LUDR Land Use Map
12. Site Photos



Preliminary Plat Application

Note: A Pre-Application meeting is required prior to submittal of an application.

PROPERTY OWNER INFORMATION

☒ Contact Person

Owner: Nor Am Investment LLC {Geoff Clark, Member}

Address: 12513 Dubois Ave SW, Lakewood, WA 98498

Phone: 253-677-3402

Email: thefourcs@comcast.net

APPLICANT/CONTRACTOR INFORMATION (if different)

☐ Contact Person

Company:

UBI#

Contact:

Address:

Phone:

Email:

SURVEYOR INFORMATION

Contact: David Baalman, PLS Rogers Surveying Inc., P.S.

Address: 1455 Columbia Park Trail, Suite 201 Richland, WA 99352

Phone: 509-783-4141

Email: dbaalman@rogerssurveying.com

ENGINEER INFORMATION

Contact:

Address:

Phone:

Email:

PROJECT DESCRIPTION

68 lot preliminary plat with duplex/triplex construction

PROPERTY INFORMATION

Parcel #: 1-3298-2BP-4732-021

Zoning: BMS LUDR

Legal Description: See face of preliminary plat drawing

Proposed Subdivision Name: Villa Vista Townhouses

Gross Plat Acreage: 13.31

Number of Lots: 68

Smallest Lot Size: 4109 Sq Ft

Net Lot Area Acreage: 9.16 Ac

Avg Lot Size: 5867 Sq Ft

Largest Lot Size: 13,042 Sq Ft

Domestic Water Supply: ☒ City ☐ Private Well

Sewage Disposal: ☒ City ☐ Septic

Irrigation Source: ☐ City ☐ Private Well ☐ Columbia Irrig District ☐ Kennewick Irrig District ☒ BMID

SEPA Checklist Submitted? ☒ Yes ☐ No

Title Report (Subdivision Guarantee) Submitted? ☒ Yes ☐ No

APPLICATION MUST INCLUDE

1. Completed Application and Filing Fee
2. 2 – Full Size Copies & the .pdf file
3. 1 – 11" x 17" copy of proposed survey
4. Title Report showing ownership, easements, restrictions and accurate legal description of the property involved
5. SEPA Checklist
6. Other information as determined by the Administrator

I authorize employees and officials of the City of Richland the right to enter and remain on the property in question to determine whether a permit should be issued and whether special conditions should be placed on any issued permit. I have the legal authority to grant such access to the property in question.

I also acknowledge that if a permit is issued for land development activities, no terms of the permit can be violated without further approval by the permitting entity. I understand that the granting of a permit does not authorize anyone to violate in any way any federal, state, or local law/regulation pertaining to development activities associated with a permit.

I hereby certify under penalty of perjury under the laws of the State of Washington that the following is true and correct:

1. I have read and examined this permit application and have documented all applicable requirements on the site plan.
2. The information provided in this application contains no misstatement of fact.
3. I am the owner(s), the authorized agent(s) of the owner(s) of the above referenced property, or I am currently a licensed contractor or specialty contractor under Chapter 18.27 RCW or I am exempt from the requirements of the Chapter 18.27 RCW.
4. I understand this permit is subject to all other local, state, and federal regulations.

Note: This application will not be processed unless the above certification is endorsed by an authorized agent of the owner(s) of the property in question and/or the owner(s) themselves. If the City of Richland has reason to believe that erroneous information has been supplied by an authorized agent of the owner(s) of the property in question and/or by the owner(s) themselves, processing of the application may be suspended.

Applicant Printed Name: GEOFFREY CLARK

Applicant Signature: 

Date 7-15-2020

LEGAL DESCRIPTION

THAT PORTION OF PARCEL A OF RECORD SURVEY 4905 (A.F.# 2017-022372) IN SECTION 32, TOWNSHIP 9 NORTH, RANGE 28 EAST W.M., CITY OF RICHLAND, BENTON COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF TRACT B OF THE FINAL PLAT OF WEST VINEYARD 1, PHASE 1, RECORDED IN VOLUME 15 OF PLATS, PAGE 458, (A.F.# 2013-010783); THENCE SOUTH 60°47'41" WEST 247.08 FEET TO THE TRUE POINT OF BEGINNING;

THENCE SOUTH 31°11'37" EAST 124.38 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTHWEST HAVING A RADIUS OF 1535.00 FEET; THENCE SOUTHEASTERLY 507.15 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 18°55'49"; THENCE NORTH 79°15'55" WEST 35.15 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHEAST, HAVING A RADIUS OF 157.50 FEET; THENCE NORTHWESTERLY 30.81 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 11°12'33" TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 142.50 FEET; THENCE WESTERLY 74.32 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 29°52'57"; THENCE SOUTH 82°03'40" WEST 26.35 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTH, HAVING A RADIUS OF 80.50 FEET; THENCE WESTERLY 84.32 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 60°00'45" TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 95.50 FEET; THENCE WESTERLY 128.40 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 77°01'53" TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 579.50 FEET; THENCE SOUTHWESTERLY 69.54 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 06°52'31"; THENCE SOUTH 71°55'04" WEST 114.61 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 402.50 FEET; THENCE SOUTHWESTERLY 57.38 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 08°10'04"; THENCE SOUTH 89°08'18" WEST 244.27 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTH, HAVING A RADIUS OF 447.50 FEET; THENCE WESTERLY 66.23 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 08°28'47"; THENCE NORTH 82°22'55" WEST 168.99 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 552.50 FEET; THENCE WESTERLY 232.55 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 24°06'58"; THENCE NORTH 02°14'17" EAST 195.93 FEET; THENCE NORTH 03°51'32" EAST 56.00 FEET; THENCE SOUTH 86°08'28" EAST 3.75 FEET; TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 25.00 FEET; THENCE NORTHEASTERLY 39.27 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 90°00'00"; THENCE NORTH 03°51'32" EAST 175.50 FEET; TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTHWEST, HAVING A RADIUS OF 25.00 FEET; THENCE NORTHWESTERLY 38.49 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 88°12'48"; THENCE NORTH 84°21'16" WEST 3.31 FEET; THENCE NORTH 05°38'44" EAST 56.00 FEET; TO THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE NORTHWEST HAVING A RADIUS OF 25.00 FEET; THENCE NORTHEASTERLY 40.05 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 91°47'12" (THE LONG CHORD OF SAID CURVE BEARS NORTH 49°45'08" EAST 35.90 FEET) THENCE SOUTH 82°45'44" EAST 56.10 FEET; TO THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE NORTHEAST HAVING A RADIUS OF 25.00 FEET; THENCE SOUTHEASTERLY 38.49 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 88°12'48" (THE LONG CHORD OF SAID CURVE BEARS SOUTH 40°14'52" EAST 34.80 FEET) THENCE SOUTH 84°21'16" EAST 297.43 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTH, HAVING A RADIUS OF 1390.51 FEET; THENCE SOUTHEASTERLY 613.83 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 25°17'35" TO THE TRUE POINT OF BEGINNING

CONTAINS 13.31 ACRES, MORE OR LESS.

Exhibit 2

PRELIMINARY PLAT OF
VILLA VISTA TOWNHOMES

LOCATED IN A PORTION OF SECTION 32,
TOWNSHIP 9 NORTH, RANGE 28 EAST, W.M.
CITY OF RICHLAND, BENTON COUNTY, WASHINGTON



DEVELOPER

SOUTH RICHLAND COMMUNITIES LLC
GEOFF CLARK
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253-677-3402 (OFFICE)
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OWNER

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PREPARED BY

ROGERS SURVEYING INC.
1455 COLUMBIA PARK TRAIL-STE 201
RICHLAND, WASHINGTON 99352
509-783-4141 (OFFICE)

LAND USAGE

GROSS PLANNING AREA = 13.31 ACRES
3044 LINEAR FEET PLAT STREETS = 3.81 ACRES
3 GUEST PARKING TRACTS = 0.46 ACRES

NET PLANNING AREA = 9.04 ACRES

9.04 ACRES X 43560 SQ. FT. = 5791 SQ. FT.
68 LOTS AVERAGE LOT SIZE

13,043 SQ FT 4108 SQ FT
LARGEST LOT (37) SMALLEST LOT (61)

ZONING = BMS-SD-SR

WATER SUPPLY = CITY OF RICHLAND

SEWAGE DISPOSAL = CITY OF RICHLAND

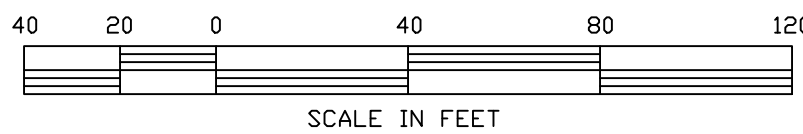
ROAD DESIGN PARAMETER = 16' LOCAL STREET W/ EDGE TYPE A (PUBLIC)

LEGEND

- EXTERIOR PLAT BOUNDARY
- PROPOSED PROPERTY LINE
- PROPOSED EASEMENT
- - - - - EXISTING UNDERGROUND UTILITY
- PROPOSED ROAD CENTERLINE
- /// APPROXIMATE FOOTPRINT OF PROPOSED DUPLEX/TRIPLEX

DEVELOPER'S NOTES:

- EACH LOT SHALL INCLUDE AN INDIVIDUAL ATTACHED GARAGE & DRIVEWAY.
- PRIVATE DRIVES OUTSIDE THE PUBLIC ROAD RIGHTS OF WAY SHALL BE MAINTAINED BY THE HOMEOWNERS ASSOCIATION.
- LOTS SHALL NOT HAVE DIRECT ACCESS TO TROWBRIDGE BLVD.



RSI ROGERS SURVEYING INC., P.S.
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Badger Mountain South

Richland, WA

Transportation Impact Analysis
May 14, 2021

Prepared for:

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Prepared by:



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INTRODUCTION

This transportation impact analysis (TIA) has been prepared for the Badger Mountain South development located on the north side of I-182 and east of Dallas Road in Richland, WA.

Project Description

Badger Mountain South (BMS) is a large mixed-use, multi-phased development on approximately 1,500 acres located in the Badger Mountain Subarea of Richland, WA. The BMS site is located north of I-182 and east of Dallas Road and is generally divided into six neighborhoods (BMS Station, West Village, West Vineyard, East Garden, East Market and South Orchard) as shown in the **Figure 1** vicinity map. As of November 2020, Phase 1 (approximately 700 dwelling units and 22,000 square feet of commercial use) had been constructed. Full project buildout is expected to be complete by 2040 and is anticipated to include a total of approximately 4,600 residential dwelling units (both single family and multifamily) and approximately 1,017,000 square feet of commercial development.

Vehicular access to/from the BMS site is currently provided via Dallas Road only. However, under full buildout of the development in 2040, vehicular access to the BMS site will be provided from Dallas Road, Reata Road, and via the future planned extension of Gage Blvd to/from the east. A preliminary site plan illustrating the anticipated buildout of the BMS site over the next 20 years is shown in **Figure 2**.

History and Purpose

Transportation impacts associated with the development of Badger Mountain South were evaluated in the 2010 Badger Mountain South Final Supplemental EIS (FSEIS). The subsequent Badger Mountain South Subarea Plan and approved Master Agreement (2015) were based on the FSEIS analysis. Exhibit B of the 2015 Master Agreement (conditions of approval) outlines several traffic mitigation measures to be completed with the first 1,000 PM peak hour trips generated by Badger Mountain South (referred to as Phase 1). Exhibit B of the Master Agreement also documents the need for a TIA to be provided to the City for every 500 trips generated after the BMS Phase 1 threshold has been reached in order to identify potential off-site improvements beyond Phase 1 of BMS.

This Traffic Impact Analysis (TIA) was prepared to meet the requirement of the Master Agreement condition of approval for evaluation of traffic impacts beyond the development of BMS Phase 1. The analysis included in this TIA is intended to evaluate traffic impacts of an additional 500 PM peak hour project trips as well as full buildout of the BMS development and to develop a mitigation strategy to address future roadway and intersection deficiencies as a result of buildout of BMS and growth in background traffic to the year 2040.

Project Approach and Study Scope

The detailed scope of work for this TIA was established through correspondence with the City of Richland. A total of 24 off-site study intersections and 12 on-site study intersections were identified for evaluation during both the AM and PM peak hours. Additionally, the City asked for evaluation of four future development years (2025, 2030, 2035 and 2040) in order to assist with identifying the future development phases of BMS for which transportation mitigation will be needed.

The scope of work for this TIA is significantly different and more extensive than the traffic analysis included in FSEIS which analyzed a total of 11 off-site study intersections and 4 on-site study intersections for the PM peak hour only.

To analyze the transportation impacts from buildout of the Badger Mountain South development, the following tasks were undertaken:

- Assessed existing conditions through field reconnaissance and reviewed existing planning documents.
- Described existing roads, pedestrian facilities, and transit facilities in the project vicinity.
- Documented existing (2021) traffic volumes and intersection level of service (LOS) at 22 off-site study intersections during the weekday AM and PM peak hours:
- Documented planned roadway improvements in the project vicinity.
- Developed weekday daily, AM peak hour, and PM peak hour trip generation estimates for four future development years (2025, 2030, 2035, and 2040).
- Summarized traffic modeling information obtained from BFCG to determine the project trip distribution.
- Documented trip distribution and assignment of AM and PM peak hour project trips.
- Documented AM and PM peak hour traffic forecasts and assumptions for year 2040 conditions with full buildout of Badger Mountain South.
- Analyzed weekday AM and PM peak hour LOS for future year 2040 conditions with full project buildout at 24 off-site study intersections.
- Analyzed weekday AM and PM peak hour LOS for future year 2040 full buildout conditions at 12 on-site intersections and identified preliminary traffic control and channelization.
- Documented preliminary roadway functional classifications for internal roadways.
- Evaluated and documented potential mitigation measures at off-site intersections forecast to operate at LOS E or LOS F in 2040.

Primary Data and Information Sources

- Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 10th edition, 2017.
- Peak Hour traffic counts by IDAX, November 2020.
- Peak Hour traffic counts by City of Richland, March 2021.
- *Highway Capacity Manual (HCM)*, 6th Edition, TRB.
- City of Richland *2021-2026 Six Year Transportation Improvement Program (TIP)*.
- City of West Richland *2021-2026 Six Year Transportation Improvement Program (TIP)*.
- *Benton Franklin Council of Governments 2021-2024 Transportation Improvement Program (TIP)*
- WSDOT *2021-2024 Statewide Transportation Improvement Program (STIP)*.

- City of Richland *Comprehensive Plan*, 2017.
- Badger Mountain South Sub Area Plan, 2010.
- Badger Mountain South Final Supplemental EIS, 2010.
- Benton Franklin Council of Governments traffic modeling.
- Ben Franklin Transit webpage, www.bft.org, May 2021.

Report Organization

This TIA report is organized to first describe Existing Conditions in the study area of the BMS development, which includes AM and PM peak hour traffic volumes and intersection operations. Then future year conditions are described in year 2040 to reflect full buildout of the BMS development and growth in background traffic. Evaluation of existing and future conditions uses intersection level of service (LOS) to identify locations where future improvements will be necessary to maintain acceptable LOS operations by 2040. Finally, a Mitigation section provides a description of transportation roadway and intersection improvements needed to accommodate buildout of BMS while accounting for growth in background traffic. The mitigation section is intended to provide a list of improvements to be used to monitor and identify road and intersection improvements as buildout of BMS occurs over the next 20 years.

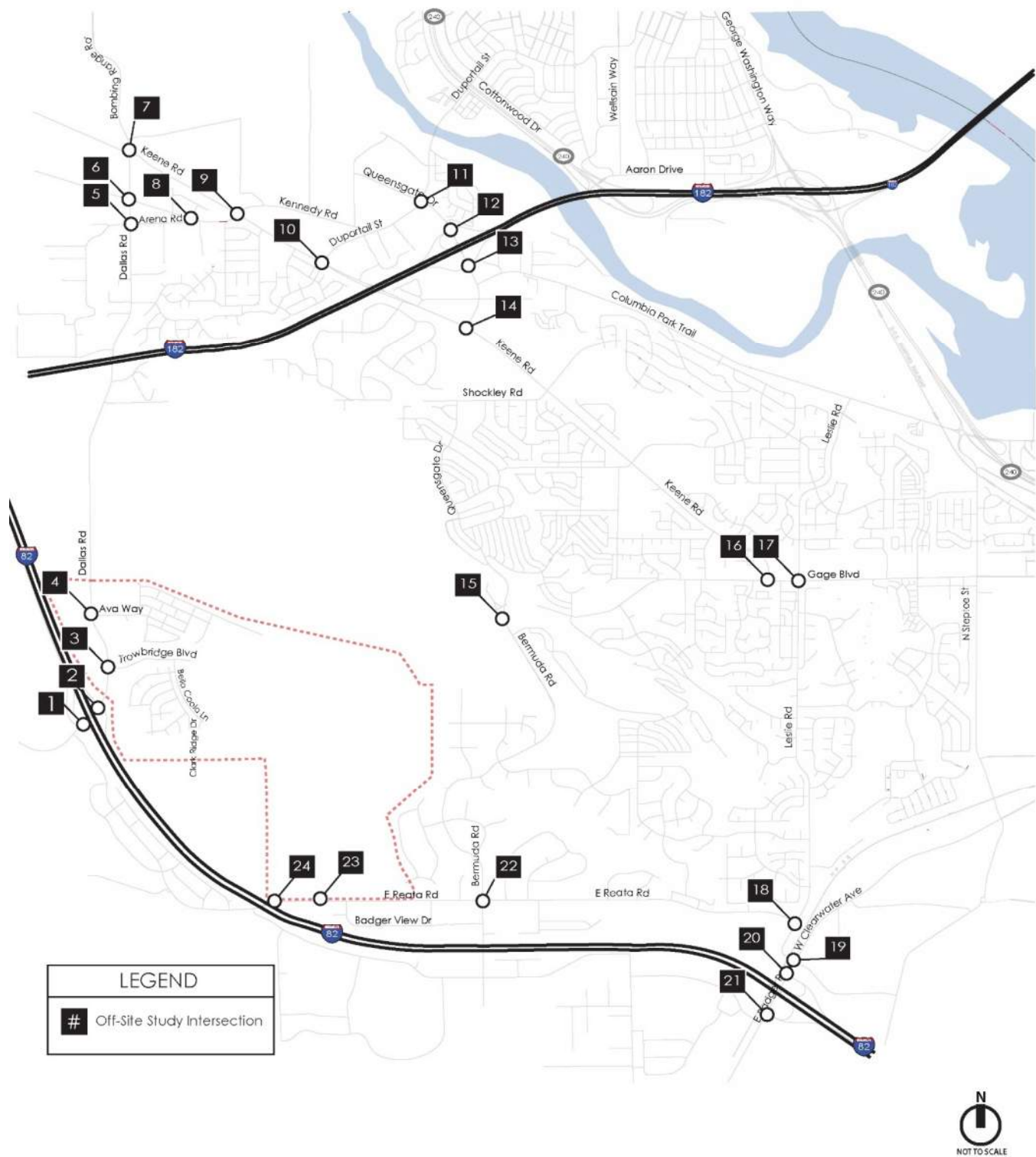
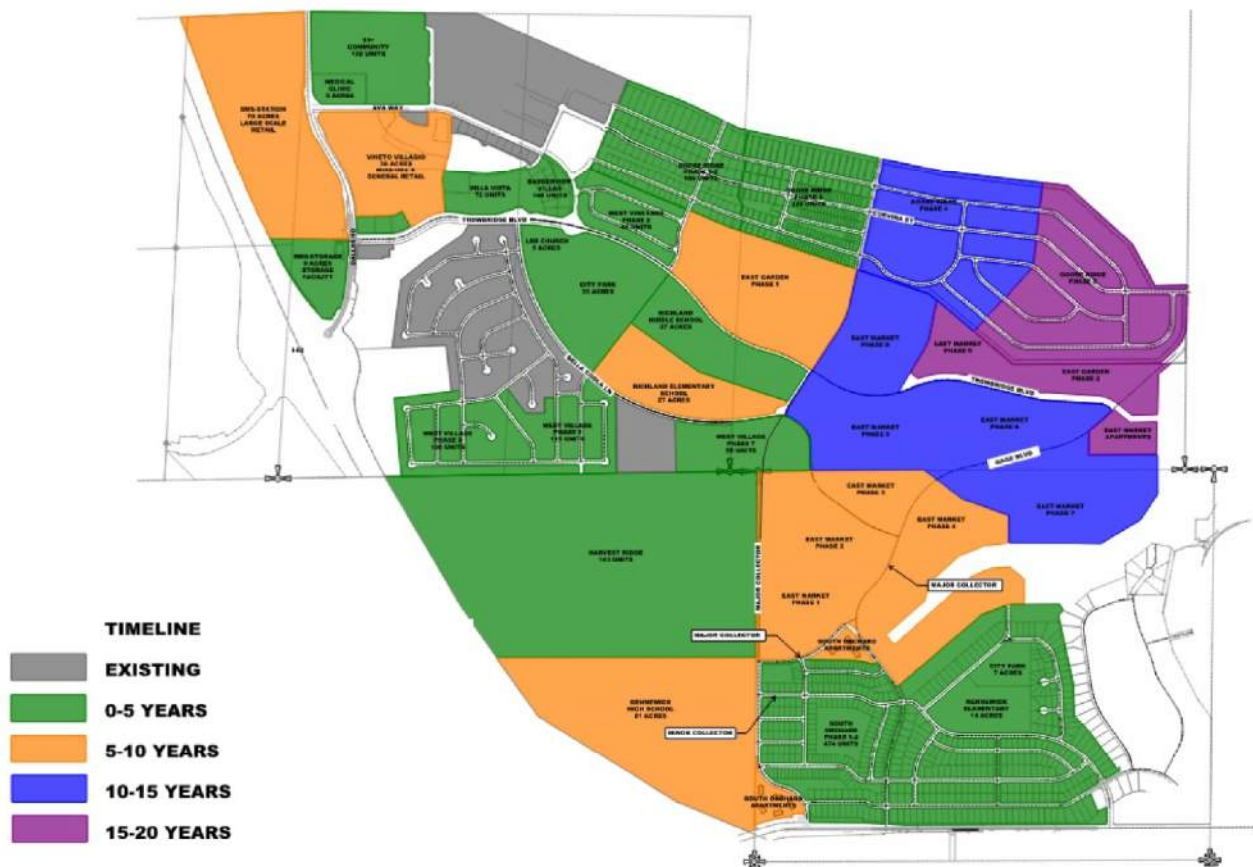


Figure 1: Project Site Vicinity and Off-Site Study Intersections



EXISTING CONDITIONS

Study Area

The existing transportation study area and roadway network providing access to the Badger Mountain South site is shown on **Figure 1**. The off-site study intersections evaluated in this transportation analysis were identified and agreed upon by the City of Richland. The 24 off-site study intersections and their corresponding jurisdiction are as follows (see also **Figure 1**):

1. Dallas Road / I-82 Eastbound Ramps (WSDOT)
2. Dallas Road / I-82 Westbound Ramps (WSDOT)
3. Dallas Road / Trowbridge Blvd (Richland)
4. Dallas Road / Ava Way (Richland)
5. Dallas Road / Arena Road (West Richland)
6. Bombing Range Road / Kennedy Road (West Richland)
7. Bombing Range Road / Keene Road (West Richland)
8. Arena Road / Kennedy Road (West Richland)
9. Kennedy Road / Keene Road (West Richland)
10. Duportail Street / Keene Road (Richland)
11. Duportail Street / Queensgate Drive (Richland)
12. Queensgate Drive / I-182 Westbound Ramps (WSDOT)
13. Queensgate Drive / I-182 Eastbound Ramps (WSDOT)
14. Queensgate Drive / Keene Road (Richland)
15. Gage Blvd / Queensgate Drive / Bermuda Road (Richland) – *Future Intersection*
16. Keene Road / Gage Blvd (Richland)
17. Leslie Road / Gage Blvd (Richland)
18. Leslie Road / Reata Road (Richland)
19. Leslie Road / Badger Road / Clearwater Avenue (Richland)
20. Badger Road / I-82 Westbound Ramps (WSDOT)
21. Badger Road / I-82 Eastbound Ramps (WSDOT)
22. Bermuda Road / Reata Road (Benton County)
23. Gage Blvd / Reata Road (Benton County) – *Future Intersection*
24. Unnamed Road / Reata Road (Benton County) – *Future Intersection*

In addition to the 24 off-site study intersections, a total of 12 on-site (internal) study intersections were identified by the City of Richland (see **Figure 3**):

- A. Bella Coola Lane / Trowbridge Blvd
- B. Ava Way / Trowbridge Blvd
- C. Sol Duc Ave / Trowbridge Blvd
- D. Unnamed N/S Road / Trowbridge Blvd
- E. Gage Blvd / Trowbridge Blvd
- F. Gage Blvd / Corvina Street
- G. Gage Blvd / Bella Coola Lane
- H. Gage Blvd / Unnamed E/W Road
- I. Gage Blvd / Morningside Parkway
- J. Unnamed N/S Road / Unnamed E/W Road
- K. Unnamed N/S Road / Bella Coola Lane
- L. Clark Ridge Dr / Bella Coola Lane



Roadway Network

Table 1 describes the existing characteristics of the streets used as primary routes to and from the BMS site. Roadway characteristics are described in terms of orientation, arterial classification, number of lanes, posted speed limits, parking, pedestrian facilities, and bicycle facilities. The relationship of these roadways to the project site is shown in **Figure 1**. An aerial view of the transportation network in the site vicinity is shown on the next page.

Table 1
Existing Study Area Roadway Network

Roadway	Orientation	Existing Functional Classification	# of Travel Lanes	Posted Speed Limit (mph)	Parking	Sidewalks	Bicycle Facilities
Interstate 82 (I-82)	EW	Interstate	4	70	No	No	None
Interstate 182 (I-182)	E/W	Interstate	4	70	No	No	None
Dallas Rd	N/S	Major Collector	2+	35/50	No	No	None
Trowbridge Blvd	E/W	Local Street	2	30	No	Intermittent	None
Ava Way	E/W	Local Street	2	25	No	Intermittent	None
Bombing Range Rd	N/S	Minor Arterial	2+	35	No	Both Sides	None
Kennedy Rd	E/W	Major Collector	2	40	No	Intermittent	None
Keene Rd	NW/SE	Principal Arterial	4+	30/45	No	Intermittent	Bike Path on One Side
Duportail St	N/S	Minor Arterial	4+	30	No	Both Sides	None
Queensgate Dr	N/S	Minor Arterial	4+	35	No	Both Sides	Bike Lanes on Both Sides
Gage Blvd	E/W	Collector Arterial	4+	30	No	Intermittent	None
Leslie Rd	N/S	Minor Arterial	2+	35	No	Intermittent	None
Reata Rd	E/W	Major Collector	2	40	No	No	None

+ includes center two-way left-turn lane (TWLTL)

The following describes the primary roads providing access to the Badger Mountain South area in more detail.

Interstate 82 (I-82) is an east-west limited access freeway that connects I-90 in central Washington I-84 in Oregon. In the project vicinity, I-82 consists of two travel lanes in each direction with a posted speed limit of 70 mph (60 mph for trucks). Paved shoulders exist on both sides of the highway. In the vicinity of Badger Mountain there is an interchange with I-82 at E Badger Rd (Exit 109), an interchange with I-82 at Dallas Road (Exit 104) and an interchange with I-82 at I-182 (Exit 102). The I-82 interchange at Dallas Rd provides primary access to the project site.

Interstate 182 (I-182) / US 12 is an east-west interstate freeway that connects the Tri Cities area between I-82 and the City of Walla Walla. In the project vicinity, I-182 consists of two travel lanes in each direction with a posted speed limit of 70 mph (60 mph for trucks). Paved shoulders exist on both sides of the highway. In the vicinity of the project site, there is an interchange with I-182 at I-

82 (Exit 102) and an interchange with I-182 at Queensgate Drive (Exit 3). The I-182 interchange at Queensgate Drive provides primary access to West Richland to the northwest and the City of Kennewick to the southeast.

Dallas Road is a north-south major collector consisting of two lanes (one in each direction) and a posted speed limit of 35 to 50 mph. Dallas Road provides access to the BMS project site from its interchange with I-82. Paved shoulders exist on both sides of the roadway.

Gage Blvd is an east-west minor arterial consisting of two lanes in each direction with a center two way left turn lane. Gage Blvd connects the commercial area of Kennewick to residential Richland. The posted speed is 30 mph and sidewalks exist on both sides of the roadway east of Keene Road. A future planned extension will connect Gage Blvd to Reata Road through the BMS site.

Reata Road is an east-west major collector consisting of two lanes in each direction and a posted speed limit of 40 mph. Gravel shoulders exist on both sides of the roadway. Reata Road provides a connection between Dallas Road and Leslie Road along the southern boundary of the BMS site.

Nonmotorized Transportation Facilities

Pedestrian facilities in the immediate project vicinity include intermittent sidewalks on the north side of Ava Way, a paved pedestrian path on the southern side of Ava Way, and a paved pedestrian path on the south side of Trowbridge Blvd. The Badger Mountain Trailhead Park Loop, Canyon Trail, Langdon Trail, Sagebrush Trail and Skyline Trail are located directly north of the project site and are protected trails for pedestrians and bicycles. Other pedestrian facilities include curb ramps and crosswalks at the majority of the study intersections. There are no designated bicycle lanes in the immediate vicinity of the site.

Transit Service

Transit service to and from the project vicinity is provided by Ben Franklin Transit (BFT). There is no existing transit service in the vicinity of the BMS project site.

Existing Traffic Volumes

Year 2021 existing weekday AM and PM peak hour traffic volumes at the existing 22 off-site study intersections were based on counts conducted in November 2020 and March 2021. The AM peak hour represents the highest one-hour time period between 7:00 and 9:00 AM and the PM peak hour represents the highest one-hour time period between 4:00 and 6:00 PM (standard ITE-defined peak period).

To calculate the impact of COVID-19 on existing peak hour traffic volumes collected in November 2020 and March 2021, the peak hour traffic volumes were compared to available historical peak hour traffic volumes provided by the City of Richland, the Benton Franklin Council of Governments, and other traffic studies in the project vicinity with an estimated growth rate of 1.2 percent applied to the historical volumes to estimate existing "normal" conditions. The 1.2 percent annual growth rate was based on a review of historical traffic volumes in the project vicinity.

Based on the results of this volume comparison, to estimate "normal" 2020 existing traffic volumes for non-COVID conditions, the traffic counts collected in November 2020 were increased by 25 percent during the AM peak hour and 15 percent during the PM peak hour. Similarly, traffic counts

collected in March 2021 were increased by 15 percent during the AM peak hour and 5 percent during the PM peak hour to estimate “normal” 2021 existing traffic volumes.

The 2021 “normal” weekday AM and PM peak hour traffic volumes at the 24 off-site study intersections are illustrated in Error! Reference source not found. and Error! Reference source not found., respectively. The traffic count sheets are included in **Appendix A**.

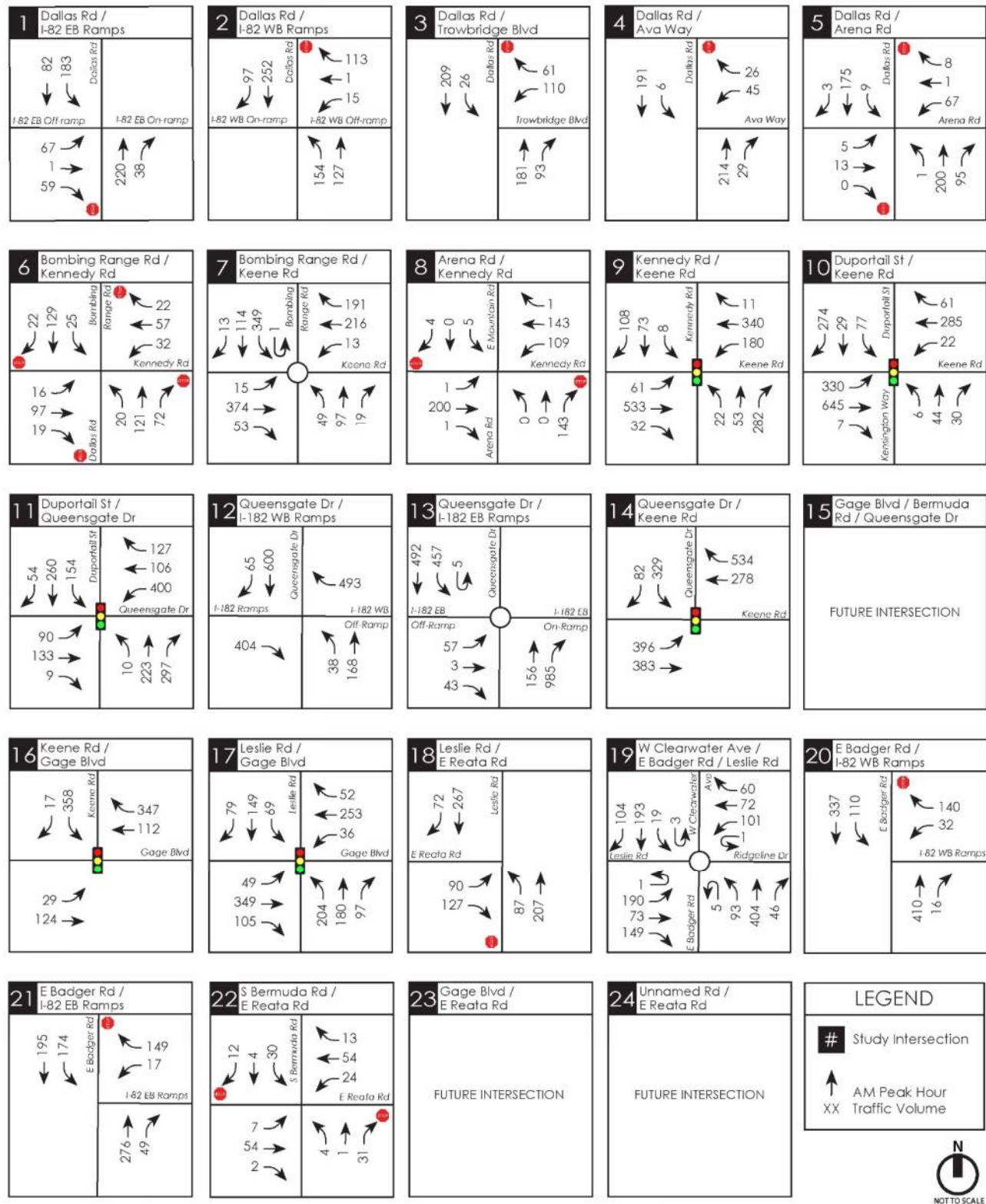


Figure 4: 2021 Existing Weekday AM Peak Hour Traffic Volumes

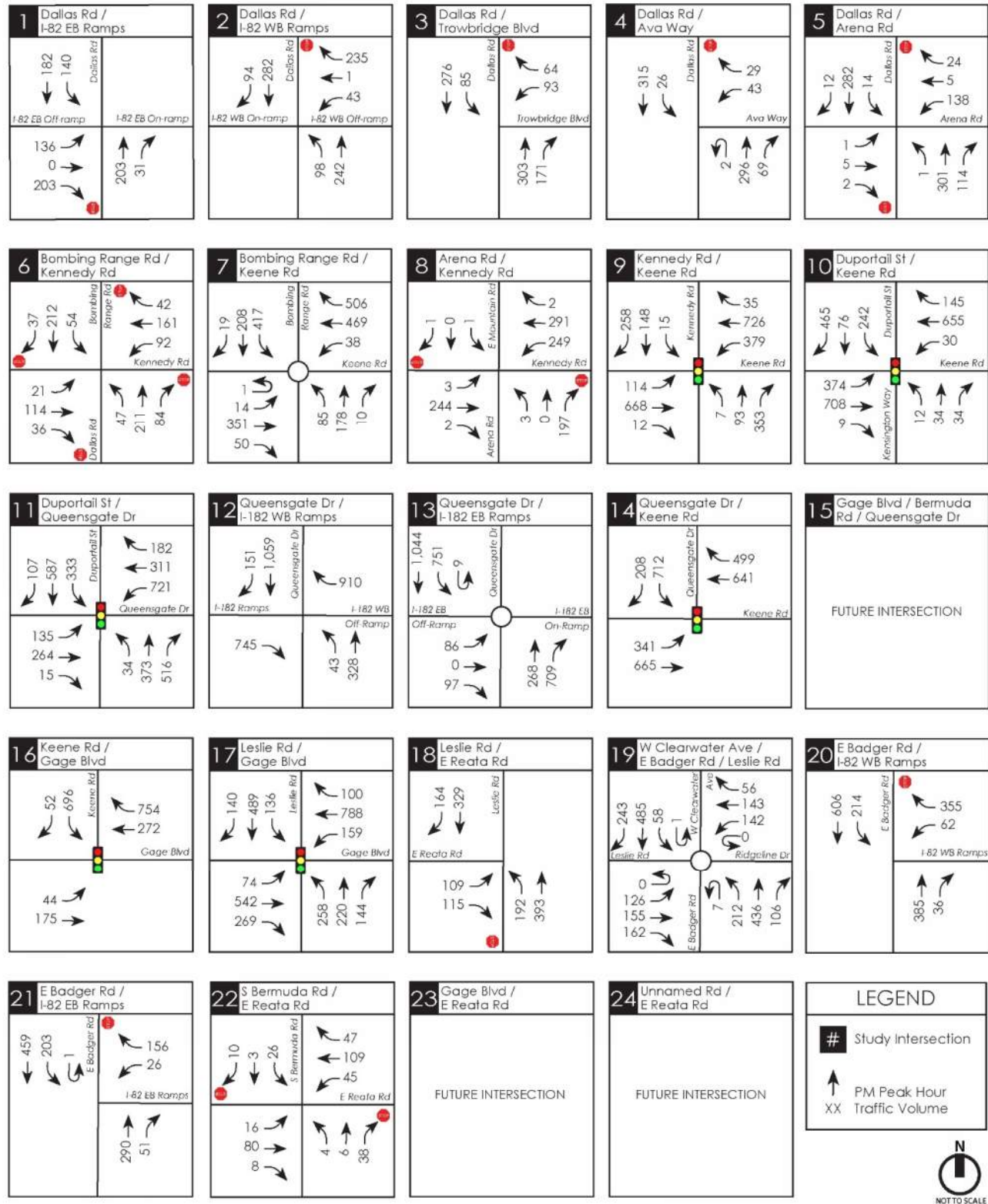


Figure 5: 2021 Existing Weekday PM Peak Hour Traffic Volumes

Existing Level of Service

Based on extensive scoping discussions with the City of Richland, existing weekday AM and PM peak hour level of service (LOS) analyses were conducted at 22 existing off-site study intersections (two of the off-site intersections identified as study intersections are not existing intersections but will be future intersections with the development of BMS).

LOS generally refers to the degree of congestion on a roadway or intersection. It is a measure of vehicle operating speed, travel time, travel delays, and driving comfort. A letter scale from A to F generally describes intersection LOS. At signalized intersections, LOS A represents free-flow conditions (motorists experience little or no delays), and LOS F represents forced-flow conditions where motorists experience an average delay in excess of 80 seconds per vehicle.

The LOS reported for signalized intersections represents the average control delay (sec/veh) and can be reported for the overall intersection, for each approach, and for each lane group (additional v/c ratio criteria apply to lane group LOS only).

The LOS reported at stop-controlled intersections is based on the average control delay and can be reported for each controlled minor approach, controlled minor lane group, and controlled major-street movement (and for the overall intersection at all-way stop controlled intersections. Additional v/c ratio criteria apply to lane group or movement LOS only).

Table 2 outlines the current HCM 6th Edition LOS criteria for signalized and stop-controlled intersections based on these methodologies.

Table 2
LOS Criteria for Signalized and Stop Controlled Intersections

SIGNALIZED INTERSECTIONS			UNSIGNALIZED INTERSECTIONS		
Control Delay (sec/veh)	LOS by Volume-to Capacity (V/C) Ratio ¹		Control Delay (sec/veh)	LOS by Volume-to Capacity (V/C) Ratio ²	
	≤ 1.0	> 1.0		≤ 1.0	> 1.0
≤ 10	A	F	≤ 10	A	F
> 10 to ≤ 20	B	F	> 10 to ≤ 15	B	F
> 20 to ≤ 35	C	F	> 15 to ≤ 25	C	F
> 35 to ≤ 55	D	F	> 25 to ≤ 35	D	F
> 55 to ≤ 80	E	F	> 35 to ≤ 50	E	F
> 80	F	F	> 50	F	F

Source: Highway Capacity Manual, Transportation Research Board, 6th Edition, 2016.

¹ For approach-based and intersection-wide assessments at signals, LOS is defined solely by control delay.

² For two-way stop controlled intersections, the LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole at two-way stop controlled intersections. For approach-based and intersection-wide assessments at all-way stop controlled intersections and roundabouts, LOS is solely defined by control delay.

LOS calculations were based on methodology and procedures outlined in the 6th Edition of the *Highway Capacity Manual* using *Synchro 10* and *SIDRA 9* traffic analysis software. Existing signal timing at the signalized study intersections was provided by the City of Richland.

The 2021 existing AM and PM peak hour LOS analysis results at the 22 existing off-site study intersections are summarized in **Table 3** (for signals and roundabouts) and **Table 4** (for stop-controlled). The LOS worksheets are included in **Appendix B**. It should be noted that study intersection #12 (Queensgate Dr / I-182 WB Ramps) is not included in **Table 3** or **Table 4** because

all movements at the intersection are uncontrolled and thus do not have any vehicular delay associated with them.

Table 3
2021 Existing Peak Hour LOS Summary at Off-Site Study Intersections (signals and roundabouts)

Study Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec)	LOS	Delay (sec)
<u>Signalized Intersections</u>				
9. Kennedy Road / Keene Road	C	22.8	C	27.5
10. Duportail Street / Keene Road	C	27.3	C	26.3
11. Duportail Street / Queensgate Drive	C	30.5	C	27.3
14. Queensgate Drive / Keene Road	B	18.8	C	24.4
16. Keene Road / Gage Blvd	B	14.0	B	14.1
17. Leslie Road / Gage Blvd	C	28.4	D	53.4
<u>Roundabout Intersections</u>				
7. Bombing Range Road / Keene Road	A	8.9	C	18.2
13. Queensgate Drive / I-182 EB Ramps	A	5.9	A	6.4
19. Badger Road / Clearwater Ave / Leslie Road	A	8.2	A	9.5

Table 4
2021 Existing Peak Hour LOS Summary at Off-Site Study Intersections (stop-controlled)

Study Intersection / Movement	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec)	LOS	Delay (sec)
<u>All-Way Stop Controlled Intersection</u>				
6. Bombing Range Road / Kennedy Road	A	9.7	C	15.9
<u>Two-Way Stop Controlled Intersections</u>				
1. Dallas Road / I-82 EB Ramps				
Eastbound Approach	C	21.5	E	41.1
Southbound Left-Turn	A	8.5	A	8.1
2. Dallas Road / I-82 WB Ramps				
Westbound Approach	B	11.2	C	16.9
Northbound Left-Turn	A	8.8	A	8.7
3. Dallas Road / Trowbridge Blvd				
Westbound Approach	B	14.3	C	22.2
Southbound Left-Turn	A	8.1	A	8.8
4. Dallas Road / Ava Way				
Westbound Approach	B	11.7	C	15.8
Southbound Left-Turn	A	8.0	A	8.2
5. Dallas Road / Arena Road				
Eastbound Approach	B	13.7	C	15.7
Westbound Approach	C	15.7	E	41.8
Northbound Left-Turn	A	7.6	A	7.9
Southbound Left-Turn	A	7.9	A	8.3
8. Arena Road / Kennedy Road				
Eastbound Left-Turn	A	7.5	A	7.8
Westbound Left-Turn	A	8.0	A	8.4
Northbound Approach	B	10.7	B	11.7
Southbound Approach	C	15.4	D	25.5
18. Leslie Road / Reata Road				
Eastbound Left-Turn	C	17.5	C	24.7
Eastbound Right-Turn	B	12.1	B	11.3
Northbound Left-Turn	A	8.8	A	9.3
20. Badger Road / I-82 WB Ramps				
Westbound Shared Left-Right	D	27.1	F	58.0
Southbound Left-Turn	A	9.7	A	9.0
21. Badger Road / I-82 EB Ramps				
Westbound Approach	C	16.5	C	15.1
Southbound Left-Turn	A	9.3	A	8.7
22. Bermuda Road / Reata Road				
Eastbound Left-Turn	A	7.5	A	7.6
Westbound Left-Turn	A	7.5	A	7.5
Northbound Approach	A	9.2	A	9.9
Southbound Approach	B	10.7	B	12.0

AM Peak Hour

As shown in **Table 3**, all signalized and roundabout study intersections are currently operating at LOS C or better during the AM peak hour.

As shown in **Table 4**, the all-way stop controlled study intersection and all individual lane groups at the stop controlled study intersections are currently operating at LOS D or better during the AM peak hour.

PM Peak Hour

As shown in **Table 3**, all signalized and roundabout study intersections are currently operating at LOS D or better during the PM peak hour.

As shown in **Table 4**, the all-way stop controlled study intersection and all individual lane groups at the stop controlled study intersections are currently operating at LOS D or better during the PM peak hour with exception to the following:

- #1 Dallas Road/I-82 EB Ramps – the eastbound approach is currently operating at LOS E
- #5 Dallas Road/Arena Road – the westbound approach is currently operating at LOS E
- #20 Badger Road/I-82 WB Ramps – the westbound approach is currently operating at LOS F

FUTURE YEAR TRAFFIC ANALYSIS

This section provides information related to future planned roadway improvements, weekday AM and PM peak hour traffic volumes, and peak hour LOS at study intersections in year 2040. The 2040 traffic conditions account for buildout of the BMS development and growth in background traffic. Level of service (LOS) evaluation during weekday AM and PM peak hours is used to identify locations where future improvements will be necessary to maintain acceptable LOS operations by 2040. Locations where improvements are needed are then addressed later in the Mitigation Measures section of the report.

Planned Transportation Improvements

This section describes the planned transportation improvements located within the project study area. The following planning documents were reviewed to document planned capacity-related transportation improvements located within the project study area. It should be noted that planned improvements are noted for the next 6-year period; road and intersection improvements beyond 2026 are not clearly identified.

- Benton-Franklin Council of Governments 2021-2024 Transportation Improvement Program (TIP)
- City of Richland 2021-2026 Transportation Improvement Program (TIP)
- City of West Richland 2021-2026 Transportation Improvement Program (TIP)
- WSDOT 2021-2024 Statewide Transportation Improvement Program (STIP)

City of Richland 2021 – 2026 TIP

16. Gage Blvd Improvements. Improvements of Gage Blvd from Penny Royal Ave to Morency Dr. The project involves the addition of curbs, gutter, sidewalks, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2024.

17. Queensgate Drive Extension Phase I. Extension of Queensgate Dr from Shockley Rd to Keene Rd. The new roadway will have three lanes with curbs, gutter, sidewalks, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2025.

22. Dallas Road / Trowbridge Blvd Intersection Improvements. Improvements of the Dallas Rd and Trowbridge Blvd intersection. The project involves the reconstruction of the intersection to provide for added capacity. Construction is anticipated to start in 2024.

23. Dallas Road / I-82 WB Ramps Intersection Improvements. Improvements of the Dallas Rd and I-82 WB ramps intersection. The project involves the reconstruction of the ramp and intersection to provide for added capacity. Construction is anticipated to start in 2025.

24. Dallas Road / I-82 EB Ramps Intersection Improvements. Improvements of the Dallas Rd and I-82 EB ramps intersection. The project involves the reconstruction of the ramp and intersection to provide for added capacity. Construction is anticipated to start in 2025.

25. Dallas Road / Ava Way Intersection Improvements. Improvements of the Dallas Rd and Ava Way intersection. The project involves the reconstruction of the intersection to provide for added capacity. Construction is anticipated to start in 2024.

26. Gage Blvd Extension. Extension of Gage Blvd from Morency Dr to Queensgate Blvd. The new roadway will have three lanes with curbs, gutter, sidewalks, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2025.

27. Dallas Road Widening. Widening of Dallas Rd from city limits to I-82. The new roadway will have four lanes with curbs, gutter, sidewalks, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2026.

28. Shockley Road Extension. Extension of Shockley Rd from Keene Rd to south of Badger Valley Way. The new roadway will have two lanes with curbs, gutter, sidewalks, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2026.

29. Trowbridge Blvd – Ava Way to B-C. Extension of Trowbridge Blvd from Ava Way to Road B-C. The new roadway will have two lanes with curbs, gutter, sidewalks, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2025.

30. Bella Coola Lane – Trowbridge Blvd to Road B-C. Construction of Bella Coola Ln from Trowbridge Blvd to Road B-C. The new roadway will have two lanes with curbs, gutter, sidewalks, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2025.

31. Road B-C / Trowbridge Blvd Intersection Improvements. Construction of the Road B-C/Trowbridge Blvd intersection. Construction is anticipated to start in 2026.

32. Road B-C. Construction of Road B-C from Corvina St to Queensgate Drive. The new roadway would include two lanes with curb, gutter, sidewalk, bike lanes, street lights, and storm drainage. Construction is anticipated to start in 2026.

33. Queensgate Drive Extension – Phase II. Construction of the Queensgate Drive Extension from Legacy Lane to the Richland city limits. The new roadway would be a 2-lane collector with curb, gutter, sidewalk, bike lanes, street lights, and storm drainage facilities. Construction is anticipated to start in 2026.

36. Kingsgate Corridor Improvements. Construction of Kingsgate Way from Kennedy Road to SR 240. The new 2-lane roadway and bridge over the Yakima River would include curb, gutter, sidewalk, bike lanes, street lights and storm drainage facilities. Construction is anticipated to start in 2026.

City of West Richland TIP

Bombing Range Road / Keene Road Intersection Modifications. This project would signalize the intersection and construct associated lane improvements. Construction is anticipated to occur in 2025.

Bombing Range Road / Kennedy Road Intersection Modifications. This project would construct intersection modifications which may include signalization of the intersection.

WSDOT 2021 – 2024 STIP

Dallas Road Bike Path Project (MP 2.20 to MP 4.22). This project will widen the shoulders of Dallas Road to include bicycle lanes on both sides of the road. Construction is anticipated to start in 2021.

Bombing Range Road / Keene Road Intersection Modifications. This project would signalize the intersection. Construction is anticipated to occur in 2025.

Future Year 2040 Roadway Network

The roadway network assumed in the future year 2040 LOS analysis at the 24 off-site study intersections was based on existing intersection geometry with exception to the following:

- **#1 Dallas Road / I-82 Eastbound Ramps** – this intersection was assumed to include a southbound left-turn lane as identified in the BMS Master Agreement for Phase 1.
- **#2 Dallas Road / I-82 Westbound Ramps** – this intersection was assumed to include a westbound right-turn lane, a northbound left-turn lane, and a southbound right-turn lane as identified in the BMS Master Agreement for Phase 1.
- **#3 Dallas Road / Trowbridge Blvd** – this intersection was assumed to account for Dallas Road being widened to 4 lanes south of Trowbridge Blvd as identified in the BMS Master Agreement for Phase 1 and was assumed to be a 4-leg roundabout.
- **#4 Dallas Road / Ava Way** – this intersection was assumed to include turn lanes on Dallas Road as identified in the BMS Master Agreement for Phase 1 and was assumed to be unsignalized with Dallas Road free flow and Ava Way stop-controlled. A new west leg of the intersection was included at this intersection to account for planned BMS development in the BMS Station neighborhood west of Dallas Road.
- **#7 Bombing Range Road / Keene Road** – this intersection was assumed to be reconstructed from an existing roundabout to a signalized intersection per a City of West Richland TIP project. Channelization improvements include the following: two eastbound through lanes with separate eastbound right and left-turn lanes; two westbound through lanes with separate westbound right and left-turn lanes; a northbound left-turn lane plus a shared through-right-turn lane; and dual southbound left-turn lanes plus a shared through-right-turn lane.
- **#14 Queensgate Drive / Keene Road** – this intersection was assumed to include a new south leg as part of the Queensgate Drive Extension project identified in the City of Richland's 2021-2026 TIP. Channelization improvements include the following: two eastbound through lanes with separate right and left-turn lanes; two westbound through lanes with separate right and left-turn lanes; a northbound left-turn lane plus a shared through-right-turn lane; and dual southbound left-turn lanes with separate through and right-turn lanes.
- **#15 Gage Blvd / Queensgate Drive / Bermuda Road** – this intersection will be a new unsignalized intersection as part of the Queensgate Drive Extension Project identified in the City of Richland's 2021-2026 TIP and was assumed to be all-way stop controlled with the eastbound, southbound, and northbound approaches consisting of a left-turn lane and shared through-right-turn lane. The east leg (westbound approach) of the intersection was assumed to be a single-lane (shared left-through-right).
- **#23 Gage Blvd / Reata Road** – a new unsignalized intersection was assumed at this location with Reata Road a single-lane in each direction and free flow. Gage Boulevard was assumed to include separate southbound right and left-turn lanes and be stop-controlled.
- **#24 Unnamed N/S Road / Reata Road** – a new unsignalized intersection was assumed at this location with Reata Road a single-lane in each direction and free flow.

The Unnamed N/S Road is assumed to include separate southbound right and left-turn lanes and be stop-controlled.

Project Land Use Assumptions by Year

Development of the BMS project will occur in phases over the next 20 years with full buildout anticipated to be achieved by 2040. **Table 5** below summarizes the existing BMS development as of November 2020 (when existing traffic volumes were conducted) and the future land use anticipated to be developed by years 2025, 2030, 2035, and 2040 as provided by the applicant/owner. It should be noted that the future land use assumptions by development year and by BMS neighborhood have been provided by the applicant/owner and are based on the best available information the owner/applicant currently has at this time. However, it should be recognized that the assumptions may be updated or changed as the Badger Mountain South project develops over the next 20 years.

Table 5
Project Land Use Summary by Development Year

Land Use	Total Badger Mountain South Land Use				
	Existing (as of Nov 2020)	Year 2025	Year 2030	Year 2035	Year 2040 (Full Buildout)
<u>Residential</u>					
Single Family	428 DU	1,247 DU	1,617 DU	2,152 DU	2,382 DU
Multifamily	283 DU	808 DU	1,258 DU	1,598 DU	2,058 DU
Senior Adult Housing	--	150 DU	150 DU	150 DU	150 DU
Subtotal Residential	711 DU	2,205 DU	3,025 DU	3,900 DU	4,590 DU
<u>Commercial</u>					
Grocery Store	18,030 sf	18,030 sf	18,030 sf	18,030 sf	18,030 sf
Gas Station w/ Market	3,200 sf	3,200 sf	3,200 sf	3,200 sf	3,200 sf
Fast-Food w/ Drive-Thru	700 sf	700 sf	700 sf	700 sf	700 sf
Shopping Center	--	--	260,000 sf	485,000 sf	500,000 SF
Home Improvement Superstore	--	--	--	130,000 sf	130,000 sf
Sporting Goods Superstore	--	--	--	130,000 sf	130,000 sf
Medical Office	--	40,000 sf	40,000 sf	40,000 sf	40,000 sf
Mini-Warehouse	--	175,000 sf	175,000 sf	175,000 sf	175,000 sf
<u>Other</u>					
Church		20,000 sf	20,000 sf	20,000 sf	20,000 sf

In addition to the BMS land use assumptions summarized in **Table 5** above, there are four schools and a separate single family residential plat anticipated to be constructed within the BMS subarea as follows:

- Elementary School (Kennewick School District) – 650 students (by 2025)
- Middle School (Richland School District) – 800 students (by 2025)
- Elementary School (Richland School District) – 650 students (by 2030)
- High School (Kennewick School District) – 2,000 students (by 2030)
- Harvest Ridge Single Family Residential Plat – 143 dwelling units (by 2025)

Project Trip Generation

Trip generation estimates for development of the BMS site in future years 2025, 2030, 2035 and 2040 (full buildout) were based on methodology documented in the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 10th Edition (2017). *It should be noted that although trip generation estimates were prepared for four future development years (2025, 2030, 2035, and 2040), the analysis documented in subsequent sections of this TIA focuses on year 2040 conditions with full buildout of the BMS site.*

Reductions to the gross trip generation estimates were made to account for internal and pass-by trips. Internal trips are made by people making multiple stops within a development without generating new trips onto the adjacent street system. The internal trip adjustments for the peak hours were based on methodology established in the ITE *Trip Generation Handbook*, 3rd Edition, 2017 and the internal adjustments for the weekday time period were based on methodology documented in the ITE *Trip Generation Handbook*, 2nd Edition. Pass-by trips are trips that are made by vehicles that are already on the adjacent streets and make intermediate stops at the commercial uses on route to a primary destination (i.e. on the way from work to home). The pass-by trips were based on methodology and studies documented in the ITE *Trip Generation Handbook*, 3rd Edition, 2017.

The resulting net new weekday daily, AM peak hour, and PM peak hour trip generation estimates for full buildout of the BMS site in 2040 are shown in **Table 6**. Detailed trip generation calculations for year 2040 conditions with full buildout are included in **Appendix C**. The detailed peak hour trip generation for future years 2025, 2030, and 2035 are included in **Appendix D**. *It should be noted that the future year 2040 trip generation estimates summarized in Table 6 and included in Appendix C include existing BMS land use that was constructed and occupied as of November 2020.*

Table 6
Project Trip Generation Summary for Project Buildout (Year 2040)

Trip Type	Weekday New Trips Generated								
	Daily			AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Gross Trips	33,041	33,042	66,083	1,266	2,311	3,577	3,359	2,724	6,083
Less Internal Trips	-4,957	-4,957	-9,914	-63	-63	-126	-539	-539	-1,078
Less Pass-by Trips	<u>-5,079</u>	<u>-5,079</u>	<u>-10,158</u>	<u>-215</u>	<u>-163</u>	<u>-378</u>	<u>-431</u>	<u>-452</u>	<u>-883</u>
New Trips	23,005	23,006	46,011	988	2,085	3,073	2,389	1,733	4,122

As shown in **Table 6**, with full buildout in 2040, the BMS site is estimated to generate a total of 46,011 new weekday daily trips, with 3,073 new trips occurring during the weekday AM peak hour (988 entering, 2,085 exiting), and 4,122 new trips occurring during the weekday PM peak hour (2,389 entering, 1,733 exiting).

A summary of the total year 2040 (full buildout) project trip generation by BMS neighborhood is also included in **Table 7** below.

Table 7
Project Trip Generation Summary for Project Buildout (Year 2040) by BMS Subarea

BMS Neighborhood	2040 Land Use	Weekday Net New Trips Generated					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
BMS Station	130,000 sf home imp. superstore						
	130,000 sf sporting goods superstore						
	445,000 sf shopping center						
	175,000 sf mini-warehouse	346	208	554	743	683	1,426
	150 DU senior housing						
	18,030 sf grocery store						
	40,000 sf medical office						
West Vineyard	303 single family DU	72	220	292	183	115	298
	220 multifamily DU						
West Village	542 single family DU						
	301 multifamily DU						
	3,200 sf gas station/market	144	386	530	349	221	570
	700 sf fast food with drive thru						
East Garden	20,000 sf church						
	305 single family DU						
	505 multifamily DU	128	394	522	329	209	538
East Market	10,000 sf shopping center						
	850 single family DU						
	320 multifamily DU	209	608	817	555	358	913
South Orchard	45,000 sf shopping center						
	382 single family DU	89	269	358	230	147	377
	252 multifamily DU						
TOTAL		988	2,085	3,073	2,389	1,733	4,122

Project Trip Distribution and Assignment

The distribution of BMS project trips for year 2040 (full buildout) conditions was based on select zone traffic modeling provided by the Benton Franklin Council of Governments (BFCG). The BFCG traffic model distributed BMS project trips through the off-site study intersections based on specific project land use and trip generation assumptions associated with each of the model's TAZ's within the BMS subarea. The project distribution from the traffic model also assumed the roadway improvements outlined above were in place. Although the BFCG traffic model is a PM peak hour based model, it was assumed that the BMS trip distribution for the AM peak hour is consistent with the PM peak hour. The estimated peak hour BMS project trip distribution for year 2040 conditions is illustrated in **Figure 6**.

The specific distribution and assignment of net new peak hour project trips through the BMS off-site access points and internal (on-site) study intersections was based on the general off-site trip distribution from the model (**Figure 6**) and the specific development assumptions and trip generation estimates for each of the six BMS neighborhoods (BMS Station, West Village, West Vineyard, East Garden, East Market and South Orchard as shown in **Figure 3**). The resulting AM and PM peak hour net new project trip assignment at the 24 off-site study intersections is shown in **Figures 7 and 8**, respectively. The resulting AM and PM peak hour net new project trip assignment at the 12 on-site study intersections is shown in **Figures 9 and 10**, respectively.

Internal project trips are typically not assigned as vehicular trips since they are assumed to occur internal to a project site and do not impact the transportation system. However, as a result of the size of the BMS site, it was conservatively assumed that all internal project trips would be vehicular trips. The assignment of peak hour internal vehicular trips through the BMS site was based on the specific origins and destinations of the internal project trips by land use and BMS neighborhood. The resulting AM and PM peak hour internal and pass-by project trip assignment at the 12 on-site study intersections is included in **Appendix E**. The resulting total AM and PM peak hour project trip assignment (net new plus internal plus pass-by trips) at the off-site study intersections is shown in **Figures 11 and 12**. The resulting total AM and PM peak hour project trip assignment (net new plus internal plus pass-by trips) at the on-site study intersections is shown in **Figures 13 and 14**.

Future Year 2040 Traffic Volumes

Future year 2040 AM and PM peak hour traffic volumes with full buildout of BMS were estimated by applying a 1.2 percent annual growth rate to the “normal” existing (year 2021) volumes, adding project traffic associated with full buildout of Badger Mountain South (see **Figures 13 and 14**), and also adding traffic volumes or estimated traffic volume adjustments associated with the following pipeline or roadway improvement projects:

- Harvest Ridge single family residential plat – 143 dwelling units
- Elementary School (Kennewick School District) – 650 students
- Middle School (Richland School District) – 800 students
- Elementary School (Richland School District) – 650 students
- High School (Kennewick School District) – 2,000 students
- Duportail Street bridge improvement
- Queensgate Drive Extension improvement
- Gage Blvd Extension improvement

The 1.2% annual growth rate was calculated based on a comparison of link traffic volumes at the off-site study intersections from the future year 2025 and year 2040 baseline (without BMS project traffic) traffic modeling provided BFCG. Traffic volumes associated with additional pipeline development identified by the City of Richland, including Sienna Hills, Westcliffe, and Red Mountain Center, is assumed to be accounted for in the 1.2% annual background growth rate.

Manual At the time that the existing counts were conducted in November 2020, the Duportail Bridge was still under construction. Therefore, traffic volume adjustments at the study intersections to account for the Duportail Street bridge improvement project were estimated by comparing November 2020 counts to March 2021 counts with the bridge open. Traffic volume adjustments at the study intersections to account for the future Queensgate Drive Extension and Gage Blvd Extension roadway improvement projects were estimated based on the future year 2040 ‘baseline’ traffic modeling (without BMS site traffic) provided by BFCG.

The future 2040 with Full Buildout weekday AM and PM peak hour traffic volumes at the 24 off-site study intersections are shown in **Figure 15 and Figure 16**, respectively. The future 2040 with Full Buildout weekday AM and PM peak hour traffic volumes at the 12 on-site study intersections are shown in **Figure 17 and Figure 18**, respectively.

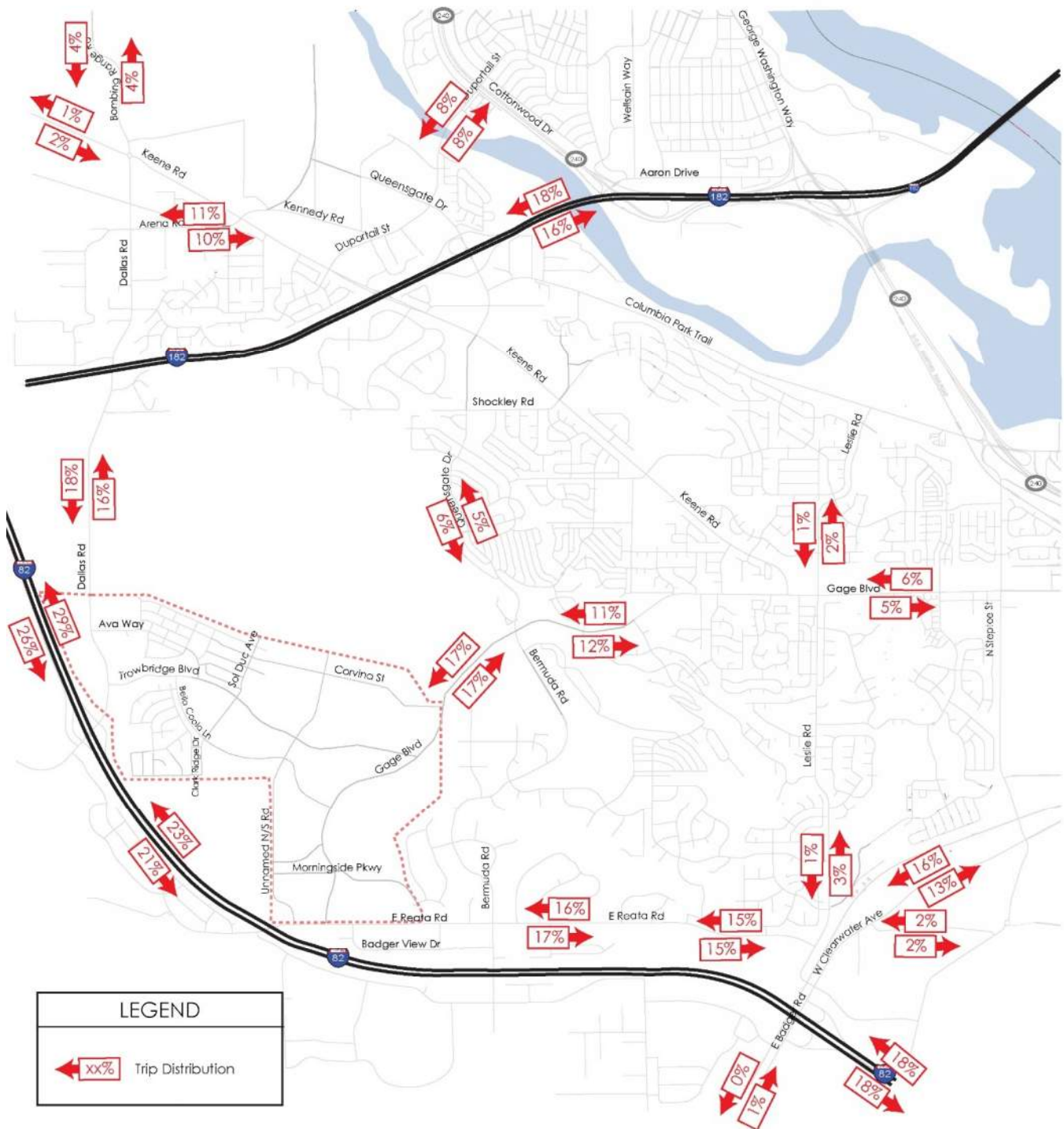


Figure 6: Year 2040 Peak Hour Project Trip Distribution



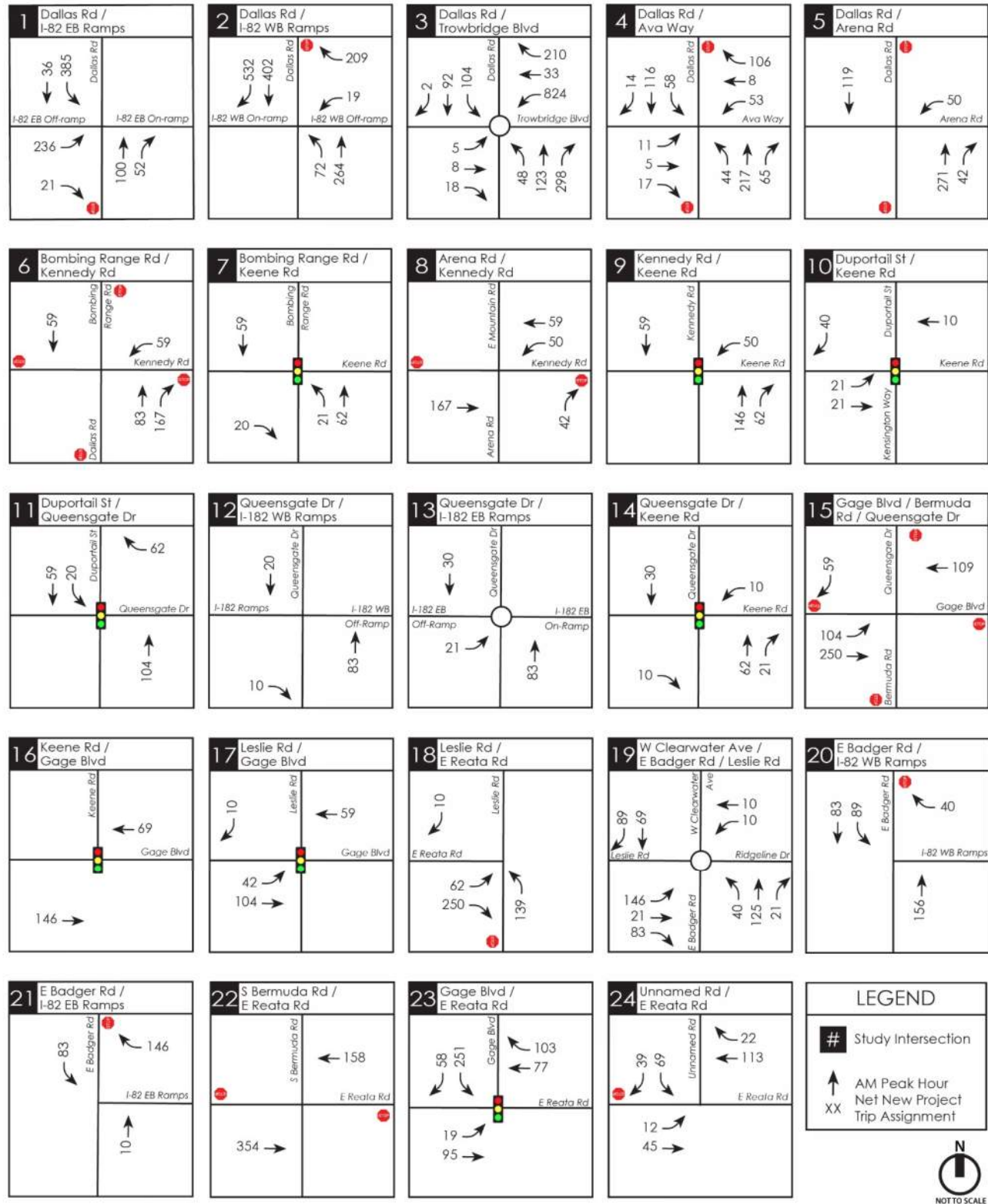


Figure 7: Year 2040 AM Peak Hour Net New Project Trip Assignment (off-site)

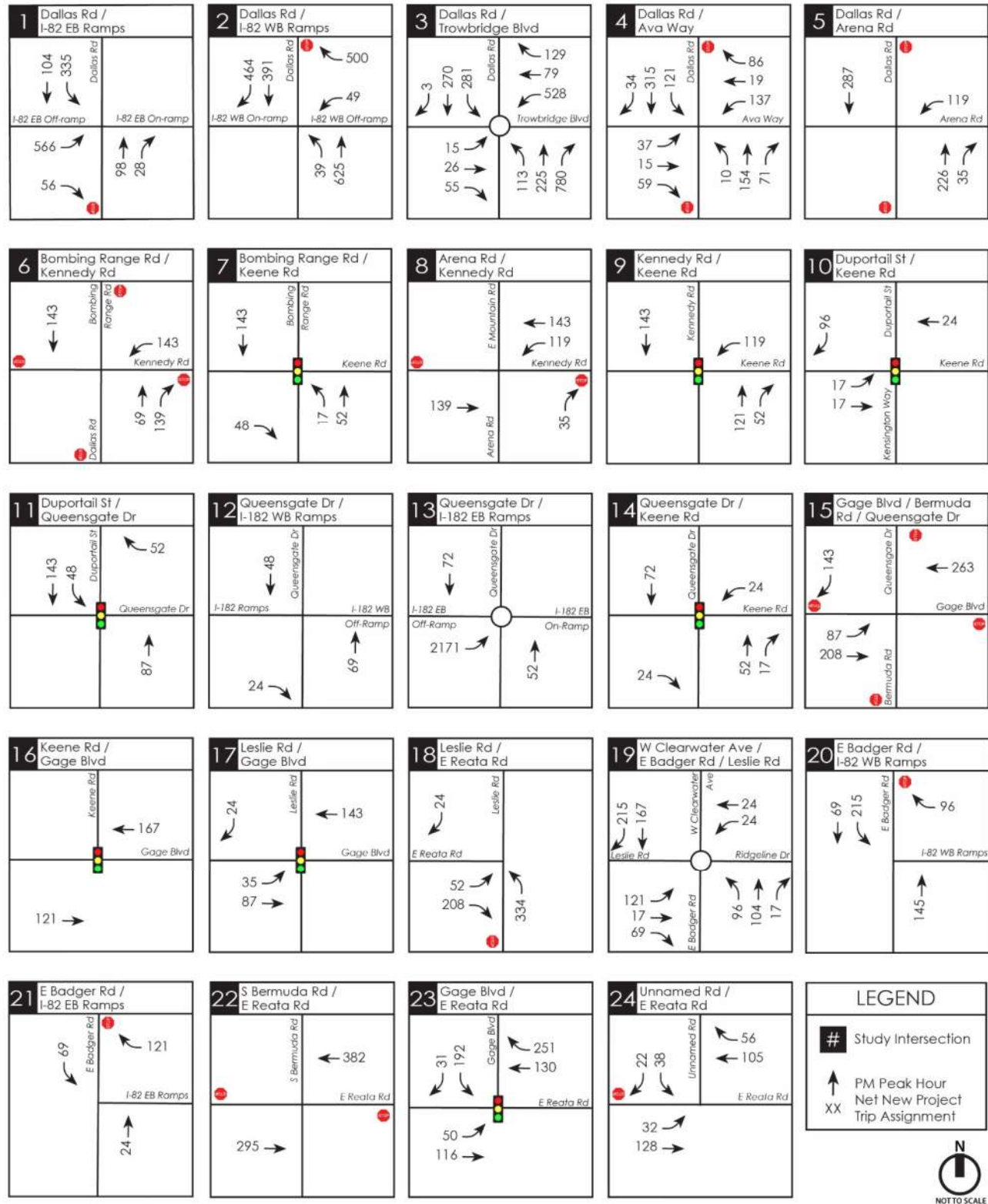


Figure 8: Year 2040 PM Peak Hour Net New Project Trip Assignment (off-site)

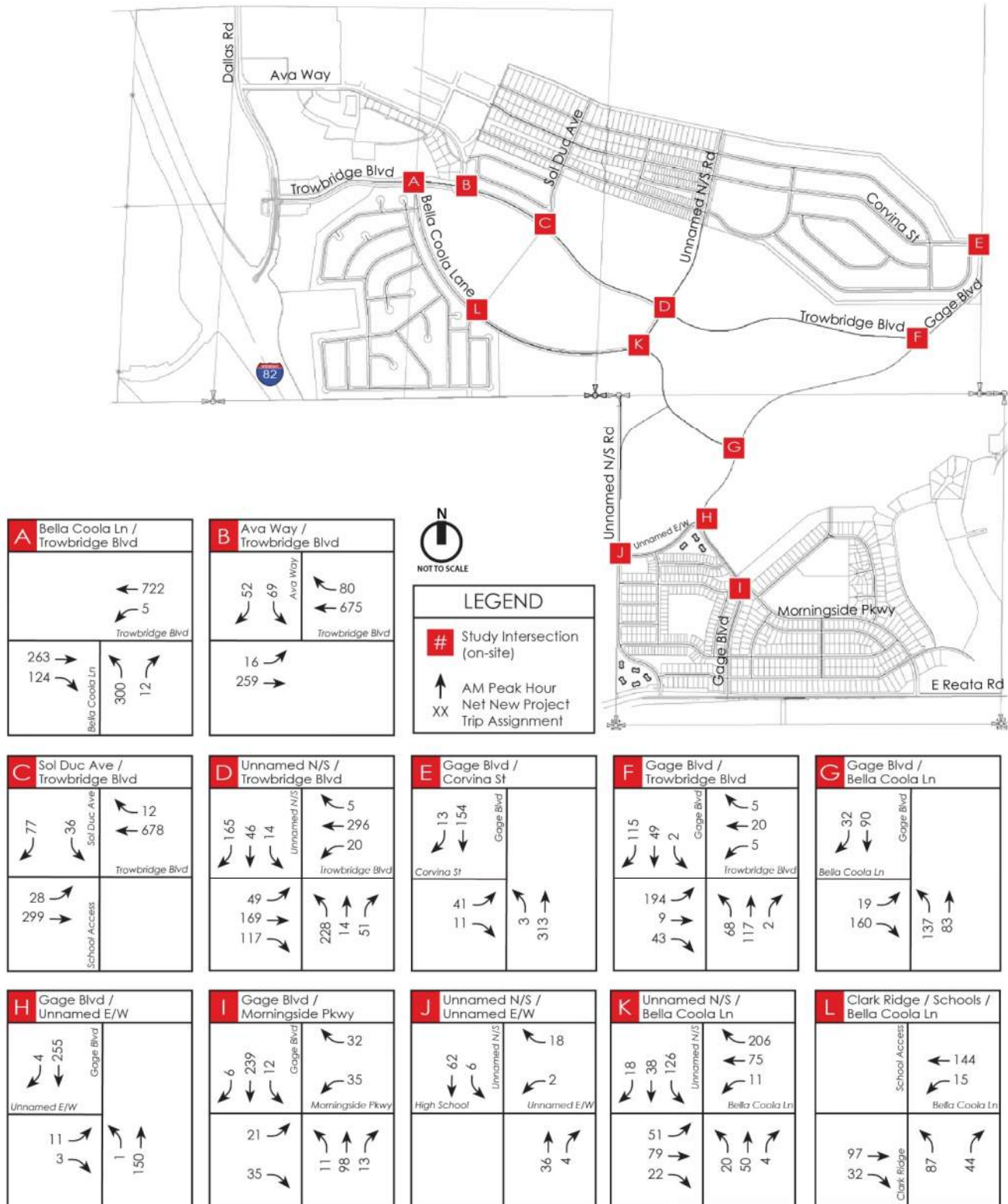


Figure 9: Year 2040 AM Peak Hour Net New Project Trip Assignment (on-site)

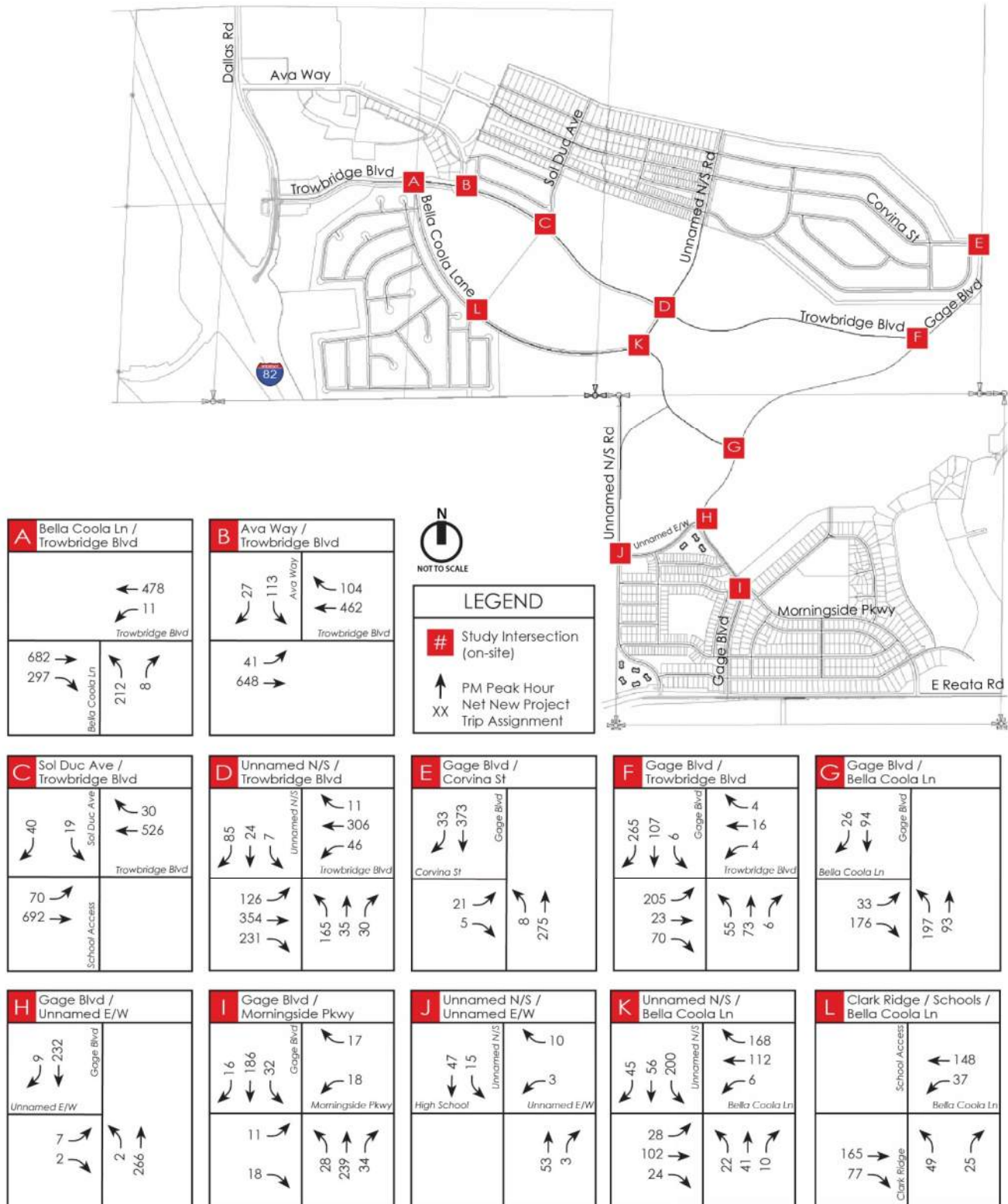


Figure 10: Year 2040 PM Peak Hour Net New Project Trip Assignment (on-site)

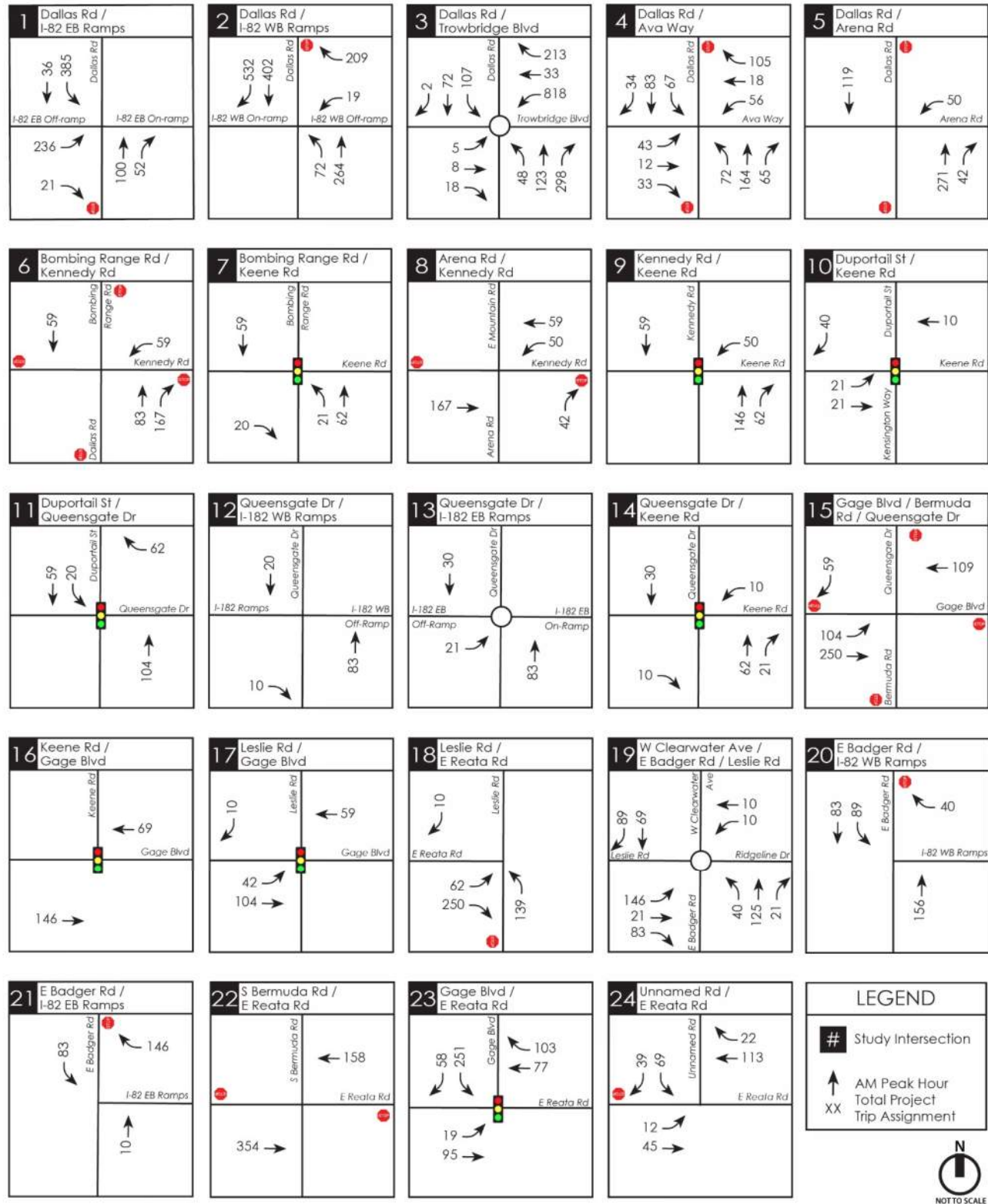


Figure 11: Year 2040 AM Peak Hour Total Project Trip Assignment (off-site)

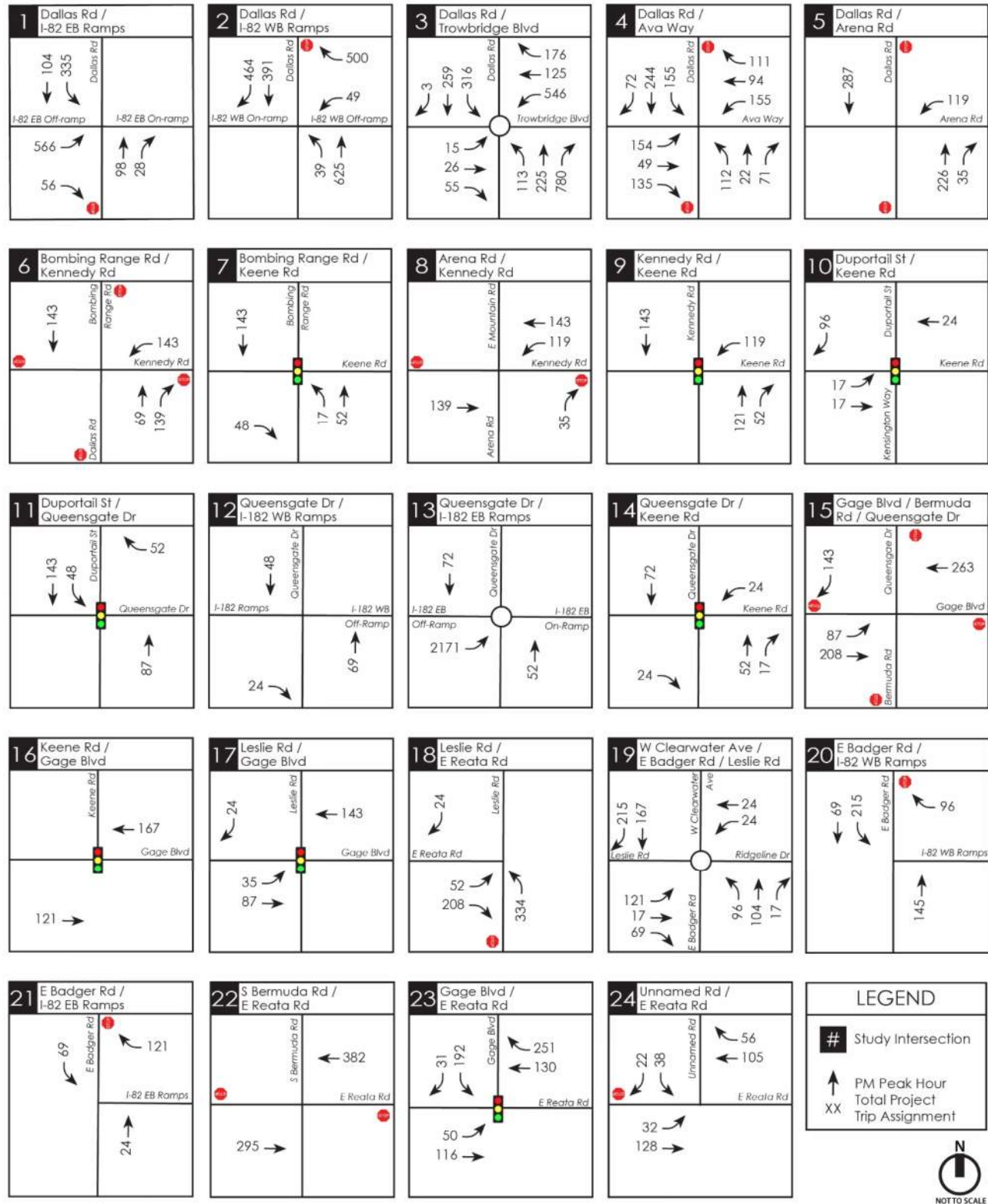


Figure 12: Year 2040 PM Peak Hour Total Project Trip Assignment (off-site)

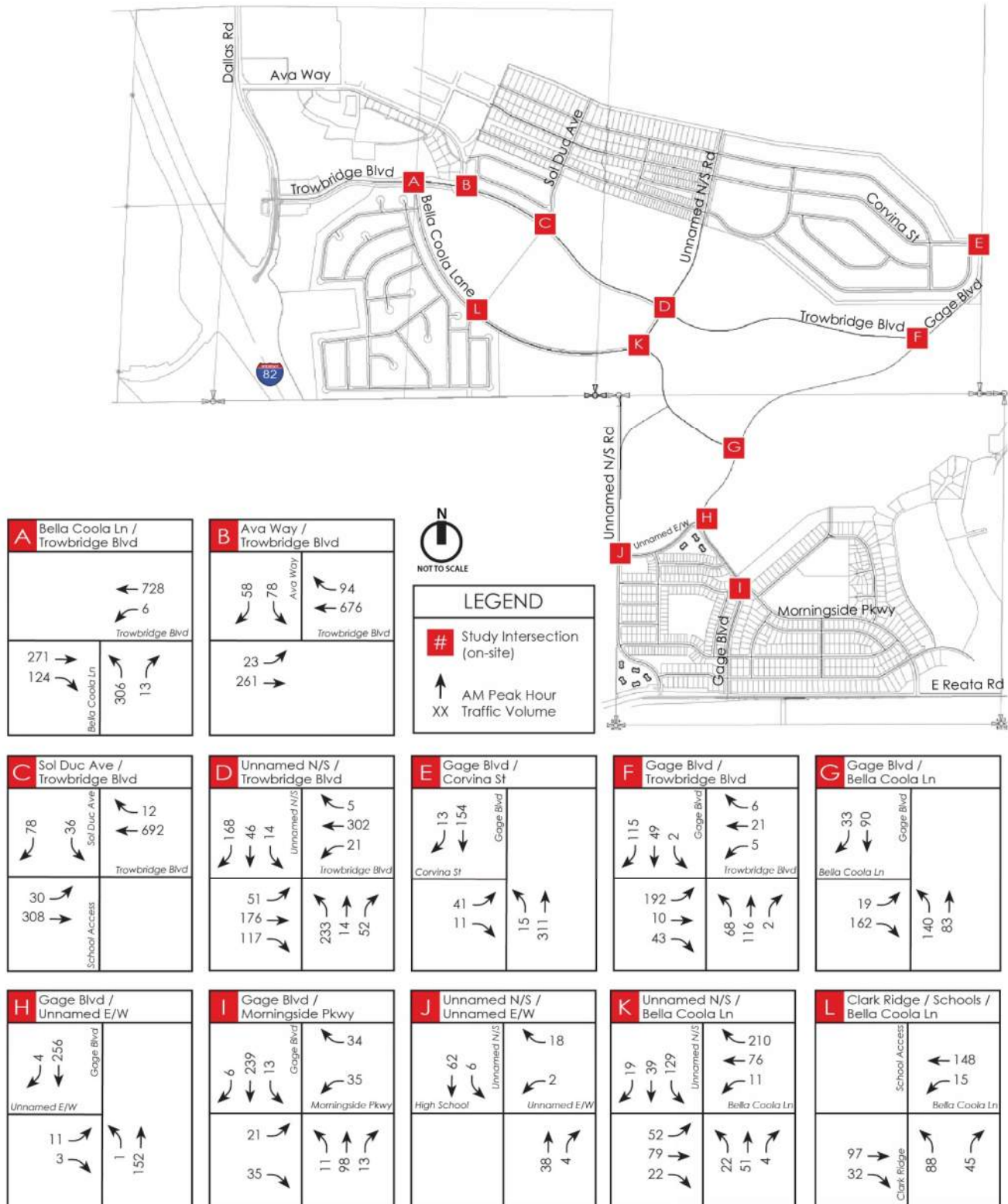


Figure 13: Year 2040 AM Peak Hour Total Project Trip Assignment (on-site)

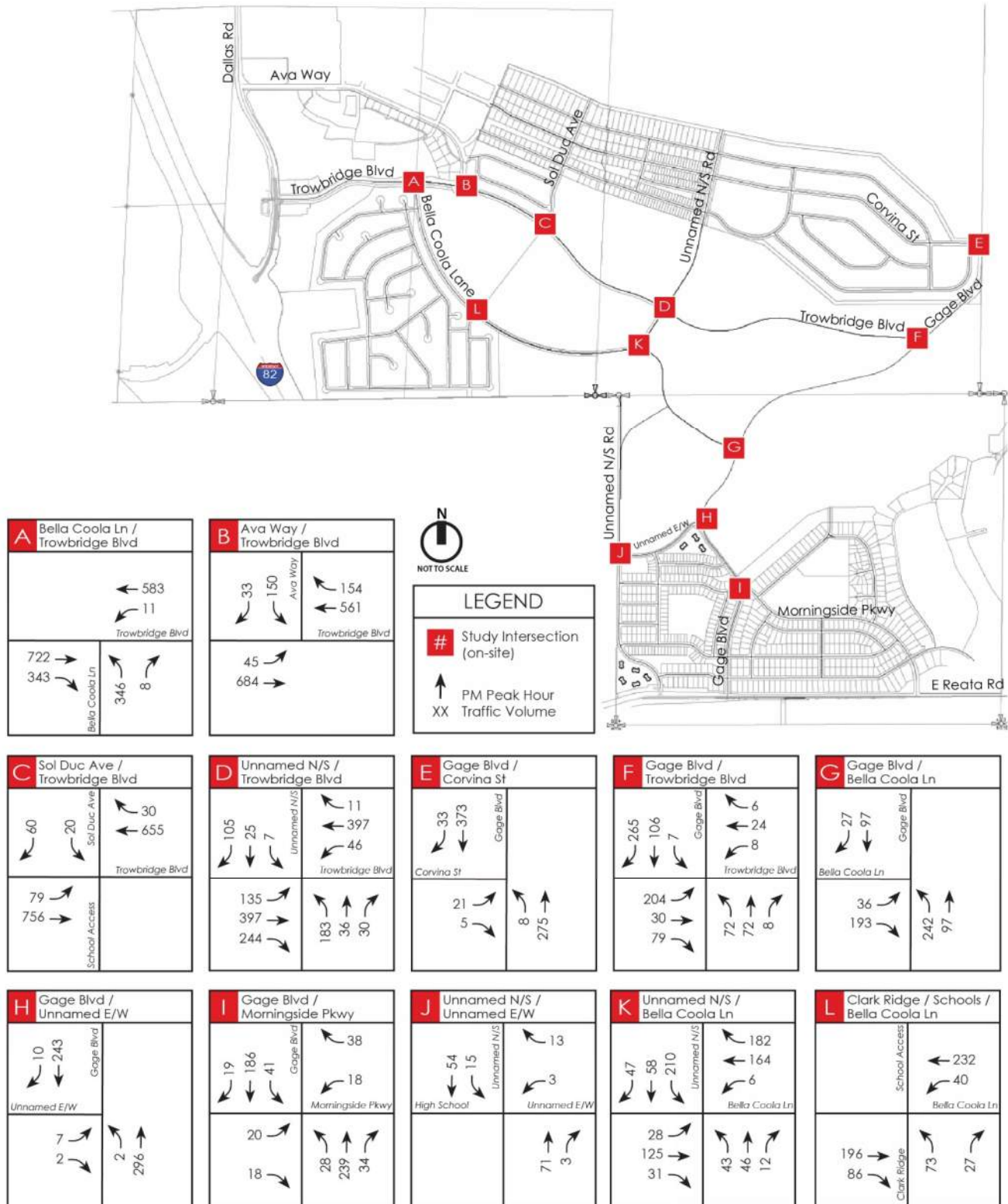


Figure 14: Year 2040 PM Peak Hour Total Project Trip Assignment (on-site)

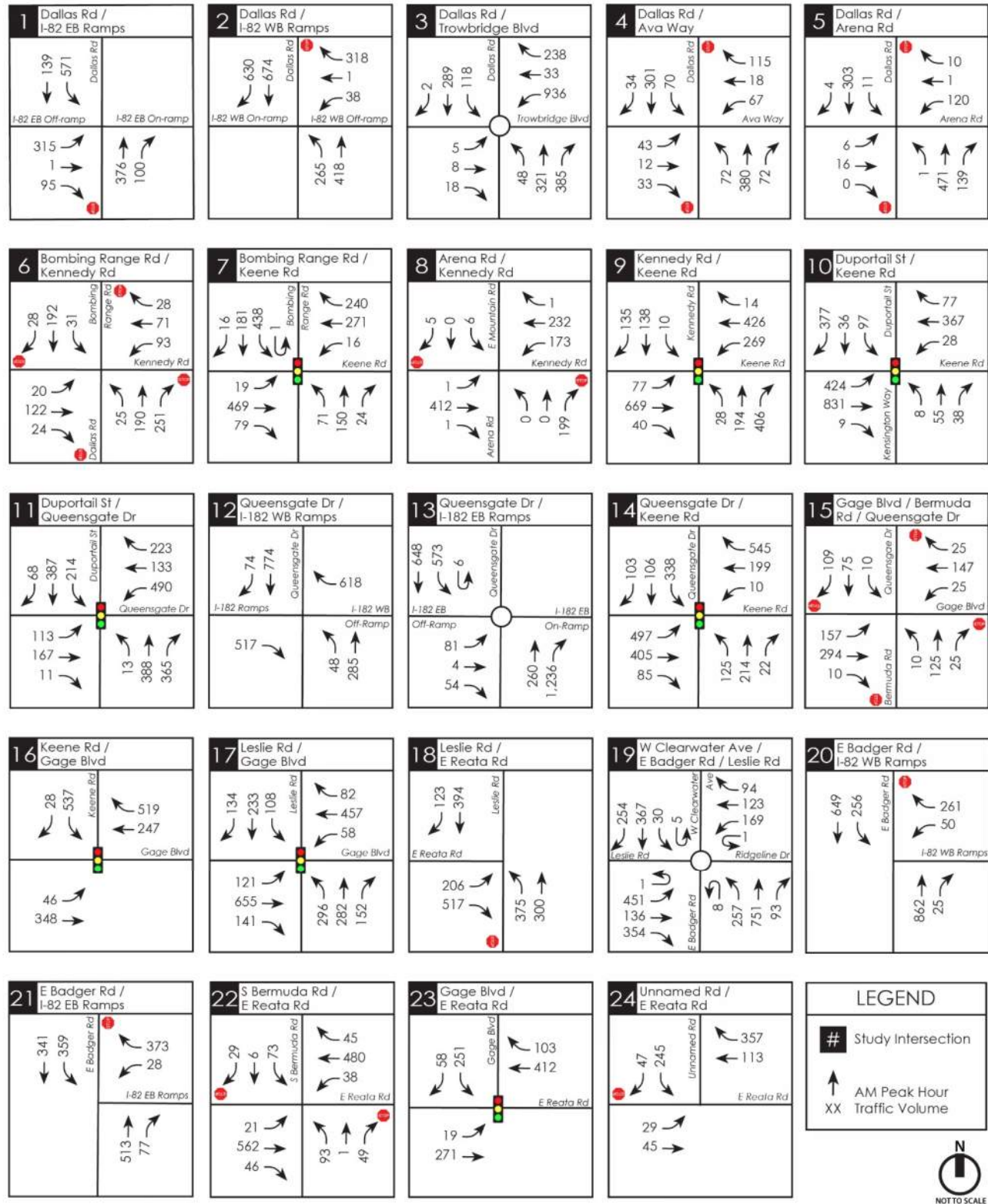


Figure 15: Year 2040 (With Full BMS Buildout) AM Peak Hour Traffic Volumes (off-site)

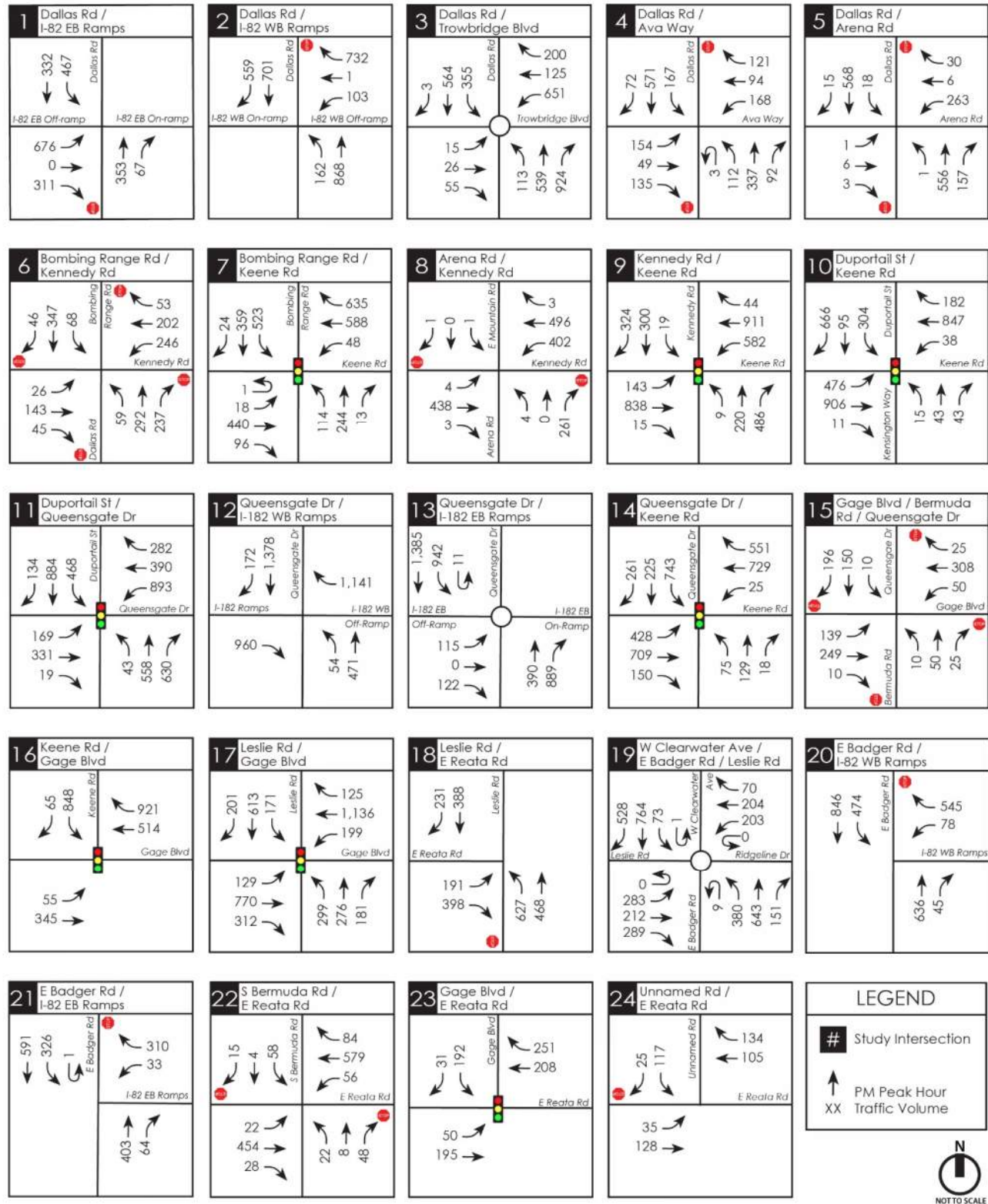


Figure 16: Year 2040 (With Full BMS Buildout) PM Peak Hour Traffic Volumes (off-site)

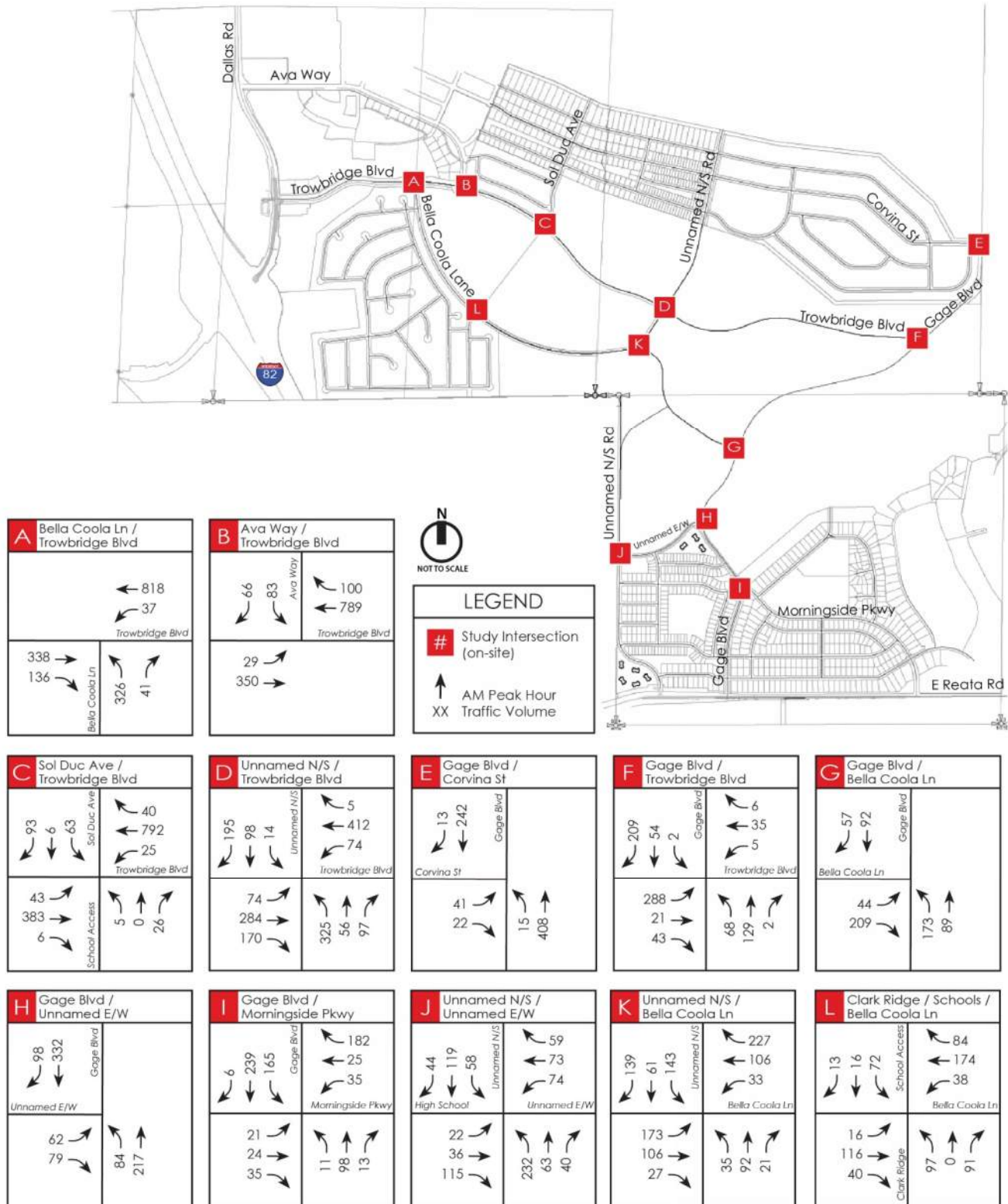


Figure 17: Year 2040 (With Full BMS Buildout) AM Peak Hour Traffic Volumes (on-site)

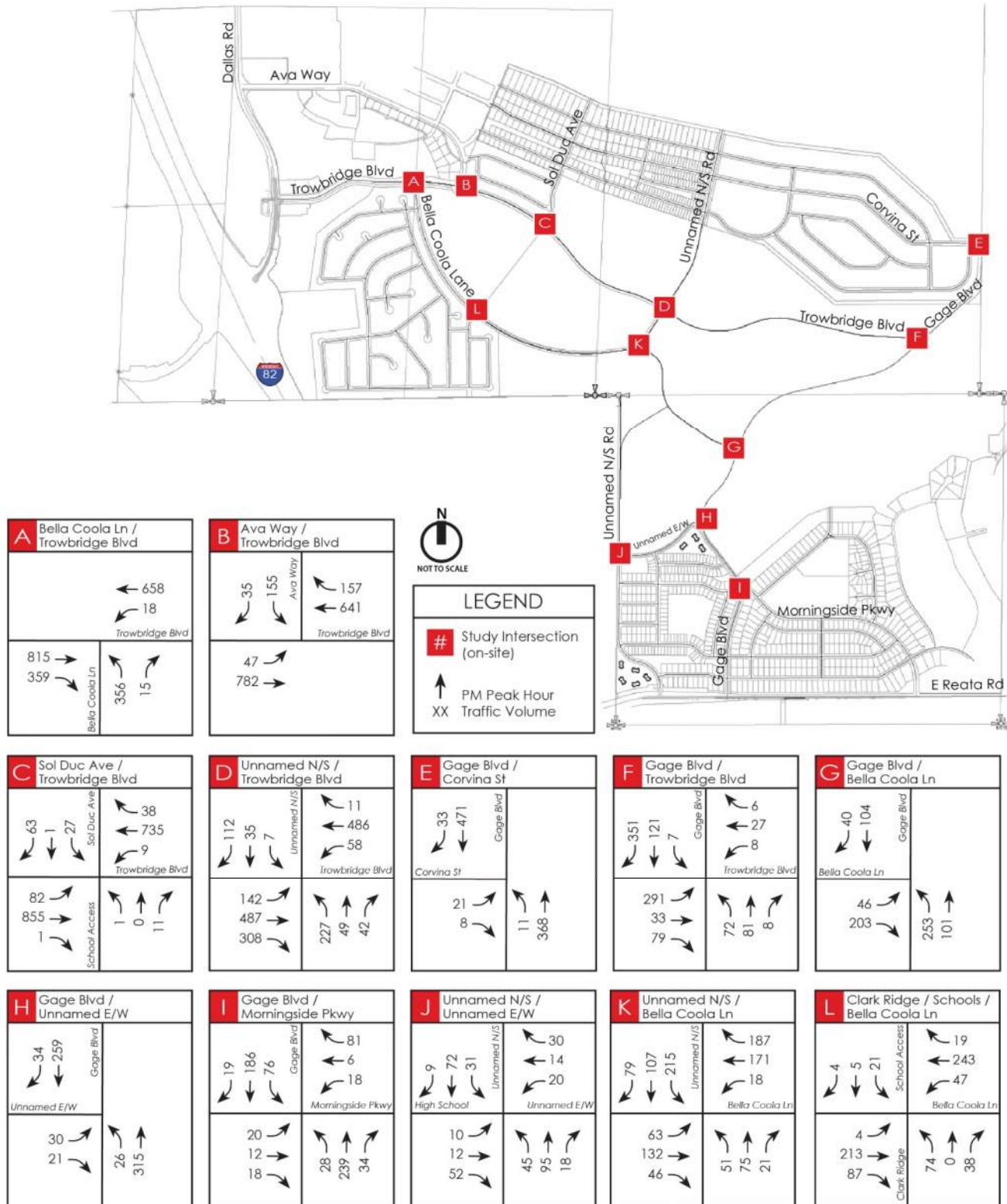


Figure 18: Year 2040 (With Full BMS Buildout) PM Peak Hour Traffic Volumes (on-site)

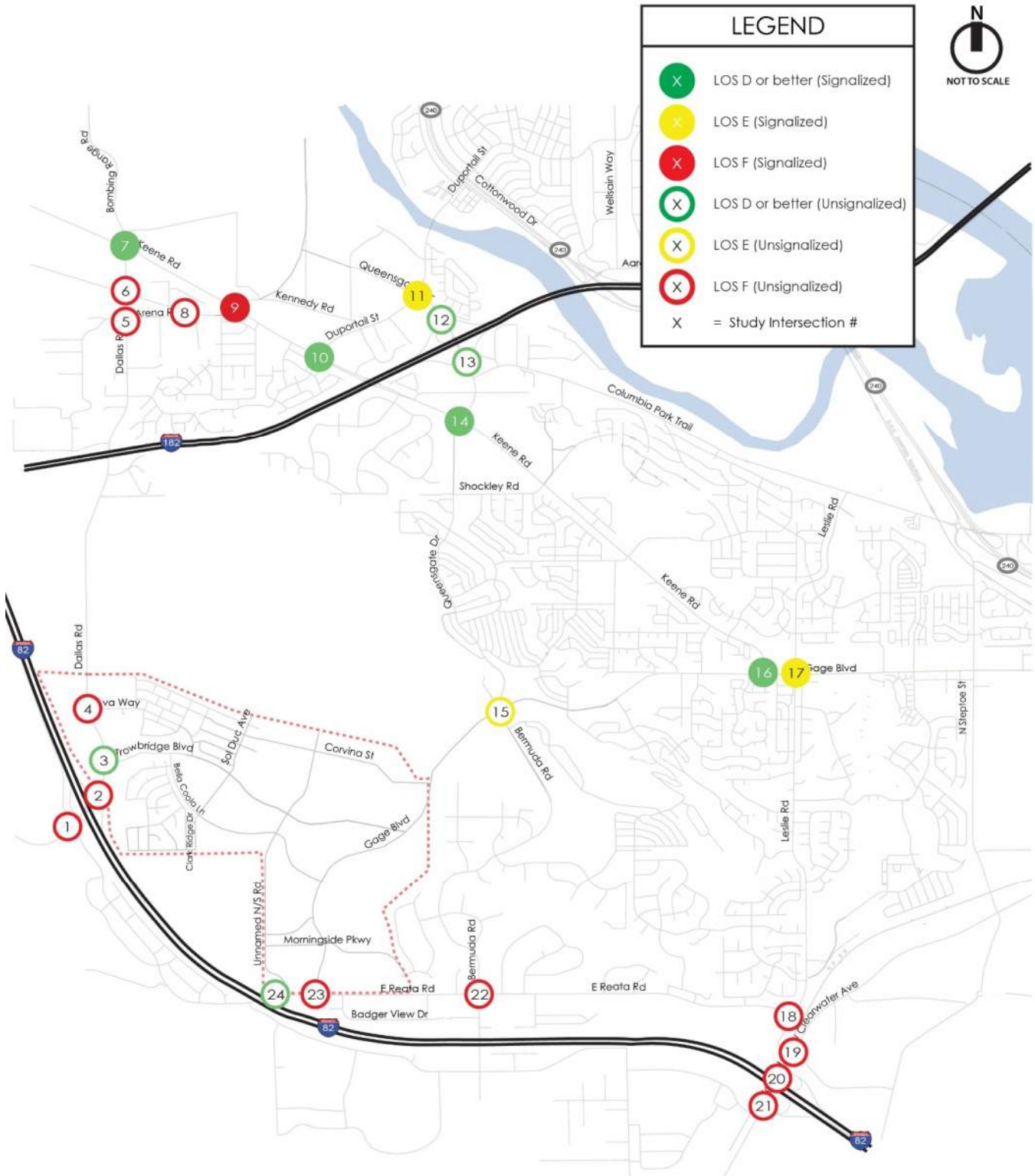


Figure 19: 2040 With Project (Full Build Out) LOS Summary

Future Year 2040 Level of Service at Off-Site Study Intersections

Future year weekday AM and PM peak hour Level of Service (LOS) analyses were conducted at the 24 off-site study intersections for year 2040 with Full Buildout of Badger Mountain South and the 2040 roadway network documented above. The LOS analyses are based on the methodology and procedures outlined in the 6th Edition of the *Highway Capacity Manual* (HCM) using the *Synchro 10* and *SIDRA 9* software program. It should be noted that LOS at on-site intersections within the BMS development are described in a later section.

The weekday AM and PM peak hour LOS results at the off-site study intersections for 2040 with Full Buildout conditions are summarized in **Table 8** (for signals and roundabouts) and **Table 9** (for stop-controlled). The year 2040 LOS results at the off-site intersections are also illustrated in **Figure 19**. The detailed LOS worksheets are included in **Appendix B**.

Table 8
2040 With Full Buildout Peak Hour LOS Summary at Off-Site Study Intersections

Study Intersection	2040 With Full Buildout of BMS			
	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec)	LOS	Delay (sec)
<u>Signalized Intersections</u>				
7. Bombing Range Road / Keene Road	D	41.8	C	34.6
9. Kennedy Road / Keene Road	C	34.2	F	85.0
10. Duportail Street / Keene Road	C	21.5	D	41.7
11. Duportail Street / Queensgate Drive	B	19.8	E	78.9
14. Queensgate Drive / Keene Road	C	29.2	D	35.7
16. Keene Road / Gage Blvd	C	22.4	C	22.7
17. Leslie Road / Gage Blvd	C	28.4	E	77.3
<u>Roundabout Intersections</u>				
3. Dallas Road / Trowbridge Blvd	B	12.7	D	35.0
13. Queensgate Drive / I-182 EB Ramps	A	6.6	A	7.4
19. Badger Road / Clearwater Ave / Leslie Road	D	26.9	F	63.9
<u>All-Way Stop Controlled Intersections</u>				
6. Bombing Range Road / Kennedy Road	C	16.9	F	88.9
15. Gage Blvd / Queensgate Dr / Bermuda Road	B	14.0	C	21.7
<u>Two-Way Stop Controlled Intersections</u>				
1. Dallas Road / I-82 EB Ramps				
Eastbound Approach	F	>100	F	>100
Southbound Left-Turn	B	13.4	B	11.1
2. Dallas Road / I-82 WB Ramps				
Westbound Shared Left-Thru	F	>100	F	>100
Westbound Right-Turn	C	16.9	F	>100
Northbound Left-Turn	C	23.4	C	16.1

Table 8 continued
2040 With Full Buildout Peak Hour LOS Summary at Off-Site Study Intersections

Study Intersection / Movement	2040 With Full Buildout of BMS			
	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec)	LOS	Delay (sec)
4. Dallas Road / Ava Way				
Eastbound Left-Turn	F	63.4	F	>100
Eastbound Shared Thru-Right	C	16.0	F	>100
Westbound Left-Turn	F	55.0	F	>100
Westbound Shared Thru-Right	C	16.9	F	>100
Northbound Left-Turn	A	8.3	A	9.7
Southbound Left-Turn	A	8.7	A	9.0
5. Dallas Road / Arena Road				
Eastbound Approach	C	22.4	D	29.3
Westbound Approach	F	67.1	F	>100
Northbound Left-Turn	A	8.0	A	8.8
Southbound Left-Turn	A	9.0	A	9.4
8. Arena Road / Kennedy Road				
Eastbound Left-Turn	A	7.8	A	8.5
Westbound Left-Turn	A	8.9	B	10.3
Northbound Approach	B	14.2	C	22.2
Southbound Approach	D	30.9	F	>100
18. Leslie Road / Reata Road				
Eastbound Left-Turn	F	>100	F	>100
Eastbound Right-Turn	E	41.9	C	21.6
Northbound Left-Turn	B	11.0	C	18.9
20. Badger Road / I-82 WB Ramps				
Westbound Shared Left-Right	F	>100	F	>100
Southbound Left-Turn	B	13.4	B	14.7
21. Badger Road / I-82 EB Ramps				
Westbound Approach	F	>100	F	50.2
Southbound Left-Turn	B	11.5	B	10.0
22. Bermuda Road / Reata Road				
Eastbound Left-Turn	A	8.7	A	9.2
Westbound Left-Turn	A	9.1	A	8.7
Northbound Approach	F	>100	D	32.2
Southbound Approach	F	>100	F	>100
23. Gage Blvd / Reata Road				
Eastbound Left-Turn	A	8.7	A	8.6
Southbound Left-Turn	F	56.7	D	25.0
Southbound Right-Turn	B	12.2	B	10.6
24. Unnamed N/S / Reata Road				
Eastbound Left-Turn	A	8.6	A	7.9
Southbound Left-Turn	C	17.4	B	13.0
Southbound Right-Turn	B	10.4	A	9.4

Signalized, Roundabout, and All-Way Stop Controlled Off-Site Study Intersections

As shown in **Table 8**, many of the signalized, roundabout, and all-way stop controlled study intersections are estimated to operate at LOS D or better during the AM and PM peak hours in 2040 with full buildout of BMS. Five study intersections are anticipated to operate at LOS E or LOS F, and would require improvements to operate at LOS D or better by year 2040; those intersections are described next along with a description of the proportionate share of traffic generated by BMS.

- **#6 Bombing Range Road/Kennedy Road** is anticipated to operate at LOS F during the PM peak hour. BMS is estimated to add 494 PM peak hour trips (28.0% of total entering traffic). Potential mitigation improvements at this intersection include a roundabout or a signal as discussed further in the mitigation section of this report.
- **#9 Kennedy Road / Keene Road** is anticipated to operate at LOS F during the PM peak hour. BMS is estimated to add 435 PM peak hour trips (11.2% of total entering traffic). Potential mitigation at this intersection includes adding northbound and southbound right-turn overlap phases as discussed further in the mitigation section of this report.
- **#11 Duportail Street / Queensgate Drive** is anticipated to operate at LOS E during the PM peak hour. BMS is estimated to add 330 PM peak hour trips (6.9% of total entering traffic). Recent improvements have been constructed at this intersection which generally render the intersection to be built out. As such, no mitigation is proposed.
- **#17 Leslie Road / Gage Boulevard** is anticipated to operate at LOS E during the PM peak hour. BMS is estimated to add 289 PM peak hour trips (6.6% of total entering traffic). Recent improvements have been constructed at this intersection which generally render the intersection to be built out. As such, no mitigation is proposed.
- **#19 Badger Road / Clearwater Ave / Leslie Road** is anticipated to operate at LOS F during the PM peak hour. BMS is estimated to add 854 PM peak hour trips (22.4% of total entering traffic). Potential mitigation at this intersection includes adding a southbound right-turn slip lane at the roundabout. There is an existing railroad crossing and a pedestrian path located on the northwest corner of this intersection that would be directly impacted by the addition of a southbound right-turn slip lane. Given the potential impacts of this improvement, monitoring and future analysis of this intersection is proposed after BMS project opening to assess traffic volumes and intersection operations based on future conditions to determine if intersection improvements may be necessary to maintain acceptable LOS.

Two-Way Stop Controlled Off-Site Study Intersections

As shown in **Table 8**, many of individual lane groups at the two-way stop controlled study intersections are estimated to operate at LOS D or better during the AM and PM peak hours in 2040 with full buildout of BMS. Several of the two-way stop controlled study intersections have controlled movements that are anticipated to operate at LOS E or LOS F, and would require improvements to operate at LOS D or better by year 2040; those intersections are described next along with a description of the proportionate share of traffic generated by BMS.

- **#1 Dallas Road/I-82 EB Ramps** – the eastbound approach is anticipated to operate at LOS F during the AM and PM peak hours. BMS is estimated to add 830 AM peak hour trips (52.0% of total entering traffic) and 1,187 PM peak hour trips (53.8% of total

entering traffic). Potential mitigation improvements at this intersection include a roundabout or a signal as discussed further in the mitigation section of this report.

- **#2 Dallas Road/I-82 VWB Ramps** – the westbound shared left-thru lane is anticipated to operate at LOS F during the AM and PM peak hours. BMS is estimated to add 1,498 AM peak hour trips (63.9% of total entering traffic) and 2,068 PM peak hour trips (66.2% of total entering traffic). Potential mitigation improvements at this intersection include a roundabout or a signal as discussed further in the mitigation section of this report.
- **#4 Dallas Road/Arena Road** – the eastbound and westbound left-turn lanes are anticipated to operate at LOS F during the AM peak hour and the eastbound and westbound approaches are anticipated to operate at LOS F during the PM peak hour. BMS is estimated to add 752 AM peak hour trips (61.8% of total entering traffic) and 1,374 PM peak hour trips (66.2% of total entering traffic). Potential mitigation improvements at this intersection include a roundabout or a signal as discussed further in the mitigation section of this report.
- **#5 Dallas Road/Arena Road** – the westbound approach is anticipated to operate at LOS F during the AM and PM peak hours. BMS is estimated to add 482 AM peak hour trips (44.5% of total entering traffic) and 667 PM peak hour trips (41.1% of total entering traffic). There is a high volume of traffic traveling from the east on Kennedy Road that utilizes Arena Road as a cut-through to travel southbound on Dallas Road. It is anticipated that the future improvements proposed at the Kennedy Road/Dallas Road intersection (either a future roundabout or a future signal) will reroute a majority of this cutthrough traffic to continue westbound on Kennedy Road instead of taking a westbound left-turn onto Arena Road. Shifting westbound traffic away from the Dallas Road/Arena Road intersection will improve side-street traffic operations on Arena Road and therefore, no mitigation improvements are proposed at this intersection.
- **#8 Arena Road / Kennedy Road** – the southbound approach is anticipated to operate at LOS F during the PM peak hour. BMS is estimated to add 436 PM peak hour trips (27.0% of total entering traffic). The anticipated level-of-service failure at this intersection stems from the delay experienced by two southbound trips exiting a residential driveway. Additionally, there is a high volume of traffic traveling from the east on Kennedy Road that utilizes Arena Road as a cutthrough to travel southbound on Dallas Road. It is anticipated that the future improvements proposed at the Kennedy Road/Dallas Road intersection (either a future roundabout or a future signal) will reroute a majority of this cutthrough traffic to continue westbound on Kennedy Road instead of taking a westbound left-turn onto Arena Road. Shifting westbound left-turn traffic away from the Arena Road/Kennedy Road intersection will improve side-street traffic operations on Arena Road and therefore, no mitigation improvements are proposed at this intersection.
- **#18 Leslie Road/Reata Road** – the eastbound left-turn lane is anticipated to operate at LOS F during the AM and PM peak hours and the eastbound right-turn lane is anticipated to operate at LOS E during the AM peak hour. BMS is estimated to add 461 AM peak hour trips (24.1% of total entering traffic) and 618 PM peak hour trips (26.8% of total entering traffic). Potential mitigation improvements at this intersection include a proposed roundabout or a proposed signal as discussed further in the mitigation section of this report.

- **#20 Badger Road/I-82 WB Ramps** – the westbound approach is anticipated to operate at LOS F during the AM and PM peak hours. BMS is estimated to add 368 AM peak hour trips (17.5% of total entering traffic) and 525 PM peak hour trips (20.0% of total entering traffic). Potential mitigation improvements at this intersection include a proposed roundabout or a proposed signal as discussed further in the mitigation section of this report.
- **#21 Badger Road/I-82 EB Ramps** – the westbound approach is anticipated to operate at LOS F during the AM and PM peak hours. BMS is estimated to add 239 AM peak hour trips (14.1% of total entering traffic) and 214 PM peak hour trips (12.4% of total entering traffic). Potential mitigation improvements at this intersection include a proposed roundabout or a proposed signal as discussed further in the mitigation section of this report.
- **#22 Bermuda Road/Reata Road** – the northbound and southbound approaches are anticipated to operate at LOS F during the AM and PM peak hours. BMS is estimated to add 512 AM peak hour trips (35.5% of total entering traffic) 677 PM peak hour trips (49.1% of total entering traffic). Potential mitigation improvements at this intersection include a roundabout or a signal as discussed further in the mitigation section of this report.
- **#23 Gage Blvd/Reata Road** – the southbound left-turn lane is anticipated to operate at LOS F. BMS is estimated to add 603 AM peak hour trips (54.1% of total entering traffic). Potential mitigation improvements at this intersection include a roundabout or a signal as discussed further in the mitigation section of this report.

At the locations listed above where improvements are necessary to maintain LOS D or better during weekday AM and PM peak hours in 2040, mitigation has been identified. Specific mitigation measures and proportionate share contribution of BMS traffic is discussed in greater detail in the *Mitigation* section of the report.

Future Year 2040 Level of Service at On-Site Study Intersections

Future year weekday AM and PM peak hour LOS analyses were conducted at the 12 on-site study intersections for year 2040 with full buildout of Badger Mountain South and the preliminary internal roadway layout as shown previously in **Figure 2**. It should be noted that LOS at intersections outside of the BMS development (off-site study intersections) were described in the prior section.

The LOS analyses are based on the methodology and procedures outlined in the 6th Edition of the *Highway Capacity Manual* (HCM) using the *Synchro 10* and *SIDRA 9* software program.

Table 9 and Table 10 summarize the weekday AM and PM peak hour LOS results at the 12 on-site study intersections for 2040 with Full Buildout conditions. The detailed LOS worksheets are included in **Appendix F**.

The LOS analyses at intersections within the BMS development include turn lanes, channelization, and intersection control (i.e. stop sign or roundabout) necessary to ensure the on-site intersections would operate at acceptable LOS during the AM and PM peak hours with full buildout in 2040. The majority of the on-site study intersections will operate at LOS D or better with two-way stop control (side streets stop controlled and primary street free flow). However, at intersections A, B, D, and K, more than one option was identified for control of the intersection, and the LOS results for both options are presented in **Table 9 and Table 10**. The specific lane channelization assumptions for both of the proposed control options at intersections A, B, D, and K is included in **Appendix G**.

As shown in **Tables 9 and 10**, all controlled movements at the unsignalized BMS internal (on-site) intersections and all proposed roundabout or signalized intersections are expected to operate at LOS D or better during the AM and PM peak hours with exception to the following:

- **C. Sol Duc Ave/Trowbridge Blvd** – the southbound approach is anticipated to operate at LOS E during the AM peak hour. Given that Sol Duc Ave is a minor side street roadway, no improvements are proposed for this side-street approach.

Table 9
2040 With Full Buildout AM Peak Hour LOS Summary for On-Site Study Intersections

Study Intersection / Movement	Intersection Control Options							
	Roundabout		Signal		Two-Way Stop		All-Way Stop	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
A. Bella Coola Lane / Trowbridge Blvd	A	7.9	B	10.2	-	-	-	-
B. Ava Way / Trowbridge Blvd	B	11.6	B	15.4	-	-	-	-
C. Sol Duc Ave / Trowbridge Blvd								
Eastbound Left-Turn	-	-	-	-	B	10.2	-	-
Westbound Left-Turn	-	-	-	-	A	8.3	-	-
Northbound Approach	-	-	-	-	C	15.6	-	-
Southbound Approach	-	-	-	-	E	42.6	-	-
D. Unnamed N/S / Trowbridge Blvd	B	14.3	D	38.2	-	-	-	-
E. Gage Blvd / Corvina S								
Eastbound Approach	-	-	-	-	B	12.6	-	-
Northbound Left-Turn	-	-	-	-	A	7.9	-	-
F. Gage Blvd / Trowbridge Blvd								
Eastbound Left-Turn	-	-	-	-	C	24.2	-	-
Eastbound Shared Thru-Right	-	-	-	-	B	10.7	-	-
Westbound Approach	-	-	-	-	B	13.2	-	-
Northbound Left-Turn	-	-	-	-	A	8.0	-	-
Southbound Left-Turn	-	-	-	-	A	7.5	-	-
G. Gage Blvd / Bella Coola Lane								
Eastbound Left-Turn	-	-	-	-	B	13.2	-	-
Eastbound Right-Turn	-	-	-	-	B	10.4	-	-
Northbound Left-Turn	-	-	-	-	A	8.0	-	-
H. Gage Blvd/ Unnamed E/W								
Eastbound Approach	-	-	-	-	B	14.9	-	-
Northbound Left-Turn	-	-	-	-	A	8.6	-	-
I. Gage Blvd / Morningside Pkwy								
Eastbound Approach	-	-	-	-	C	16.1	-	-
Westbound Approach	-	-	-	-	C	15.0	-	-
Northbound Left-Turn	-	-	-	-	A	7.8	-	-
Southbound Left-Turn	-	-	-	-	A	7.8	-	-
J. Unnamed N/S / Unnamed E/W								
Eastbound Left-Turn	-	-	-	-	D	27.8	-	-
Eastbound Shared Thru-Right	-	-	-	-	B	13.7	-	-
Westbound Left-Turn	-	-	-	-	D	34.8	-	-
Westbound Shared Thru-Right	-	-	-	-	C	18.9	-	-
Northbound Left-Turn	-	-	-	-	A	8.2	-	-
Southbound Left-Turn	-	-	-	-	A	7.6	-	-
K. Unnamed N/S / Bella Coola Lane	A	7.3	-	-	-	-	C	15.9
L. Clark Ridge Dr / Bella Coola Lane								
Eastbound Left-Turn	-	-	-	-	A	7.9	-	-
Westbound Left-Turn	-	-	-	-	A	7.7	-	-
Northbound Approach	-	-	-	-	C	15.0	-	-
Southbound Approach	-	-	-	-	C	17.0	-	-

Table 10
2040 With Full Buildout PM Peak Hour LOS Summary for On-Site Intersections

Study Intersection / Movement	Intersection Control Options							
	Roundabout		Signal		Two-Way Stop		All-Way Stop	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
A. Bella Coola Lane / Trowbridge Blvd	B	11.3	B	14.0	-	-	-	-
B. Ava Way / Trowbridge Blvd	B	12.6	B	16.7	-	-	-	-
C. Sol Duc Ave / Trowbridge Blvd								
Eastbound Left-Turn	-	-	-	-	B	10.2	-	-
Westbound Left-Turn	-	-	-	-	B	10.0	-	-
Northbound Approach	-	-	-	-	C	19.0	-	-
Southbound Approach	-	-	-	-	D	31.0	-	-
D. Unnamed N/S / Trowbridge Blvd	C	18.7	D	40.8	-	-	-	-
E. Gage Blvd / Corvina S								
Eastbound Approach	-	-	-	-	B	14.0	-	-
Northbound Left-Turn	-	-	-	-	A	8.6	-	-
F. Gage Blvd / Trowbridge Blvd								
Eastbound Left-Turn	-	-	-	-	D	30.9	-	-
Eastbound Shared Thru-Right	-	-	-	-	B	12.4	-	-
Westbound Approach	-	-	-	-	C	15.2	-	-
Northbound Left-Turn	-	-	-	-	A	8.8	-	-
Southbound Left-Turn	-	-	-	-	A	7.4	-	-
G. Gage Blvd / Bella Coola Lane								
Eastbound Left-Turn	-	-	-	-	C	15.6	-	-
Eastbound Right-Turn	-	-	-	-	B	10.3	-	-
Northbound Left-Turn	-	-	-	-	A	8.2	-	-
H. Gage Blvd/ Unnamed E/W								
Eastbound Approach	-	-	-	-	B	12.0	-	-
Northbound Left-Turn	-	-	-	-	A	8.0	-	-
I. Gage Blvd / Morningside Pkwy								
Eastbound Approach	-	-	-	-	B	14.1	-	-
Westbound Approach	-	-	-	-	B	12.1	-	-
Northbound Left-Turn	-	-	-	-	A	7.8	-	-
Southbound Left-Turn	-	-	-	-	A	8.1	-	-
J. Unnamed N/S / Unnamed E/W								
Eastbound Left-Turn	-	-	-	-	B	11.6	-	-
Eastbound Shared Thru-Right	-	-	-	-	A	9.7	-	-
Westbound Left-Turn	-	-	-	-	B	11.9	-	-
Westbound Shared Thru-Right	-	-	-	-	B	10.1	-	-
Northbound Left-Turn	-	-	-	-	A	7.5	-	-
Southbound Left-Turn	-	-	-	-	A	7.5	-	-
K. Unnamed N/S / Bella Coola Lane	A	7.4	-	-	-	-	C	17.9
L. Clark Ridge Dr / Bella Coola Lane								
Eastbound Left-Turn	-	-	-	-	A	7.9	-	-
Westbound Left-Turn	-	-	-	-	A	8.1	-	-
Northbound Approach	-	-	-	-	C	17.2	-	-
Southbound Approach	-	-	-	-	C	16.4	-	-

Roadway Functional Classification for BMS Roads

This section uses the future 2040 traffic volumes projections to compare to the City's roadway functional classifications, and recommends roadway classifications for primary roadways within the BMS development. Future 2040 average daily traffic (ADT) for roadways within BMS were estimated based on the weekday AM and PM peak hour volumes multiplied by a k-factor of 9%.

Recommended roadway classifications for the internal roadways serving BMS were evaluated based on the City of Richland's preliminary functional classification recommendations, which are provided in **Appendix H**. Those functional classifications include a range of average daily traffic (ADT) for a range of roadway types, including principal arterial, minor arterial, major collector, and local road.

Table 11 summarizes recommended roadway classifications and number of travel lanes for roadways within and serving BMS. The recommendations are based on review of 2040 ADT and comparison to the City's functional classification recommendations (**Appendix H**). These recommendations are generally consistent with the functional classifications identified by the City for the BMS internal roadways with a few exceptions which are recommended to be re-considered by the City based on the future ADT projections in 2040.

Dallas Road between Trowbridge and I-82 – re-consideration as a Principal Arterial with 4-5 travel lanes.

Trowbridge Blvd between Dallas Road and east of Ava Way to Unnamed N/S Road – re-consideration as a Principal Arterial with 4-5 travel lanes.

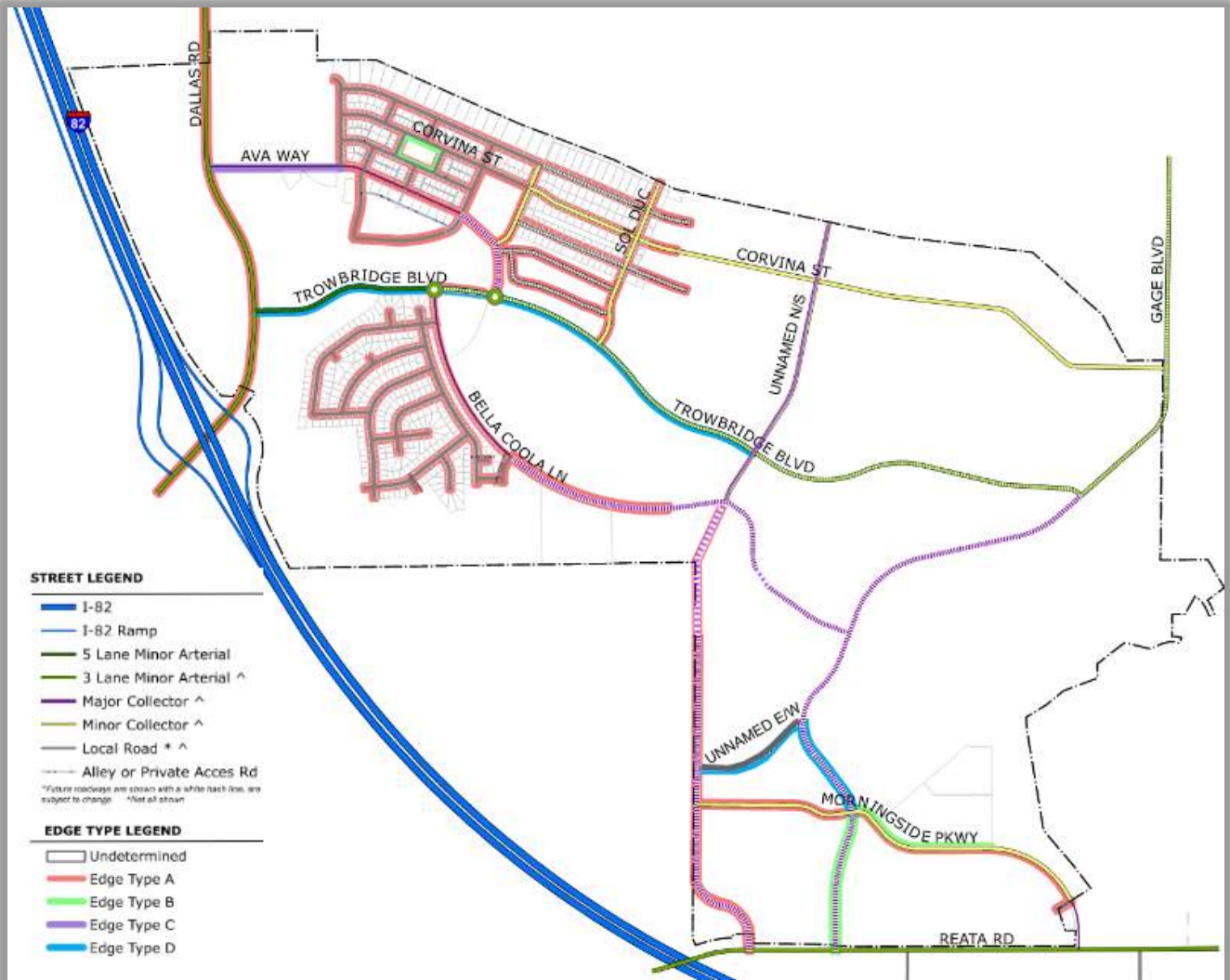
Table 11
Preliminary Functional Classification Recommendations for BMS Internal Roadways

Roadway / location	2040 PM Peak Hour Traffic Volume (total of both directions)	Estimated Average Daily Traffic (ADT) ¹	Preliminary # of Lanes	Preliminary Functional Classification Recommendation
<u>Dallas Road</u>				
north of Ava Way	1,422	15,800	2-3	Minor Arterial
south of Trowbridge Blvd	2,846	31,600	4-5	Principal Arterial ²
<u>Ava Way</u>				
east of Dallas Rd	691	7,700	2-3	Major Collector
north of Trowbridge Blvd	394	4,400	2-3	Major Collector
<u>Trowbridge Blvd</u>				
east of Dallas Rd	2,281	25,300	4-5	Principal Arterial ²
east of Bella Coola Ln	1,506	16,700	5	Principal Arterial ²
east of Ava Way	1,735	19,300	3	Principal Arterial ²
east of Unnamed N/S	1,091	12,100	3	Minor Arterial
west of Gage Blvd	853	9,500	3	Minor Arterial
<u>Bella Coola Ln</u>				
south of Trowbridge Blvd	748	8,300	2-3	Major Collector
west of Unnamed N/S	542	6,000	2-3	Major Collector
east of Unnamed N/S	744	8,300	2-3	Major Collector
west of Gage Blvd	542	6,000	2-3	Major Collector
<u>Unnamed N/S</u>				
South of Trowbridge Blvd	716	8,000	2-3	Major Collector
South of Bella Coola Ln	318	3,500	2-3	Major Collector
North of Unnamed E/W	248	2,700	2-3	Major Collector
South of Unnamed E/W	302	3,400	2-3	Major Collector
<u>Unnamed E/W</u>				
East of Unnamed N/S	125	1,400	2	Local Road
West of Gage Blvd	111	1,200	2	Local Road
<u>Gage Blvd</u>				
Northeast of Corvina St	893	9,900	2-3	Minor Arterial
North of Trowbridge Blvd	857	9,500	2-3	Minor Arterial
South of Trowbridge Blvd	369	4,100	2-3	Major Collector
South of Bella Coola Ln	661	7,300	2-3	Major Collector
South of Unnamed E/W	621	6,900	2-3	Major Collector
North of Reata Rd	524	5,800	2-3	Major Collector

1. ADT volumes were estimated from PM peak hour volumes with an applied K-factor of 9%.
2. Recommended for re-consideration as a Principal Arterial based on ADT projection by 2040.

The number of travel lanes identified in **Table 11** is based on the future ADT by 2040 as well as the anticipated intersection control at the intersections along each roadway segment. Consideration may be given to whether 4 lane roadways should be 5 lanes in order to accommodate left-turns onto future internal roadway connections.

The snip below illustrates a preliminary draft version of the internal roadway network plan for BMS showing primary roadways and alignments within the development area. The preliminary roadway classifications are generally consistent with those identified in **Table 11**. It is anticipated that this information will be reviewed as part of this traffic analysis, and may be updated based on discussions with City staff in determining the most appropriate roadway classifications for BMS roads.



MITIGATION MEASURES

This section identifies potential improvements necessary to mitigate off-site intersections forecast to operate at LOS E or LOS F in 2040 with full buildout of the BMS development. Although some study intersections may require mitigation to operate at acceptable LOS during one of the earlier development phases (2025, 2030, or 2040), the specific mitigation measures identified in this section are intended to fully mitigate impacts of the full BMS buildout in 2040.

Based on the traffic analysis documented in this TIA for year 2040 future conditions with full buildout of the BMS project, a total of 15 off-site study intersections are forecast to operate at LOS E or F in 2040 with full buildout of BMS. However, it should be noted that 4 of the intersections that are forecast to operate at LOS E or F in 2040 have recently been improved or are anticipated to improve as a result of other planned intersection or roadway improvements in the vicinity. Therefore, potential mitigation measures were identified at 11 off-site study intersections as shown in **Table 12**.

Table 12 also identifies the estimated development phase (and year) in which the mitigation measure is likely to be needed, and provides a preliminary estimated pro-rata share of mitigation for the BMS development based on year 2040 traffic volumes with full buildout of BMS.

Table 12
Summary of Mitigation Measures at Off-Site Study Intersections

Study Intersection	Potential Mitigation Measure ¹	Development Phase (Year) Improvement Needed ²	Estimated BMS Pro-Rata Share ³
1. Dallas Road / I-82 EB Ramps	RAB or signal	2025	52–54%
2. Dallas Road / I-82 WB Ramps	RAB or signal	2025	64–66%
4. Dallas Road / Ava Way	RAB or signal	2025	62–66%
6. Bombing Range Rd / Kennedy Rd	RAB or signal	2030	28%
9. Kennedy Rd / Keene Road	NB+SB RT overlap phases at signal	2030	11%
18. Leslie Road / Reata Road	RAB or signal	2030	24–27%
19. Badger Rd / Clearwater Ave / Leslie Rd	SB right-turn slip lane at RAB	2040	22%
20. Badger Road / I-82 WB Ramps	RAB or signal	2025	18–20%
21. Badger Road / I-82 EB Ramps	RAB or signal	2030	12–14%
22. Bermuda Road / Reata Road	RAB or signal	2030	36–49%
23. Gage Blvd / Reata Road	RAB or signal	2030	54%

1. RAB = roundabout

2. Based on the anticipated year buildout of the development phase (either 2025, 2030, 2035 or 2040).

3. Pro-rata share based on weekday year 2040 AM and PM peak hour traffic volumes.

Although improvements to mitigate future AM and PM peak hour LOS deficiencies at off-site study intersections with full buildout of BMS in 2040 have been preliminarily identified in **Table 12**, the specific mitigation to be constructed, the timing of the mitigation, and the pro-rata share contributions for BMS are anticipated to be refined and confirmed based on input and evaluation from the project Applicant the City of Richland, and other stakeholders (West Richland and Benton County) as necessary. The final mitigation measures, timing of the mitigation, and pro-rata share contribution

percentages are anticipated to be established in a new or updated Master Agreement for the BMS development.

Weekday AM and PM peak hour LOS analyses were conducted for each of the mitigation options at the 11 off-site study intersections for which mitigation measures were identified. The LOS results are summarized in **Tables 13 and 14**, respectively. A summary of the channelization assumptions at each intersection with more than one mitigation option is included **Appendix G**. The detailed LOS reports are included in **Appendix I**.

All identified mitigation measures at the study intersections are expected to result in LOS D or better operations during both the AM and PM peak hours in 2040 with full buildout of the BMS development.

Table 13
2040 Full Buildout and Mitigation - AM Peak Hour Intersection LOS Summary

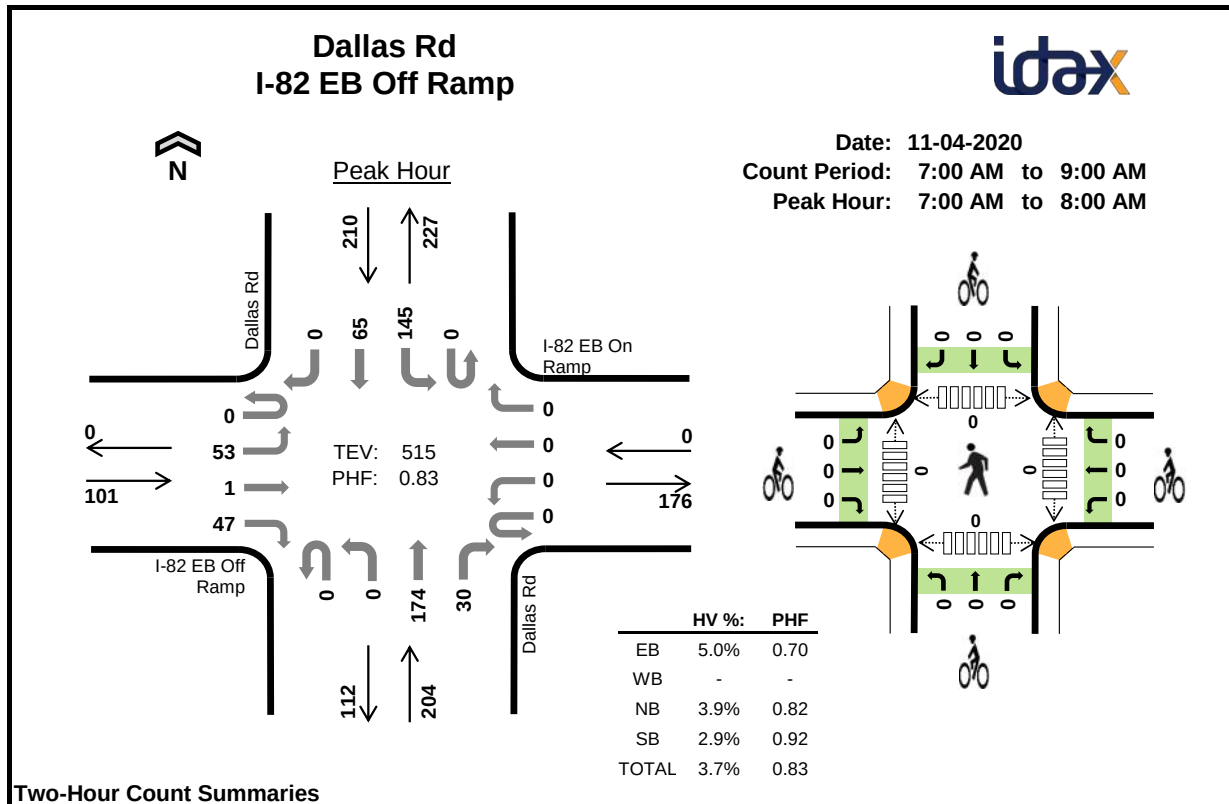
Study Intersection	Mitigation Measures					
	<u>Roundabout</u>		<u>Signal</u>		<u>Overlap Phasing</u>	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (Sec)
1. Dallas Road / I-82 EB Ramps	C	18.0	C	23.6	-	-
2. Dallas Road / I-82 WB Ramps	B	11.4	B	13.6	-	-
4. Dallas Road / Ava Way	A	7.8	B	16.5	-	-
6. Bombing Range Rd / Kennedy Rd	A	6.5	B	12.0	-	-
9. Kennedy Rd / Keene Road	-	-	-	-	D	49.8
18. Leslie Road / Reata Road	C	20.0	B	18.6	-	-
19. Badger Rd / Clearwater Ave / Leslie Rd	D	25.5	-	-	-	-
20. Badger Road / I-82 WB Ramps	C	22.4	B	10.0	-	-
21. Badger Road / I-82 EB Ramps	B	13.4	D	45.5	-	-
22. Bermuda Road / Reata Road	A	9.4	A	7.7	-	-
23. Gage Blvd / Reata Road	A	7.5	A	8.6	-	-

Table 14
2040 Full Buildout and Mitigation - PM Peak Hour Intersection LOS Summary

Study Intersection	Mitigation Options					
	<u>Roundabout</u>		<u>Signal</u>		<u>Overlap Phasing</u>	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (Sec)
1. Dallas Road / I-82 EB Ramps	D	34.0	D	51.2	-	-
2. Dallas Road / I-82 WB Ramps	C	22.4	B	11.6	-	-
4. Dallas Road / Ava Way	D	34.0	C	27.5	-	-
6. Bombing Range Rd / Kennedy Rod	B	13.9	B	17.5	-	-
9. Kennedy Rd / Keene Road	-	-	-	-	C	33.9
18. Leslie Road / Reata Road	D	26.0	B	19.1	-	-
19. Badger Rd / Clearwater Ave / Leslie Rd	D	29.3	-	-	-	-
20. Badger Road / I-82 WB Ramps	C	20.5	B	12.0	-	-
21. Badger Road / I-82 EB Ramps	B	12.6	B	16.6	-	-
22. Bermuda Road / Reata Road	A	9.2	A	7.1	-	-
23. Gage Blvd / Reata Road	A	6.1	A	7.9	-	-

Appendix A

Existing Peak Hour Traffic Counts

**Two-Hour Count Summaries**

Interval Start	I-82 EB Off Ramp				I-82 EB On Ramp				Dallas Rd Northbound				Dallas Rd Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	13	0	7	0	0	0	0	0	0	43	10	0	31	13	0	117	0
7:15 AM	0	10	1	7	0	0	0	0	0	0	35	4	0	38	17	0	112	0
7:30 AM	0	12	0	15	0	0	0	0	0	0	45	5	0	38	16	0	131	0
7:45 AM	0	18	0	18	0	0	0	0	0	0	51	11	0	38	19	0	155	515
8:00 AM	0	10	0	10	0	0	0	0	0	0	39	6	0	30	13	0	108	506
8:15 AM	0	3	0	4	0	0	0	0	0	0	40	2	0	23	18	0	90	484
8:30 AM	0	16	1	11	0	0	0	0	0	0	42	5	0	30	19	0	124	477
8:45 AM	0	17	1	10	0	0	0	0	0	0	36	4	0	32	13	0	113	435
Count Total	0	99	3	82	0	0	0	0	0	0	331	47	0	260	128	0	950	0
Peak Hour	All	0	53	1	47	0	0	0	0	0	174	30	0	145	65	0	515	0
	HV	0	2	1	2	0	0	0	0	0	8	0	0	6	0	0	19	0
	HV%	-	4%	100%	4%	-	-	-	-	-	5%	0%	-	4%	0%	-	4%	0

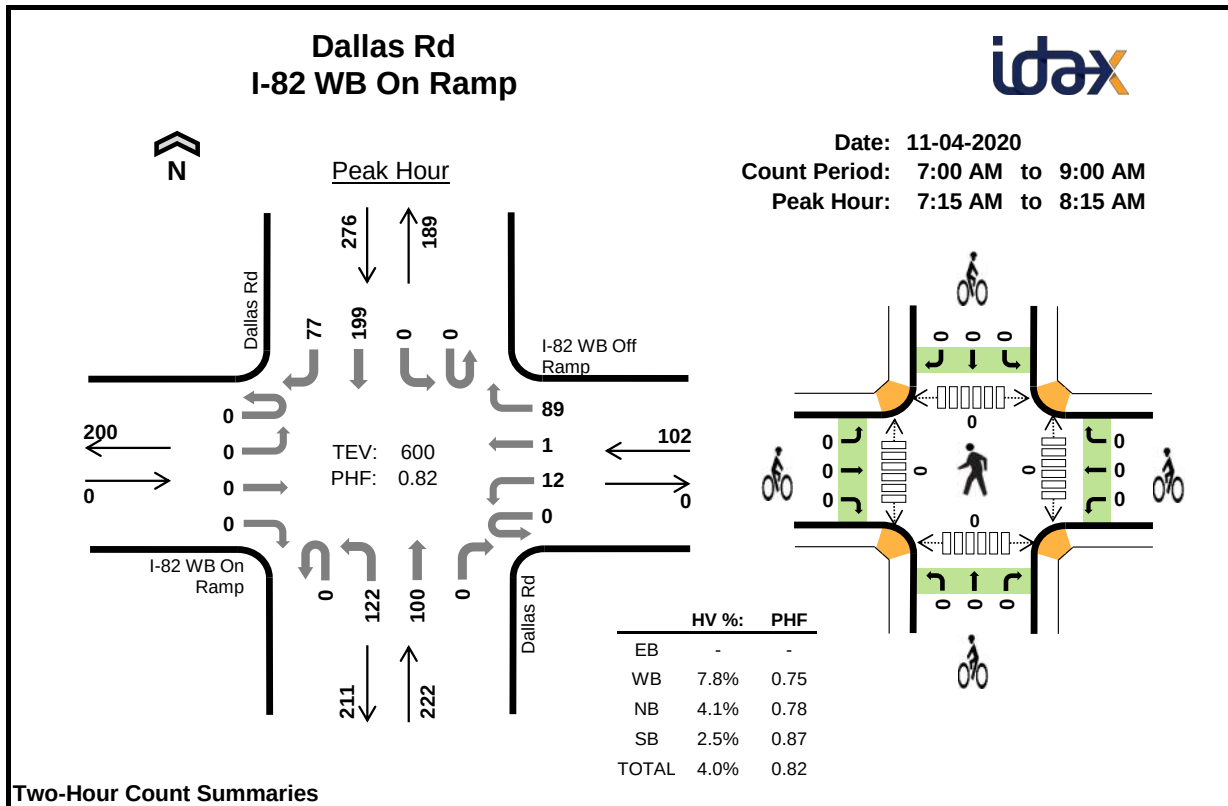
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
7:15 AM	2	0	2	4	8	0	0	0	0	0	0	0	0	0	0
7:30 AM	3	0	4	1	8	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
8:00 AM	1	0	0	2	3	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
8:30 AM	4	0	1	4	9	0	0	0	0	0	0	0	0	0	0
8:45 AM	5	0	3	2	10	0	0	0	0	0	0	0	0	0	0
Count Total	15	0	13	15	43	0	0	0	0	0	0	0	0	0	0
Peak Hour	5	0	8	6	19	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	I-82 EB Off Ramp				I-82 EB On Ramp				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	0
7:15 AM	0	0	1	1	0	0	0	0	0	0	2	0	0	4	0	0	8	0
7:30 AM	0	2	0	1	0	0	0	0	0	0	4	0	0	1	0	0	8	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	19
8:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	3	20
8:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	14
8:30 AM	0	1	1	2	0	0	0	0	0	0	1	0	0	3	1	0	9	15
8:45 AM	0	3	0	2	0	0	0	0	0	0	3	0	0	2	0	0	10	24
Count Total	0	6	2	7	0	0	0	0	0	0	13	0	0	13	2	0	43	0
Peak Hour	0	2	1	2	0	0	0	0	0	0	8	0	0	6	0	0	19	0

Two-Hour Count Summaries - Bikes																		
Interval Start	I-82 EB Off Ramp			I-82 EB On Ramp			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Interval Start		I-82 WB On Ramp				I-82 WB Off Ramp				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	0	0	0	4	0	12	0	33	23	0	0	0	39	20	131	0
7:15 AM		0	0	0	0	0	4	0	18	0	25	22	0	0	0	51	19	139	0
7:30 AM		0	0	0	0	0	4	0	18	0	35	18	0	0	0	52	17	144	0
7:45 AM		0	0	0	0	0	2	0	32	0	34	37	0	0	0	54	25	184	598
8:00 AM		0	0	0	0	0	2	1	21	0	28	23	0	0	0	42	16	133	600
8:15 AM		0	0	0	0	0	7	1	18	0	18	24	0	0	0	32	24	124	585
8:30 AM		0	0	0	0	0	7	0	28	0	24	35	0	0	0	43	19	156	597
8:45 AM		0	0	0	0	0	4	0	19	0	23	30	0	0	0	40	17	133	546
Count Total		0	0	0	0	0	34	2	166	0	220	212	0	0	0	353	157	1,144	0
Peak Hour	All	0	0	0	0	0	12	1	89	0	122	100	0	0	0	199	77	600	0
	HV	0	0	0	0	0	0	0	8	0	3	6	0	0	0	7	0	24	0
	HV%	-	-	-	-	-	0%	0%	9%	-	2%	6%	-	-	-	4%	0%	4%	0

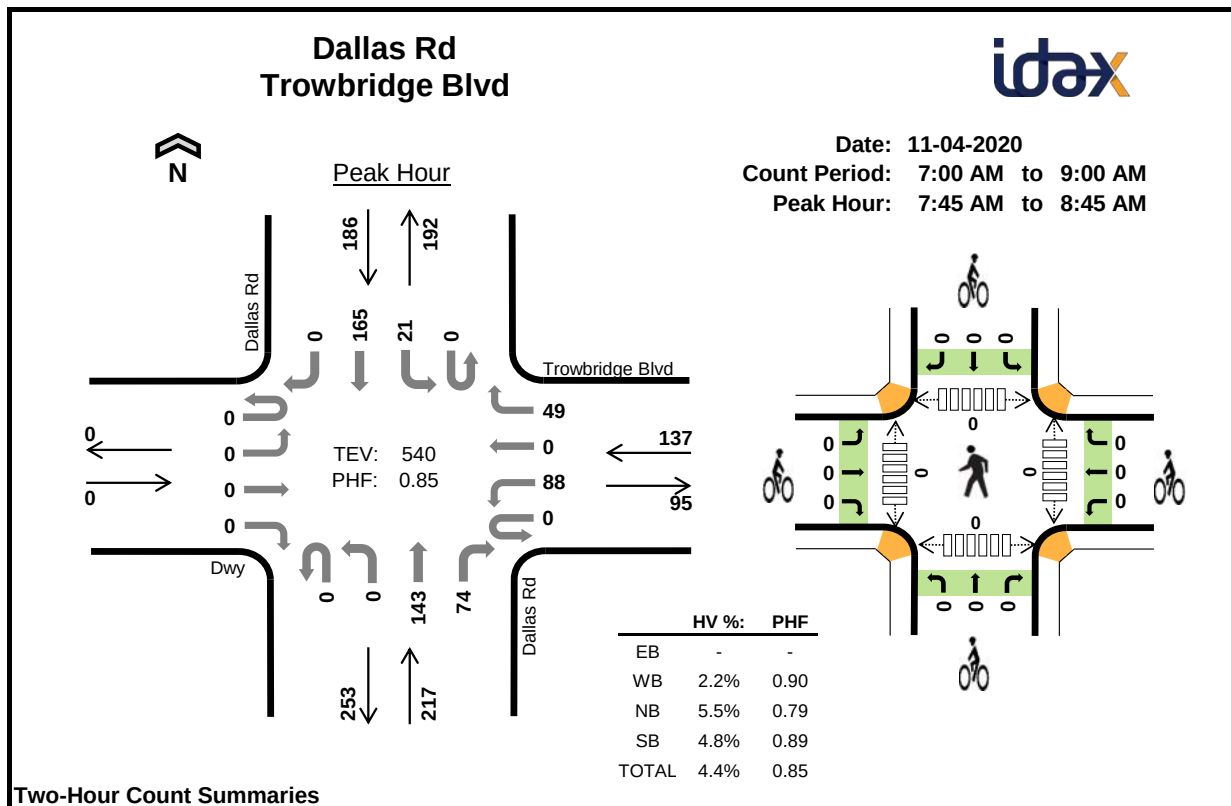
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	1	1	1	3	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	1	2	4	7	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	1	5	1	7	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	2	2	0	4	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	4	0	2	6	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	2	2	4	8	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	6	3	10	0	0	0	0	0	0	0	0	0	0
Count Total	0	12	19	17	48	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	8	9	7	24	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																			
Interval Start	I-82 WB On Ramp				I-82 WB Off Ramp				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
7:00 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	3	0
7:15 AM	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	4	0	7	0
7:30 AM	0	0	0	0	0	0	0	1	0	3	2	0	0	0	0	1	0	7	0
7:45 AM	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4	21
8:00 AM	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	2	0	6	24
8:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	3	20
8:30 AM	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	4	0	8	21
8:45 AM	0	0	0	0	0	0	0	1	0	3	3	0	0	0	0	2	1	10	27
Count Total	0	0	0	0	0	0	0	12	0	8	11	0	0	0	15	2		48	0
Peak Hour	0	0	0	0	0	0	0	8	0	3	6	0	0	0	7	0		24	0

Two-Hour Count Summaries - Bikes																	
Interval Start	I-82 WB On Ramp			I-82 WB Off Ramp			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Dwy				Trowbridge Blvd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
	7:00 AM	0	0	0	0	0	20	0	1	0	0	21	15	0	4	38	0	99	0
	7:15 AM	0	0	0	0	0	25	0	11	0	0	26	13	0	6	45	0	126	0
	7:30 AM	0	0	0	0	0	24	0	5	0	0	26	11	0	2	47	0	115	0
	7:45 AM	0	0	0	0	0	31	0	7	0	0	44	25	0	5	47	0	159	499
	8:00 AM	0	0	0	0	0	15	0	12	0	0	24	20	0	7	43	0	121	521
	8:15 AM	0	0	0	0	0	20	0	18	0	0	34	9	0	4	36	0	121	516
	8:30 AM	0	0	0	0	0	22	0	12	0	0	41	20	0	5	39	0	139	540
	8:45 AM	0	0	0	0	0	30	0	7	0	0	35	15	0	11	28	0	126	507
Count Total		0	0	0	0	0	187	0	73	0	0	251	128	0	44	323	0	1,006	0
Peak Hour	All	0	0	0	0	0	88	0	49	0	0	143	74	0	21	165	0	540	0
	HV	0	0	0	0	0	1	0	2	0	0	7	5	0	2	7	0	24	0
	HV%	-	-	-	-	-	1%	-	4%	-	-	5%	7%	-	10%	4%	-	4%	0

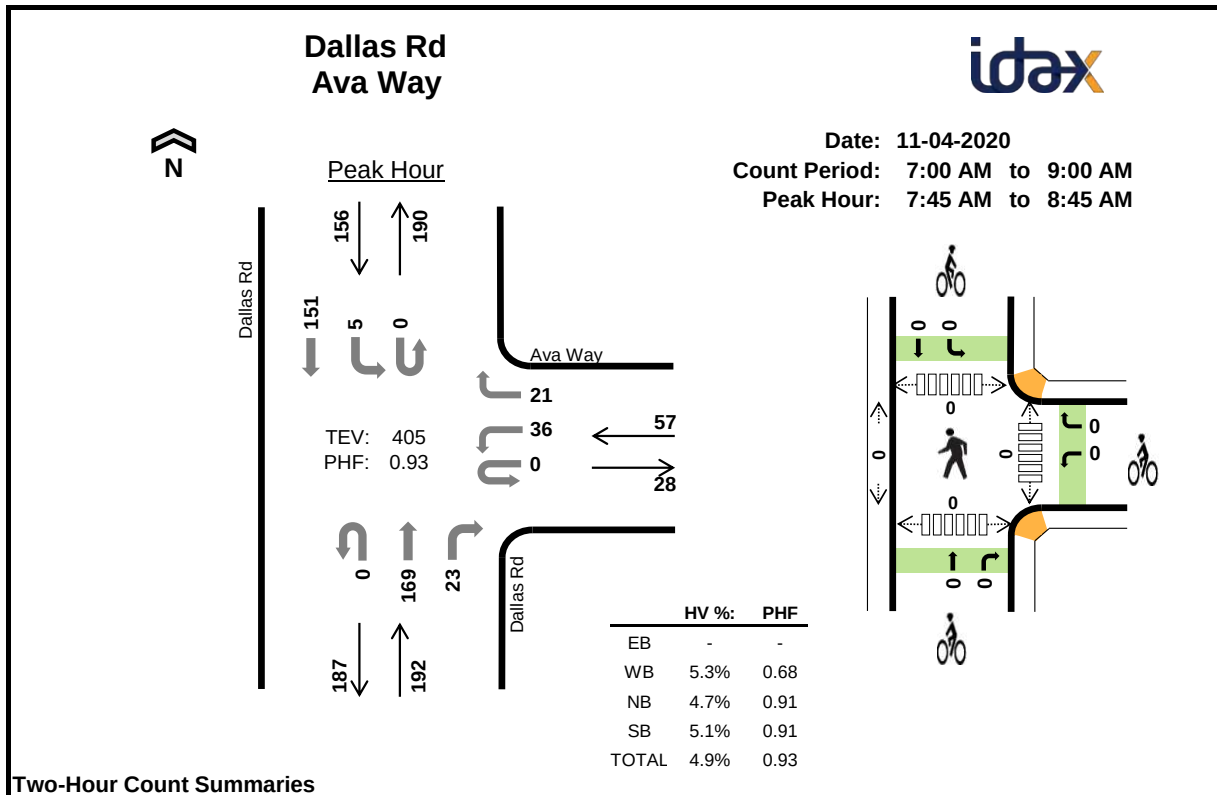
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	3	4	7	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	1	3	1	5	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	1	4	1	6	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	4	3	7	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	2	0	2	4	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	4	3	7	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	2	4	1	7	0	0	0	0	0	0	0	0	0	0
Count Total	0	6	23	16	45	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	3	12	9	24	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Dwy				Trowbridge Blvd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	2	1	0	0	4	0	7	0
7:30 AM	0	0	0	0	0	0	0	1	0	0	1	2	0	0	1	0	5	0
7:45 AM	0	0	0	0	0	0	0	1	0	0	4	0	0	1	0	0	6	20
8:00 AM	0	0	0	0	0	0	0	0	0	0	2	2	0	1	2	0	7	25
8:15 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	4	22
8:30 AM	0	0	0	0	0	0	0	0	0	0	1	3	0	0	3	0	7	24
8:45 AM	0	0	0	0	0	2	0	0	0	0	3	1	0	0	1	0	7	25
Count Total	0	0	0	0	0	3	0	3	0	0	13	10	0	2	14	0	45	0
Peak Hour	0	0	0	0	0	1	0	2	0	0	7	5	0	2	7	0	24	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Dwy			Trowbridge Blvd			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		0				Ava Way				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	0	0	0	9	0	1	0	0	22	2	0	3	35	0	72	0
7:15 AM		0	0	0	0	0	9	0	5	0	0	33	3	0	0	40	0	90	0
7:30 AM		0	0	0	0	0	14	0	2	0	0	30	2	0	0	37	0	85	0
7:45 AM		0	0	0	0	0	9	0	4	0	0	46	7	0	1	42	0	109	356
8:00 AM		0	0	0	0	0	10	0	4	0	0	31	5	0	2	40	0	92	376
8:15 AM		0	0	0	0	0	11	0	10	0	0	48	3	0	2	29	0	103	389
8:30 AM		0	0	0	0	0	6	0	3	0	0	44	8	0	0	40	0	101	405
8:45 AM		0	0	0	0	0	8	0	4	0	0	33	9	0	10	28	0	92	388
Count Total		0	0	0	0	0	76	0	33	0	0	287	39	0	18	291	0	744	0
Peak Hour	All	0	0	0	0	0	36	0	21	0	0	169	23	0	5	151	0	405	0
	HV	0	0	0	0	0	2	0	1	0	0	8	1	0	1	7	0	20	0
	HV%	-	-	-	-	-	6%	-	5%	-	-	5%	4%	-	20%	5%	-	5%	0

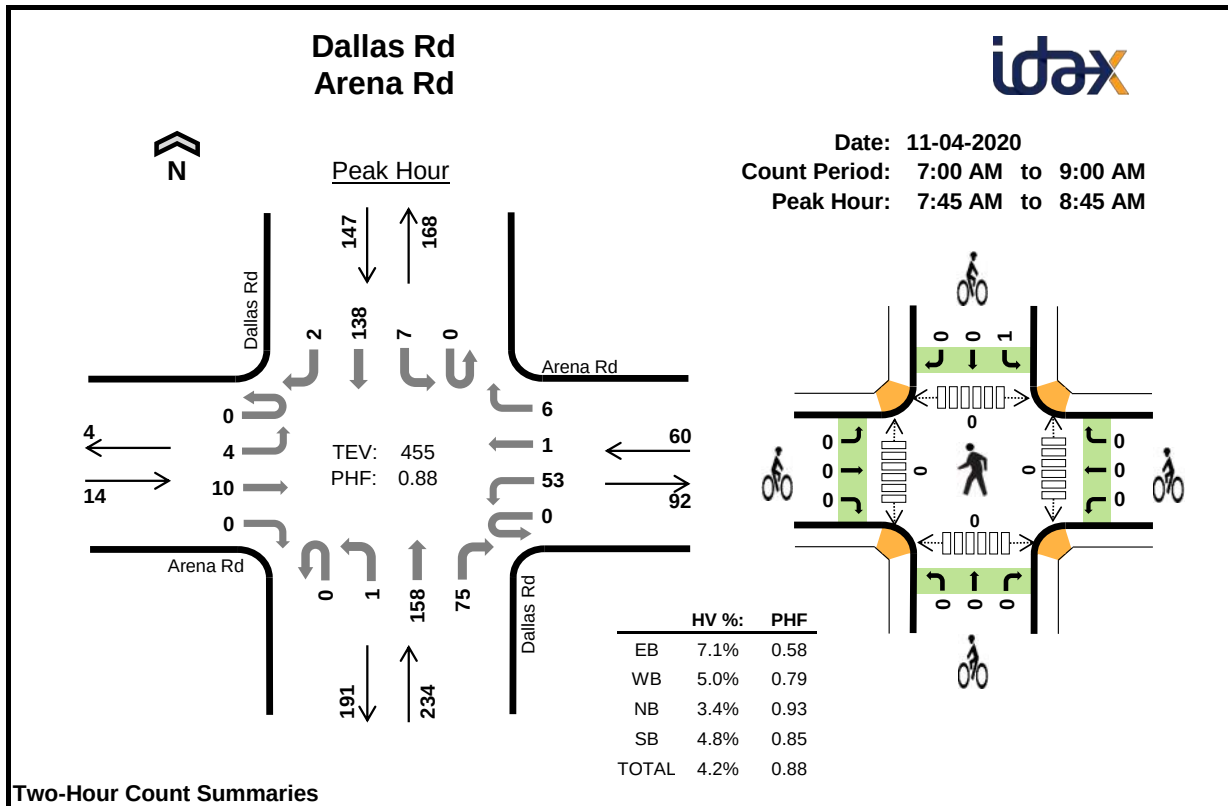
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	2	2	3	7	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	1	2	0	3	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	5	1	6	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	2	2	2	6	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	1	1	2	4	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	1	3	4	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	3	0	4	0	0	0	0	0	0	0	0	0	0
Count Total	0	7	16	12	35	0	0	0	0	0	0	0	0	0	0
Peak Hr	0	3	9	8	20	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																			
Interval Start	0				Ava Way				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
7:15 AM	0	0	0	0	0	1	0	1	0	0	2	0	0	0	0	3	0	7	0
7:30 AM	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	3	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	1	0	6	17
8:00 AM	0	0	0	0	0	2	0	0	0	0	0	2	0	0	1	1	0	6	22
8:15 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0	4	19
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	4	20
8:45 AM	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0	4	18
Count Total	0	0	0	0	0	5	0	2	0	0	14	2	0	1	11	0	35	0	0
Peak Hour	0	0	0	0	0	2	0	1	0	0	8	1	0	1	7	0	20	0	0

Two-Hour Count Summaries - Bikes																			
Interval Start	0			Ava Way			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour					
	Eastbound			Westbound			Northbound			Southbound									
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT							
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Arena Rd				Arena Rd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	2	0	0	12	0	0	0	1	26	5	0	0	34	1	81	0
7:15 AM		0	2	3	2	0	14	1	0	0	0	30	12	0	0	33	1	98	0
7:30 AM		0	0	3	1	0	12	1	1	0	0	39	12	0	1	29	1	100	0
7:45 AM		0	2	4	0	0	11	0	0	0	0	44	17	0	0	37	1	116	395
8:00 AM		0	0	2	0	0	11	0	1	0	0	32	15	0	0	36	0	97	411
8:15 AM		0	0	2	0	0	15	1	2	0	0	41	22	0	3	27	0	113	426
8:30 AM		0	2	2	0	0	16	0	3	0	1	41	21	0	4	38	1	129	455
8:45 AM		0	1	0	0	0	20	0	1	0	0	32	15	0	4	32	0	105	444
Count Total		0	7	18	3	0	111	3	8	0	2	285	119	0	12	266	5	839	0
Peak Hour	All	0	4	10	0	0	53	1	6	0	1	158	75	0	7	138	2	455	0
	HV	0	0	1	0	0	3	0	0	0	0	7	1	0	0	7	0	19	0
	HV%	-	0%	10%	-	-	6%	0%	0%	-	0%	4%	1%	-	0%	5%	0%	4%	0

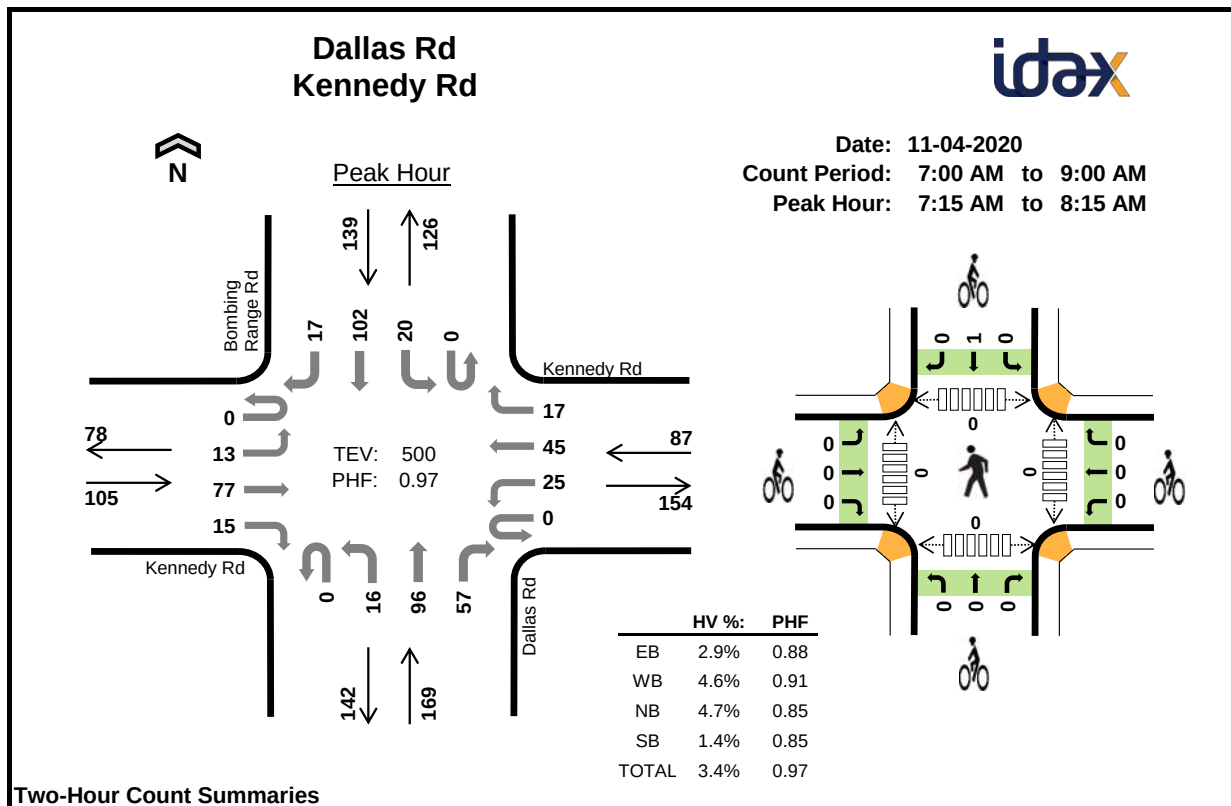
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	2	1	3	0	0	0	0	0	0	0	0	1	1
7:30 AM	1	1	1	1	4	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	1	5	0	6	0	0	0	1	1	0	0	0	0	0
8:00 AM	0	1	1	1	3	0	0	0	0	0	0	0	0	0	0
8:15 AM	1	1	1	3	6	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	1	3	4	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	3	1	5	0	0	0	0	0	0	0	0	0	0
Count Total	2	5	14	14	35	0	0	0	1	1	0	0	0	1	1
Peak Hour	1	3	8	7	19	0	0	0	1	1	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																			
Interval Start	Arena Rd				Arena Rd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3	0
7:30 AM	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	4	0
7:45 AM	0	0	0	0	0	1	0	0	0	0	0	5	0	0	0	0	0	6	17
8:00 AM	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	3	16
8:15 AM	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	3	0	6	19
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	4	19
8:45 AM	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0	1	0	5	18
Count Total	0	0	2	0	0	5	0	0	0	0	0	13	1	0	0	13	1	35	0
Peak Hour	0	0	1	0	0	3	0	0	0	0	0	7	1	0	0	7	0	19	0

Two-Hour Count Summaries - Bikes																		
Interval Start	Arena Rd			Arena Rd			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0			
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		Kennedy Rd				Kennedy Rd				Dallas Rd				Bombing Range Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	3	13	7	0	4	8	0	0	4	20	6	0	4	27	4	100	0
7:15 AM		0	4	19	5	0	6	11	2	0	5	22	8	0	3	25	8	118	0
7:30 AM		0	3	22	5	0	6	6	10	0	4	24	17	0	6	22	4	129	0
7:45 AM		0	6	17	3	0	8	10	4	0	2	33	15	0	1	27	2	128	475
8:00 AM		0	0	19	2	0	5	18	1	0	5	17	17	0	10	28	3	125	500
8:15 AM		0	2	13	6	0	6	5	3	0	1	24	16	0	8	18	2	104	486
8:30 AM		0	1	24	6	0	11	13	6	0	0	32	17	0	6	23	4	143	500
8:45 AM		0	5	17	5	0	6	11	4	0	7	17	10	0	6	23	6	117	489
Count Total		0	24	144	39	0	52	82	30	0	28	189	106	0	44	193	33	964	0
Peak Hour	All	0	13	77	15	0	25	45	17	0	16	96	57	0	20	102	17	500	0
	HV	0	1	1	1	0	1	2	1	0	1	4	3	0	1	1	0	17	0
	HV%	-	8%	1%	7%	-	4%	4%	6%	-	6%	4%	5%	-	5%	1%	0%	3%	0

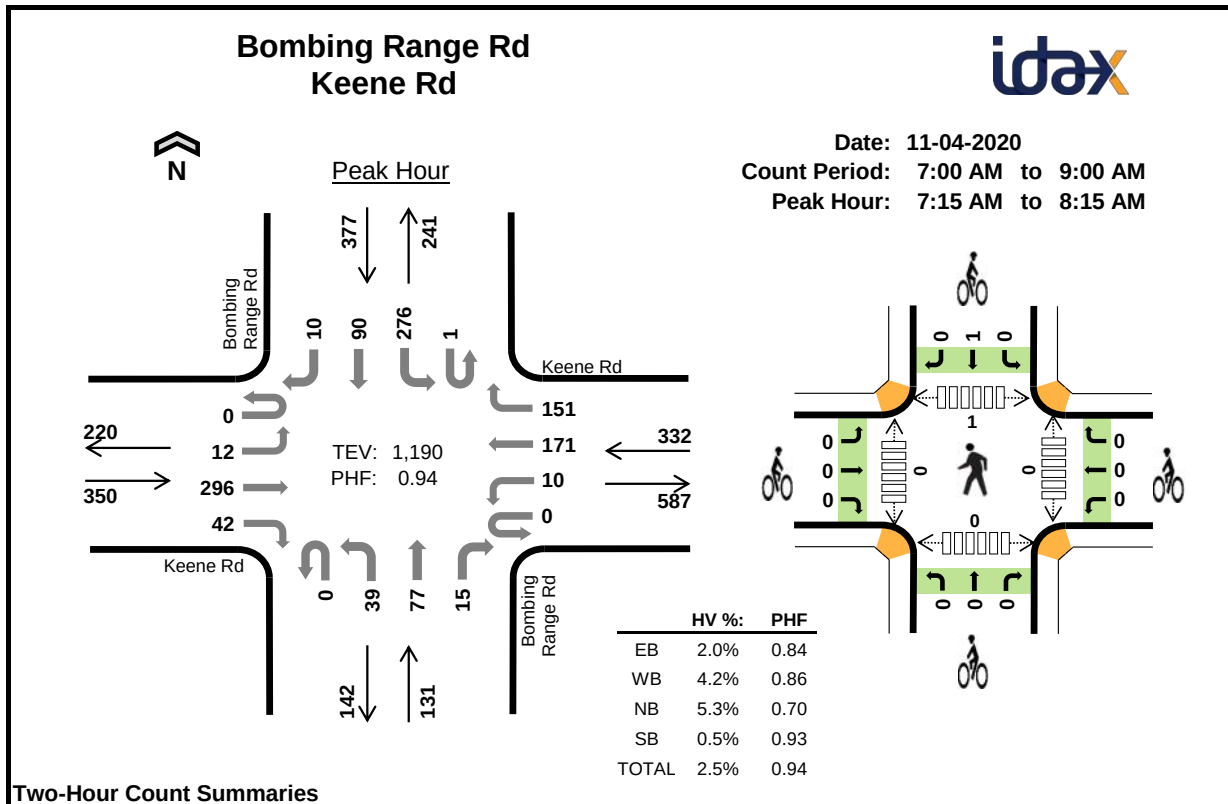
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	3	1	0	2	6	0	0	0	0	0	0	0	0	0	0
7:15 AM	2	1	2	0	5	0	0	0	0	0	0	0	0	0	0
7:30 AM	1	1	1	1	4	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	1	4	0	5	0	0	0	1	1	0	0	0	0	0
8:00 AM	0	1	1	1	3	0	0	0	0	0	0	0	0	0	0
8:15 AM	1	3	0	2	6	0	0	0	0	0	2	0	0	0	2
8:30 AM	2	1	1	3	7	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0
Count Total	9	9	11	9	38	0	0	0	1	1	2	0	0	0	2
Peak Hour	3	4	8	2	17	0	0	0	1	1	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Kennedy Rd				Kennedy Rd				Dallas Rd				Bombing Range Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	1	0	2	0	1	0	0	0	0	0	0	0	1	1	0	6	0
7:15 AM	0	1	0	1	0	0	1	0	0	0	1	1	0	0	0	0	5	0
7:30 AM	0	0	1	0	0	0	0	1	0	0	0	1	0	0	1	0	4	0
7:45 AM	0	0	0	0	0	0	1	0	0	0	3	1	0	0	0	0	5	20
8:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	3	17
8:15 AM	0	0	0	1	0	1	1	1	0	0	0	0	0	0	2	0	6	18
8:30 AM	0	0	1	1	0	0	1	0	0	0	1	0	0	1	1	1	7	21
8:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	18
Count Total	0	2	2	5	0	3	4	2	0	3	5	3	0	3	5	1	38	0
Peak Hour	0	1	1	1	0	1	2	1	0	1	4	3	0	1	1	0	17	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Kennedy Rd			Kennedy Rd			Dallas Rd			Bombing Range Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	1			
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	1	0	1	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Keene Rd				Keene Rd				Bombing Range Rd				Bombing Range Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	3	59	16	0	0	29	32	0	4	18	3	0	74	17	2	257	0
7:15 AM		0	3	78	8	0	5	53	39	0	8	18	1	0	66	24	3	306	0
7:30 AM		0	4	88	12	0	2	32	32	0	8	25	2	0	79	20	2	306	0
7:45 AM		0	4	75	9	0	1	42	36	0	20	19	8	0	77	20	4	315	1,184
8:00 AM		0	1	55	13	0	2	44	44	0	3	15	4	1	54	26	1	263	
8:15 AM		0	7	45	13	1	3	40	46	0	8	16	5	0	65	16	4	269	1,153
8:30 AM		0	2	61	15	0	4	49	50	0	8	29	4	1	62	16	4	305	1,152
8:45 AM		0	2	70	7	0	2	39	49	0	3	21	3	0	61	24	2	283	1,120
Count Total		0	26	531	93	1	19	328	328	0	62	161	30	2	538	163	22	2,304	0
Peak Hour	All	0	12	296	42	0	10	171	151	0	39	77	15	1	276	90	10	1,190	0
	HV	0	2	4	1	0	0	6	8	0	3	4	0	0	1	1	0	30	0
	HV%	-	17%	1%	2%	-	0%	4%	5%	-	8%	5%	0%	0%	0%	1%	0%	3%	0

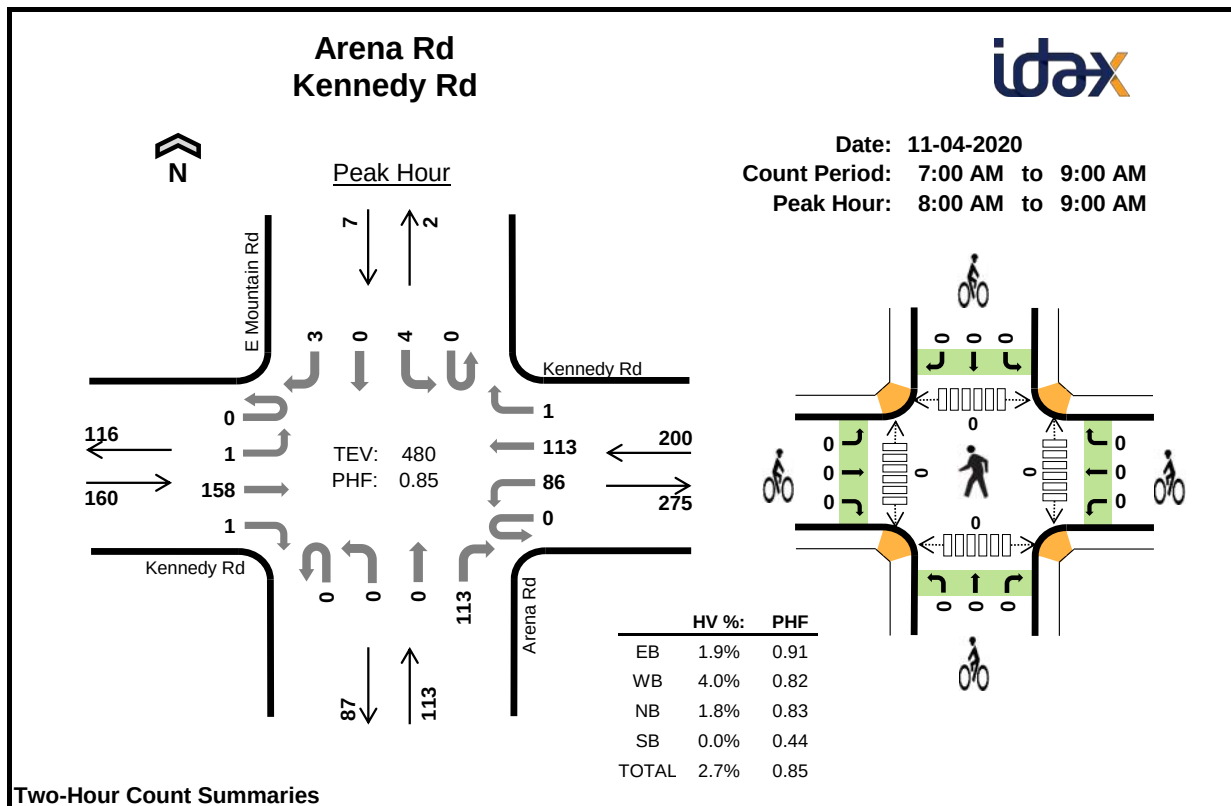
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	2	1	6	10	0	0	0	0	0	0	0	0	0	0
7:15 AM	1	3	2	0	6	0	0	0	0	0	0	0	0	0	0
7:30 AM	3	5	1	1	10	0	0	0	0	0	0	0	1	0	1
7:45 AM	0	1	3	0	4	0	0	0	1	1	0	0	0	0	0
8:00 AM	3	5	1	1	10	0	0	0	0	0	0	0	0	0	0
8:15 AM	2	3	0	2	7	0	0	0	0	0	2	0	1	0	3
8:30 AM	3	2	2	3	10	0	0	0	1	1	0	0	0	0	0
8:45 AM	1	2	0	2	5	0	0	0	0	0	0	0	1	0	1
Count Total	14	23	10	15	62	0	0	0	2	2	2	0	3	0	5
Peak Hour	7	14	7	2	30	0	0	0	1	1	0	0	1	0	1

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Keene Rd				Keene Rd				Bombing Range Rd				Bombing Range Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	1	0	0	0	0	2	0	0	1	0	0	4	2	0	10	0
7:15 AM	0	0	1	0	0	0	0	3	0	0	2	0	0	0	0	0	6	0
7:30 AM	0	1	1	1	0	0	4	1	0	0	1	0	0	1	0	0	10	0
7:45 AM	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	4	30
8:00 AM	0	1	2	0	0	0	1	4	0	0	1	0	0	0	1	0	10	30
8:15 AM	0	0	1	1	0	0	1	2	0	0	0	0	0	1	1	0	7	31
8:30 AM	0	0	1	2	0	0	1	1	0	0	2	0	0	2	1	0	10	31
8:45 AM	0	0	1	0	0	0	1	1	0	0	0	0	0	2	0	0	5	32
Count Total	0	2	8	4	0	0	9	14	0	3	7	0	0	10	5	0	62	0
Peak Hour	0	2	4	1	0	0	6	8	0	3	4	0	0	1	1	0	30	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Keene Rd			Keene Rd			Bombing Range Rd			Bombing Range Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Kennedy Rd				Kennedy Rd				Arena Rd				E Mountain Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
	7:00 AM	0	0	29	0	0	13	16	0	0	0	0	6	0	0	0	0	64	0
	7:15 AM	0	0	34	0	0	14	23	0	0	0	0	18	0	0	0	0	89	0
	7:30 AM	0	1	44	0	0	17	22	0	0	0	0	15	0	1	0	0	100	0
	7:45 AM	0	0	33	0	0	14	22	0	0	0	0	19	0	0	0	0	88	341
	8:00 AM	0	0	36	0	0	15	26	0	0	0	0	23	0	2	0	2	104	381
	8:15 AM	0	1	39	1	0	27	18	0	0	0	0	29	0	0	0	0	115	407
	8:30 AM	0	0	44	0	0	23	37	1	0	0	0	34	0	1	0	1	141	448
	8:45 AM	0	0	39	0	0	21	32	0	0	0	0	27	0	1	0	0	120	480
Count Total		0	2	298	1	0	144	196	1	0	0	0	171	0	5	0	3	821	0
Peak Hour	All	0	1	158	1	0	86	113	1	0	0	0	113	0	4	0	3	480	0
	HV	0	0	3	0	0	3	5	0	0	0	0	2	0	0	0	0	13	0
	HV%	-	0%	2%	0%	-	3%	4%	0%	-	-	-	2%	-	0%	-	0%	3%	0

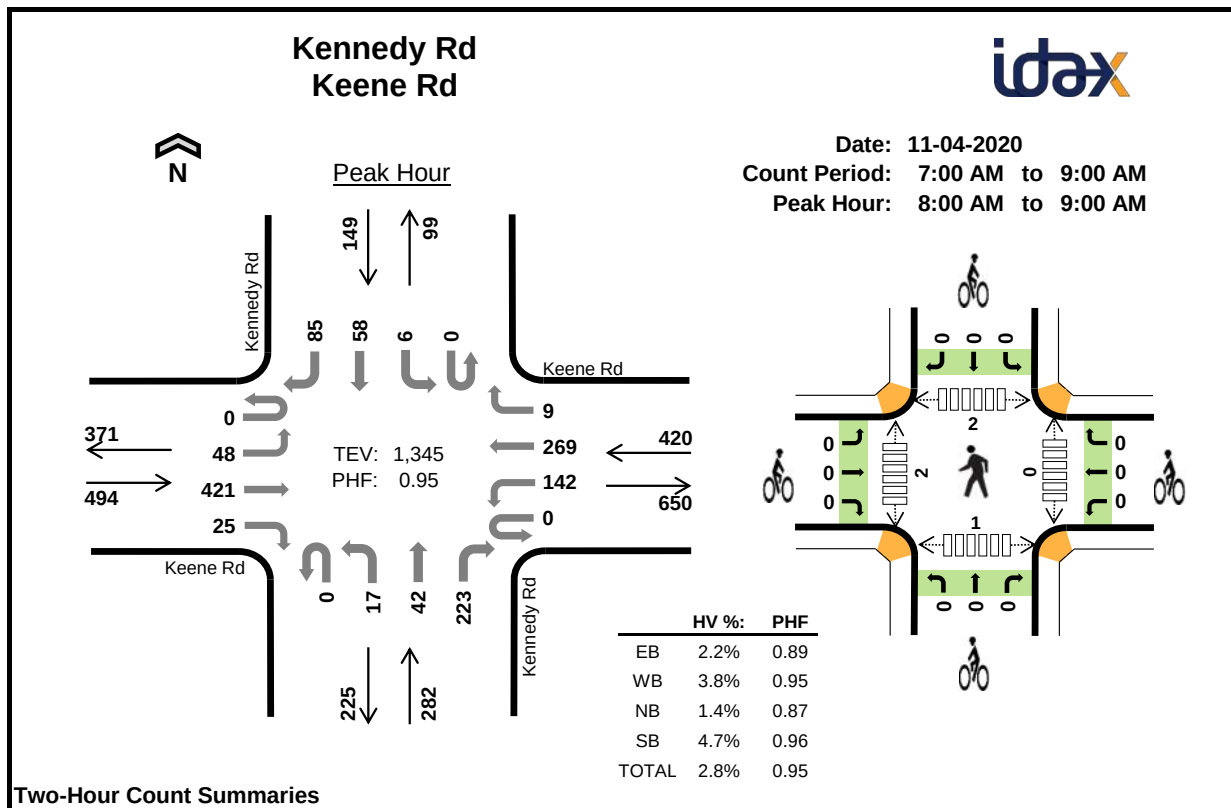
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	1	0	0	3	0	0	0	0	0	0	0	0	0	0
7:15 AM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0
7:30 AM	1	3	1	0	5	0	0	0	0	0	0	0	0	0	0
7:45 AM	2	0	0	0	2	0	0	1	0	1	0	0	0	0	0
8:00 AM	1	2	0	0	3	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	4	2	0	6	0	0	0	0	0	0	0	0	0	0
8:30 AM	2	1	0	0	3	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Count Total	9	13	3	0	25	0	0	1	0	1	0	0	0	0	0
Peak Hour	3	8	2	0	13	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Kennedy Rd				Kennedy Rd				Arena Rd				E Mountain Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0
7:15 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0
7:30 AM	0	0	1	0	0	2	1	0	0	0	0	1	0	0	0	0	5	0
7:45 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12
8:00 AM	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	3	12
8:15 AM	0	0	0	0	0	1	3	0	0	0	0	2	0	0	0	0	6	16
8:30 AM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	14
8:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	13
Count Total	0	0	9	0	0	5	8	0	0	0	0	3	0	0	0	0	25	0
Peak Hour	0	0	3	0	0	3	5	0	0	0	0	2	0	0	0	0	13	0

Two-Hour Count Summaries - Bikes																		
Interval Start	Kennedy Rd			Kennedy Rd			Arena Rd			E Mountain Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	1	0	0	0	1	1				
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	1	0	0	0	1	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Keene Rd				Keene Rd				Kennedy Rd				Kennedy Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	10	108	7	0	24	46	0	0	2	4	36	0	0	9	25	271	0
7:15 AM		0	12	132	6	0	34	72	0	0	4	7	42	0	3	8	16	336	0
7:30 AM		0	16	137	8	0	21	52	1	0	1	7	61	0	2	13	15	334	0
7:45 AM		0	8	138	7	0	34	59	2	0	3	11	54	0	0	6	23	345	1,286
8:00 AM		0	12	97	7	0	32	65	2	0	3	9	54	0	0	16	21	318	1,333
8:15 AM		0	7	102	5	0	31	75	4	0	4	15	45	0	4	12	22	326	1,323
8:30 AM		0	11	107	7	0	43	67	1	0	2	5	64	0	1	13	25	346	1,335
8:45 AM		0	18	115	6	0	36	62	2	0	8	13	60	0	1	17	17	355	1,345
Count Total		0	94	936	53	0	255	498	12	0	27	71	416	0	11	94	164	2,631	0
Peak Hour	All	0	48	421	25	0	142	269	9	0	17	42	223	0	6	58	85	1,345	0
	HV	0	1	10	0	0	6	9	1	0	0	1	3	0	1	3	3	38	0
	HV%	-	2%	2%	0%	-	4%	3%	11%	-	0%	2%	1%	-	17%	5%	4%	3%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	4	1	2	3	10	0	0	0	0	0	0	0	0	0	0
7:15 AM	3	1	1	3	8	0	0	0	0	0	0	0	0	0	0
7:30 AM	2	6	1	1	10	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	1	2	1	4	0	0	0	0	0	1	0	0	0	1
8:00 AM	2	6	1	1	10	0	0	0	0	0	0	0	0	0	0
8:15 AM	2	3	1	5	11	0	0	0	0	0	0	0	0	0	0
8:30 AM	3	3	2	0	8	0	0	0	0	0	0	0	2	0	2
8:45 AM	4	4	0	1	9	0	0	0	0	0	0	2	0	1	3
Count Total	20	25	10	15	70	0	0	0	0	0	1	2	2	1	6
Peak Hour	11	16	4	7	38	0	0	0	0	0	0	2	2	1	5

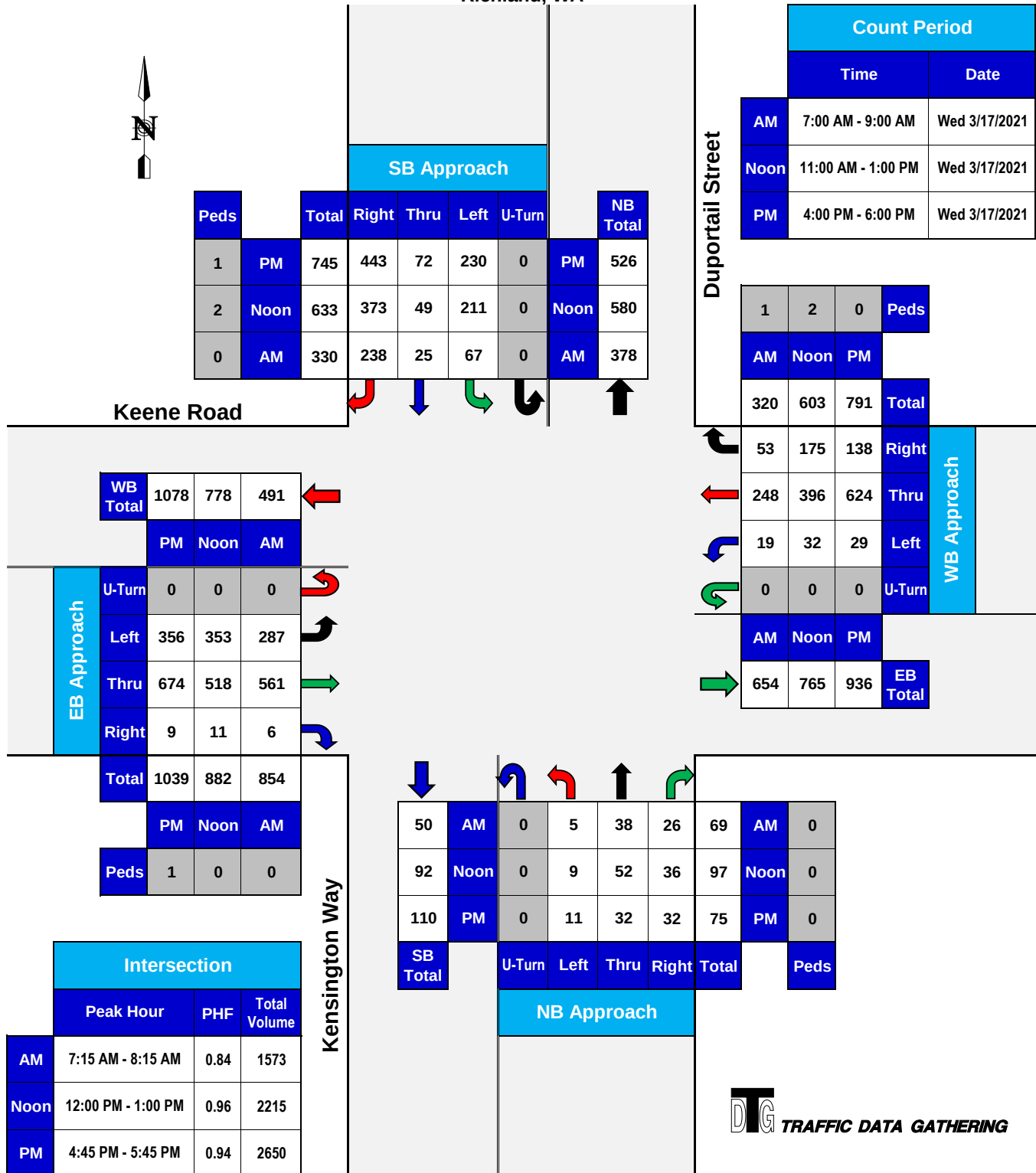
Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Keene Rd				Keene Rd				Kennedy Rd				Kennedy Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	4	0	0	0	1	0	0	0	0	2	0	0	1	2	10	0
7:15 AM	0	0	3	0	0	0	1	0	0	0	0	1	0	0	1	2	8	0
7:30 AM	0	0	2	0	0	3	3	0	0	0	0	1	0	0	0	1	10	0
7:45 AM	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	1	4	32
8:00 AM	0	0	2	0	0	3	3	0	0	0	0	1	0	0	0	1	10	32
8:15 AM	0	1	1	0	0	0	2	1	0	0	1	0	0	1	3	1	11	35
8:30 AM	0	0	3	0	0	1	2	0	0	0	0	2	0	0	0	0	8	33
8:45 AM	0	0	4	0	0	2	2	0	0	0	0	0	0	0	0	1	9	38
Count Total	0	1	19	0	0	9	15	1	0	0	1	9	0	1	5	9	70	0
Peak Hour	0	1	10	0	0	6	9	1	0	0	1	3	0	1	3	3	38	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Keene Rd			Keene Rd			Kennedy Rd			Kennedy Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Keene Road @ Duportail Street

Richland, WA





INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: Keene Road @ Duportail Street
Richland, WA

DATE OF COUNT: Wed. 3/17/2021

COUNTED BY: TDG

START OF COUNT: 7:00 AM

DATE OF REDUCTION: 3/31/2021

TIME OF COUNT: 7:00 AM - 9:00 AM

DURATION OF COUNT: 2

TIME INTERVAL ENDING AT	SOUTHBOUND							NORTHBOUND							WESTBOUND							EASTBOUND							INTERVAL TOTALS
	Kensington Way							Duportail Street							Keene Road							Keene Road							
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
07:15 AM	0	0	2	0	11	2	46	0	0	0	0	2	10	1	0	0	5	0	4	37	15	0	0	7	0	47	100	0	275
07:30 AM	0	0	8	0	15	2	62	0	0	1	0	2	8	9	0	0	9	0	2	54	8	0	1	10	0	59	123	0	344
07:45 AM	0	0	6	0	16	7	47	0	0	0	0	0	9	8	1	0	6	0	5	78	18	0	0	6	0	101	145	1	435
08:00 AM	0	0	6	0	14	7	63	0	0	0	0	3	10	7	0	0	4	0	3	63	16	0	0	6	0	78	197	5	466
08:15 AM	0	0	4	0	22	9	66	0	0	0	0	0	11	2	0	0	2	0	9	53	11	0	0	3	0	49	96	0	328
08:30 AM	0	0	8	0	47	10	55	0	0	0	0	2	11	4	1	0	6	0	13	50	27	0	0	1	0	17	7	4	247
08:45 AM	0	0	4	0	77	15	49	0	0	3	0	6	38	24	0	0	6	0	10	51	35	0	0	1	0	40	12	1	358
09:00 AM	0	0	10	0	81	7	61	0	0	0	0	2	16	15	0	0	7	0	2	69	28	0	0	0	0	4	22	0	307
PEAK HOUR TOTALS	0	0	24	0	67	25	238	0	0	1	0	5	38	26	1	0	21	0	19	248	53	0	1	25	0	287	561	6	INTERSECTION
ALL MOVEMENTS				330							69							320							854				1573
% HV			7.3%							1.4%							6.6%							2.9%		4.5%			
PEAK HOUR FACTOR				0.85							0.86							0.79							0.76				0.84

HV = Heavy Vehicle

PHF = Peak Hour Factor

7:00 AM - 9:00 AM PEAK HOUR:

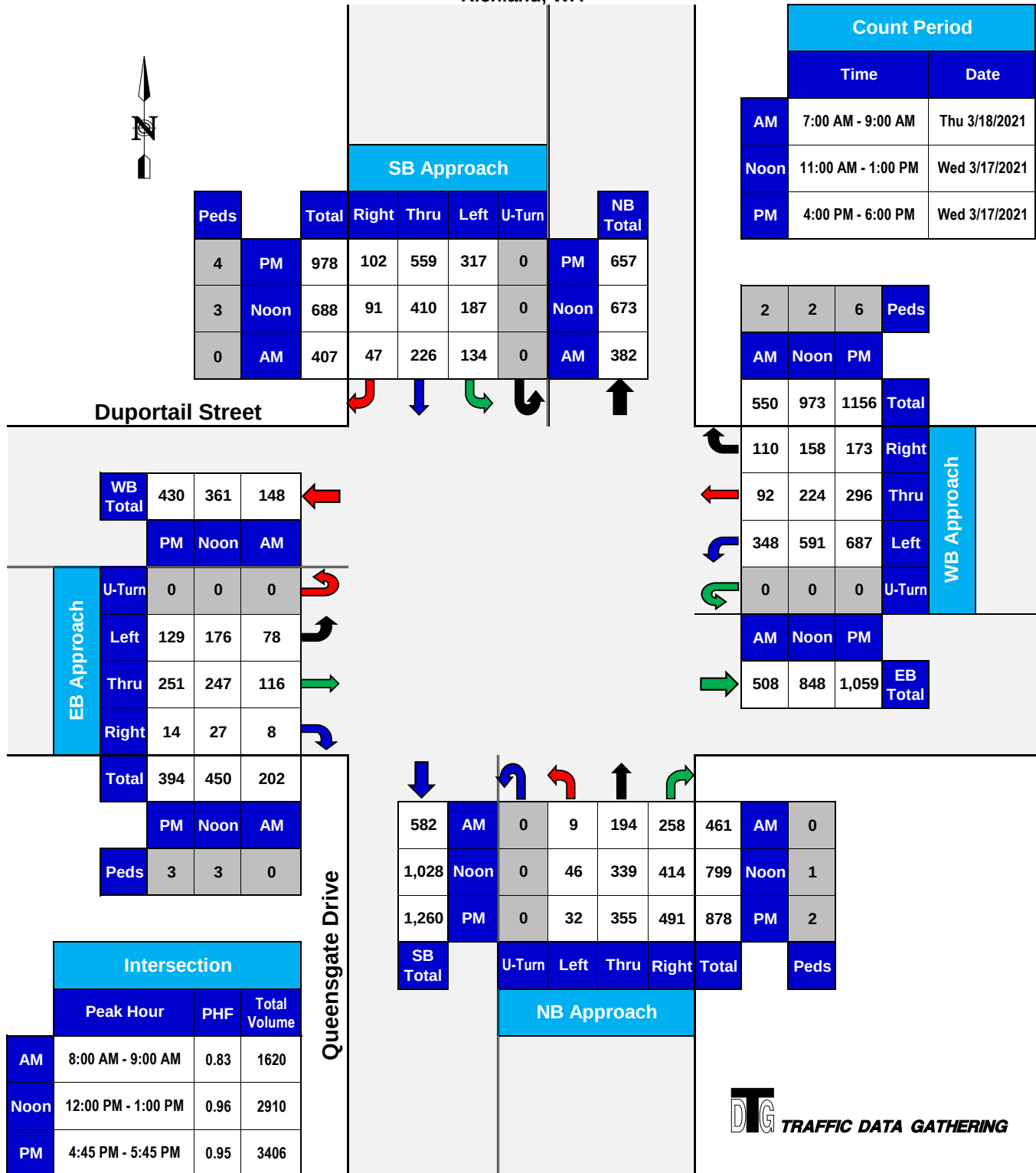
7:15 AM - 8:15 AM

ROLLING HOUR COUNT

TIME INTERVAL	SOUTHBOUND Kensington Way							NORTHBOUND Duportail Street							WESTBOUND Keene Road							EASTBOUND Keene Road							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
7:00 AM - 8:00 AM	0	0	22	0	56	18	218	0	0	1	0	7	37	25	1	0	24	0	14	232	57	0	1	29	0	285	565	6	1520
7:15 AM - 8:15 AM	0	0	24	0	67	25	238	0	0	1	0	5	38	26	1	0	21	0	19	248	53	0	1	25	0	287	561	6	1573
7:30 AM - 8:30 AM	0	0	24	0	99	33	231	0	0	0	0	5	41	21	2	0	18	0	30	244	72	0	0	16	0	245	445	10	1476
7:45 AM - 8:45 AM	0	0	22	0	160	41	233	0	0	3	0	11	70	37	1	0	18	0	35	217	89	0	0	11	0	184	312	10	1399
8:00 AM - 9:00 AM	0	0	26	0	227	41	231	0	0	3	0	10	76	45	1	0	21	0	34	223	101	0	0	5	0	110	137	5	1240
7:00 AM - 9:00 AM Total:	0	0	48	0	283	59	449	0	0	4	0	17	113	70	2	0	45	0	48	455	158	0	1	34	0	395	702	11	2760

Duportail Street @ Queensgate Drive

Richland, WA



TURNING MOVEMENTS DIAGRAM - Daily Summary

#11 AM



TRAFFIC DATA GATHERING

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: Duportail Street @ Queensgate Drive
Richland, WA

DATE OF COUNT: Wed. 3/17/2021COUNTED BY: TDGSTART OF COUNT: 11:00 AMDATE OF REDUCTION: 3/31/2021TIME OF COUNT: 11:00 AM - 1:00 PMDURATION OF COUNT: 2

TIME INTERVAL ENDING AT	SOUTHBOUND							NORTHBOUND							WESTBOUND							EASTBOUND							INTERVAL TOTALS			
	Queensgate Drive							Queensgate Drive							Duportail Street							Duportail Street										
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right				
11:15 AM	0	0	2	0	25	76	20	0	0	5	0	8	65	101	0	0	8	0	139	41	34	0	0	2	0	21	53	3	586			
11:30 AM	0	0	7	0	43	101	31	0	0	2	0	4	79	98	1	0	3	0	130	48	28	0	0	3	0	35	63	5	665			
11:45 AM	0	0	4	0	38	87	25	0	0	3	0	7	75	97	0	0	6	0	111	40	46	0	0	3	0	40	57	3	626			
12:00 PM	0	0	6	0	40	94	15	0	0	6	0	9	80	111	0	0	7	0	144	59	41	0	0	4	0	34	65	11	703			
12:15 PM	1	0	6	0	39	91	21	0	0	4	0	11	88	102	0	0	2	0	160	50	31	2	0	2	0	40	65	6	704			
12:30 PM	1	0	10	0	55	113	25	0	0	7	0	17	81	105	0	0	8	0	147	68	40	1	0	1	0	38	61	8	758			
12:45 PM	1	0	2	0	50	99	20	1	0	6	0	12	86	107	1	0	5	0	155	48	36	0	0	6	0	50	61	10	734			
01:00 PM	0	0	4	0	43	107	25	0	0	7	0	6	84	100	1	0	4	0	129	58	51	0	0	2	0	48	60	3	714			
PEAK HOUR TOTALS	3	0	22	0	187	410	91	1	0	24	0	46	339	414	2	0	19	0	591	224	158	3	0	11	0	176	247	27	INTERSECTION			
ALL MOVEMENTS				688								799								973								450				2910
% HV			3.2%								3.0%								2.0%								2.4%		2.6%			
PEAK HOUR FACTOR				0.89								0.97								0.95								0.93				0.96

HV = Heavy Vehicle

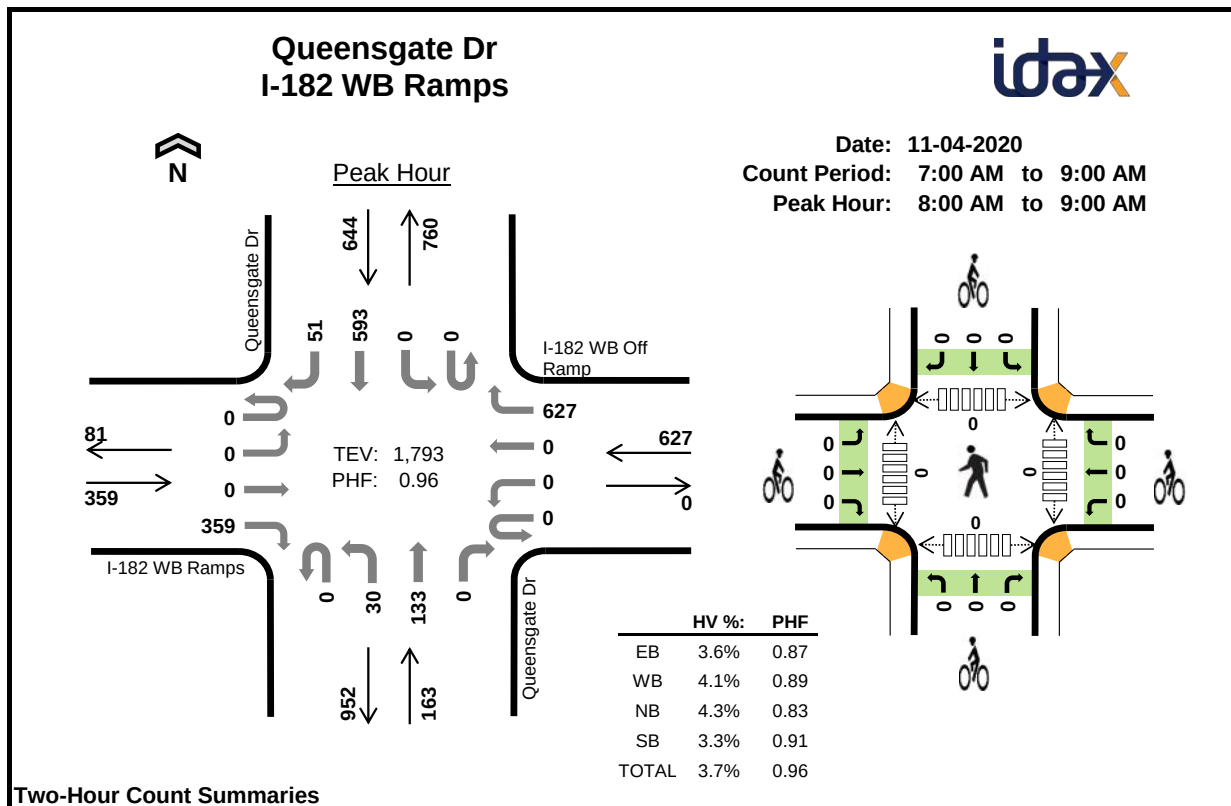
PHF = Peak Hour Factor

11:00 AM - 1:00 PM PEAK HOUR:

12:00 PM - 1:00 PM

ROLLING HOUR COUNT

TIME INTERVAL	SOUTHBOUND Queensgate Drive							NORTHBOUND Queensgate Drive							WESTBOUND Duportail Street							EASTBOUND Duportail Street							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
11:00 AM - 12:00 PM	0	0	19	0	146	358	91	0	0	16	0	28	299	407	1	0	24	0	524	188	149	0	0	12	0	130	238	22	2580
11:15 AM - 12:15 PM	1	0	23	0	160	373	92	0	0	15	0	31	322	408	1	0	18	0	545	197	146	2	0	12	0	149	250	25	2698
11:30 AM - 12:30 PM	2	0	26	0	172	385	86	0	0	20	0	44	324	415	0	0	23	0	562	217	158	3	0	10	0	152	248	28	2791
11:45 AM - 12:45 PM	3	0	24	0	184	397	81	1	0	23	0	49	335	425	1	0	22	0	606	225	148	3	0	13	0	162	252	35	2899
12:00 PM - 1:00 PM	3	0	22	0	187	410	91	1	0	24	0	46	339	414	2	0	19	0	591	224	158	3	0	11	0	176	247	27	2910
11:00 AM - 1:00 PM Total:	3	0	41	0	333	768	182	1	0	40	0	74	638	821	3	0	43	0	1115	412	307	3	0	23	0	306	485	49	5490

**Two-Hour Count Summaries**

Interval Start		I-182 WB Ramps				I-182 WB Off Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	0	29	0	0	0	108	0	10	25	0	0	0	140	8	320	0
7:15 AM		0	0	0	49	0	0	0	113	0	12	24	0	0	0	135	11	344	0
7:30 AM		0	0	0	32	0	0	0	155	0	11	36	0	0	0	169	11	414	0
7:45 AM		0	0	0	78	0	0	0	169	0	9	41	0	0	0	144	10	451	1,529
8:00 AM		0	0	0	103	0	0	0	144	0	6	31	0	0	0	145	15	444	1,653
8:15 AM		0	0	0	92	0	0	0	161	0	7	35	0	0	0	147	8	450	1,759
8:30 AM		0	0	0	76	0	0	0	145	0	5	30	0	0	0	160	16	432	1,777
8:45 AM		0	0	0	88	0	0	0	177	0	12	37	0	0	0	141	12	467	1,793
Count Total		0	0	0	547	0	0	0	1,172	0	72	259	0	0	0	1,181	91	3,322	0
Peak Hour	All	0	0	0	359	0	0	0	627	0	30	133	0	0	0	593	51	1,793	0
	HV	0	0	0	13	0	0	0	26	0	2	5	0	0	0	18	3	67	0
	HV%	-	-	-	4%	-	-	-	4%	-	7%	4%	-	-	-	3%	6%	4%	0

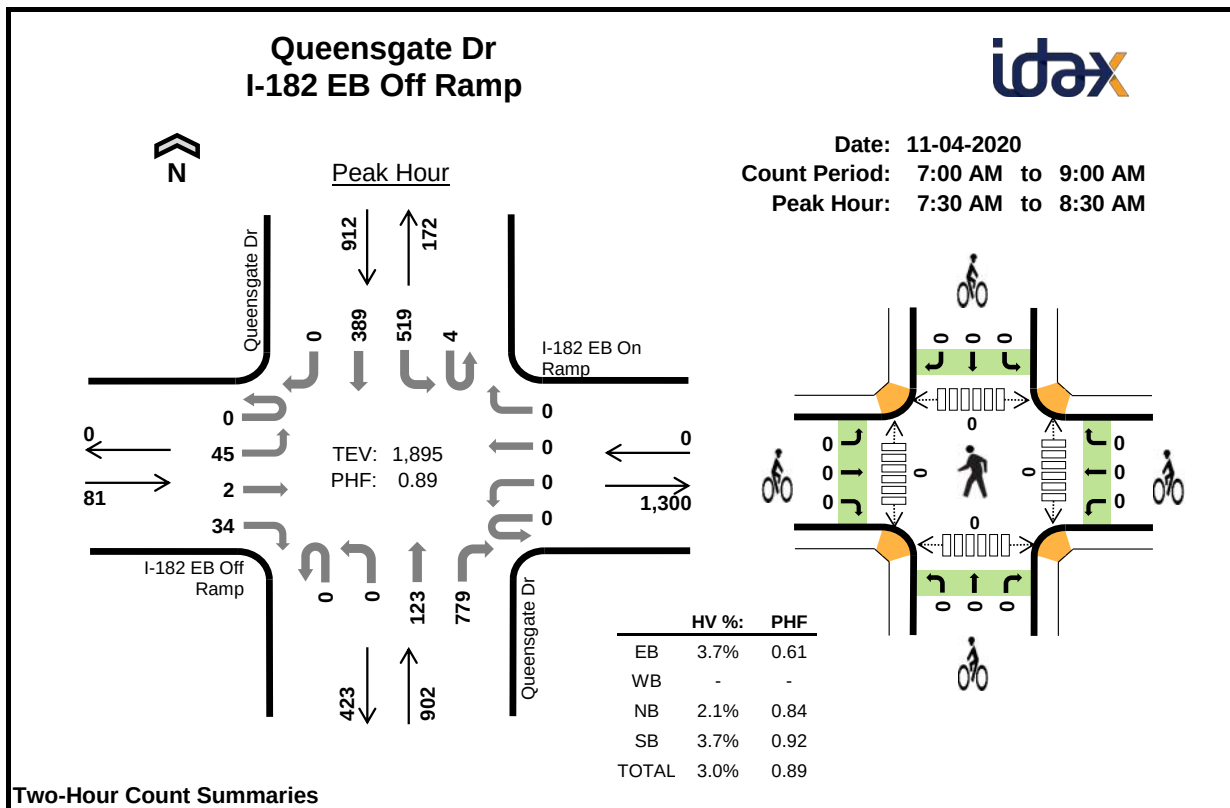
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	5	0	7	13	0	0	0	0	0	0	0	0	0	0
7:15 AM	1	4	1	6	12	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	8	2	4	14	0	0	0	0	0	0	0	0	0	0
7:45 AM	5	6	0	7	18	0	0	0	0	0	0	0	0	0	0
8:00 AM	3	7	1	4	15	0	0	0	0	0	0	0	0	0	0
8:15 AM	5	5	3	9	22	0	0	0	0	0	0	0	0	0	0
8:30 AM	3	8	2	5	18	0	0	0	0	0	0	0	0	0	0
8:45 AM	2	6	1	3	12	0	0	0	0	0	0	0	0	0	0
Count Total	20	49	10	45	124	0	0	0	0	0	0	0	0	0	0
Peak Hour	13	26	7	21	67	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	I-182 WB Ramps				I-182 WB Off Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	1	0	0	0	5	0	0	0	0	0	0	6	1	13	0
7:15 AM	0	0	0	1	0	0	0	4	0	0	1	0	0	0	5	1	12	0
7:30 AM	0	0	0	0	0	0	0	8	0	0	2	0	0	0	4	0	14	0
7:45 AM	0	0	0	5	0	0	0	6	0	0	0	0	0	0	7	0	18	57
8:00 AM	0	0	0	3	0	0	0	7	0	0	1	0	0	0	3	1	15	59
8:15 AM	0	0	0	5	0	0	0	5	0	0	3	0	0	0	8	1	22	69
8:30 AM	0	0	0	3	0	0	0	8	0	1	1	0	0	0	4	1	18	73
8:45 AM	0	0	0	2	0	0	0	6	0	1	0	0	0	0	3	0	12	67
Count Total	0	0	0	20	0	0	0	49	0	2	8	0	0	0	40	5	124	0
Peak Hour	0	0	0	13	0	0	0	26	0	2	5	0	0	0	18	3	67	0

Two-Hour Count Summaries - Bikes																		
Interval Start	I-182 WB Ramps			I-182 WB Off Ramp			Queensgate Dr			Queensgate Dr			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		I-182 EB Off Ramp				I-182 EB On Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	9	0	7	0	0	0	0	0	0	25	136	0	120	43	0	340	0
7:15 AM		0	8	0	5	0	0	0	0	0	0	28	159	0	114	74	0	388	0
7:30 AM		0	10	0	10	0	0	0	0	0	0	34	233	1	143	55	0	486	0
7:45 AM		0	20	2	11	0	0	0	0	0	0	31	238	1	131	96	0	530	1,744
8:00 AM		0	5	0	10	0	0	0	0	0	0	29	151	1	121	125	0	442	1,846
8:15 AM		0	10	0	3	0	0	0	0	0	0	29	157	1	124	113	0	437	1,895
8:30 AM		0	12	0	9	0	0	0	0	0	0	24	136	0	123	112	0	416	1,825
8:45 AM		0	12	0	11	0	0	0	0	0	0	30	170	1	117	112	0	453	1,748
Count Total		0	86	2	66	0	0	0	0	0	0	230	1,380	5	993	730	0	3,492	0
Peak Hour	All	0	45	2	34	0	0	0	0	0	0	123	779	4	519	389	0	1,895	0
	HV	0	2	1	0	0	0	0	0	0	0	3	16	1	15	18	0	56	0
	HV%	-	4%	50%	0%	-	-	-	-	-	-	2%	2%	25%	3%	5%	-	3%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	4	7	11	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	5	6	11	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	9	4	13	0	0	0	0	0	0	0	0	0	0
7:45 AM	2	0	2	13	17	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	4	7	11	0	0	0	0	0	0	0	0	0	0
8:15 AM	1	0	4	10	15	0	0	0	0	0	0	0	0	0	0
8:30 AM	2	0	11	9	22	0	0	0	0	0	0	0	0	0	0
8:45 AM	2	0	8	5	15	0	0	0	0	0	0	0	0	0	0
Count Total	7	0	47	61	115	0	0	0	0	0	0	0	0	0	0
Peak Hour	3	0	19	34	56	0	0	0	0	0	0	0	0	0	0

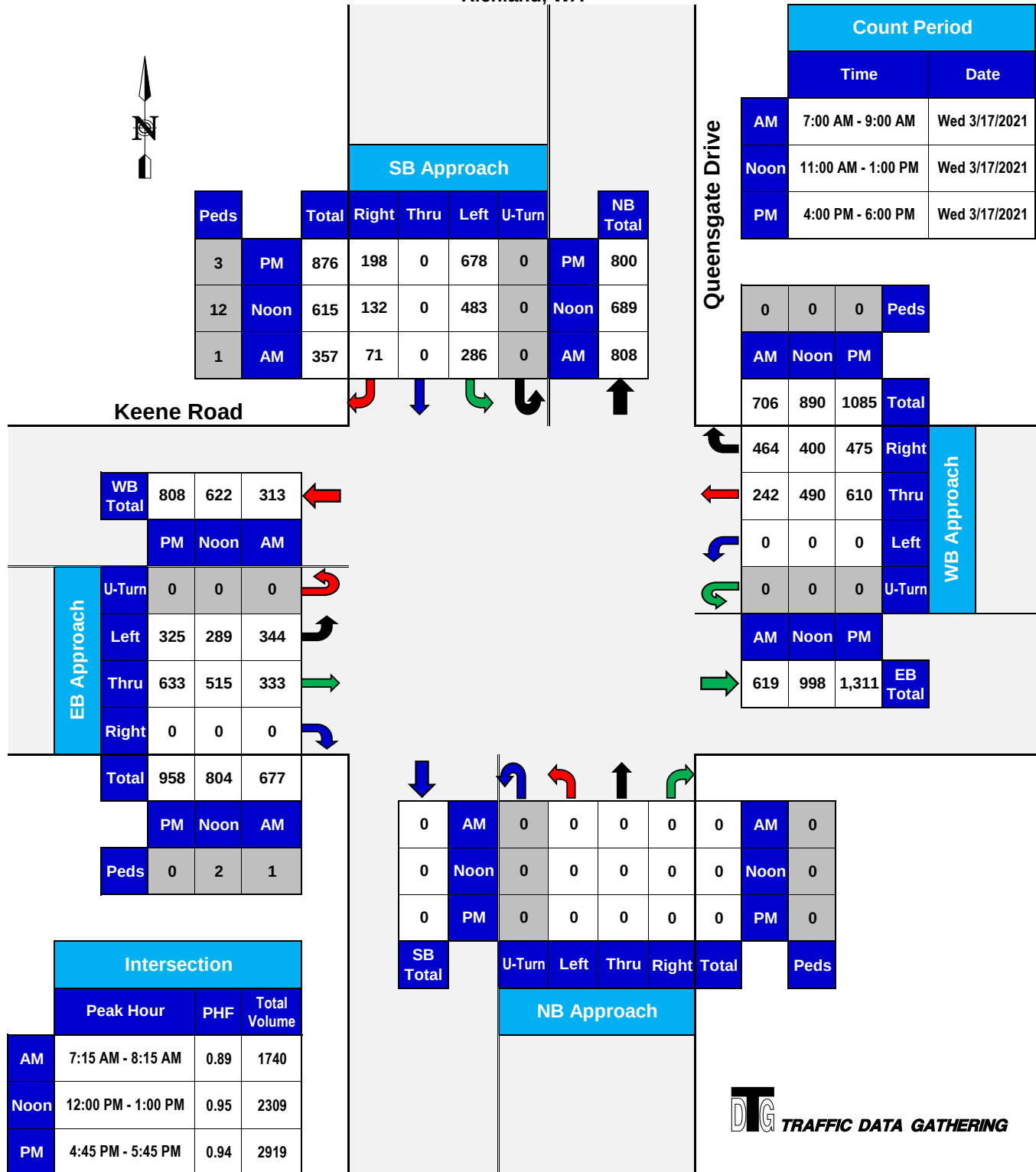
Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	I-182 EB Off Ramp				I-182 EB On Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	4	0	5	2	0	11	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	1	4	0	4	2	0	11	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	1	8	1	3	0	0	13	0
7:45 AM	0	1	1	0	0	0	0	0	0	0	0	2	0	7	6	0	17	52
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	4	0	2	5	0	11	52
8:15 AM	0	1	0	0	0	0	0	0	0	0	2	2	0	3	7	0	15	56
8:30 AM	0	1	0	1	0	0	0	0	0	0	1	10	0	4	5	0	22	65
8:45 AM	0	2	0	0	0	0	0	0	0	0	0	8	0	2	3	0	15	63
Count Total	0	5	1	1	0	0	0	0	0	0	5	42	1	30	30	0	115	0
Peak Hour	0	2	1	0	0	0	0	0	0	0	3	16	1	15	18	0	56	0

Two-Hour Count Summaries - Bikes																		
Interval Start	I-182 EB Off Ramp			I-182 EB On Ramp			Queensgate Dr			Queensgate Dr			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Keene Road @ Queensgate Drive

Richland, WA



TURNING MOVEMENTS DIAGRAM - Daily Summary



TRAFFIC DATA GATHERING

#14 AM

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: Keene Road @ Queensgate Drive
Richland, WA

DATE OF COUNT: Wed. 3/17/2021

COUNTED BY: TDG

START OF COUNT: 7:00 AM

DATE OF REDUCTION: 3/31/2021

TIME OF COUNT: 7:00 AM - 9:00 AM

DURATION OF COUNT: 2

TIME INTERVAL ENDING AT	SOUTHBOUND Queensgate Drive							NORTHBOUND							WESTBOUND Keene Road							EASTBOUND Keene Road							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
07:15 AM	0	0	10	0	48	0	16	0	0	0	0	0	0	0	0	0	6	1	0	43	82	0	0	5	0	66	34	0	290
07:30 AM	0	0	8	0	55	0	11	0	0	0	0	0	0	0	0	0	9	0	0	47	95	0	1	9	0	74	80	0	362
07:45 AM	0	0	7	0	51	0	15	0	0	0	0	0	0	0	0	0	6	0	0	80	161	0	0	5	0	100	79	0	486
08:00 AM	0	0	4	0	87	0	17	0	0	0	0	0	0	0	0	0	4	0	0	56	132	0	0	5	0	93	105	0	490
08:15 AM	1	0	6	0	93	0	28	0	0	0	0	0	0	0	0	0	1	0	0	59	76	1	0	5	0	77	69	0	402
08:30 AM	0	0	3	0	91	0	15	0	0	0	0	0	0	0	0	0	10	0	0	68	104	0	0	2	0	20	32	0	330
08:45 AM	0	0	10	0	87	0	15	0	0	0	0	0	0	0	0	0	8	0	0	80	132	0	0	9	0	37	86	0	437
09:00 AM	0	0	4	0	115	0	20	0	0	0	0	0	0	0	0	0	9	0	0	98	127	0	0	3	0	25	98	0	483
PEAK HOUR TOTALS	1	0	25	0	286	0	71	0	0	0	0	0	0	0	0	0	20	0	0	242	464	1	1	24	0	344	333	0	INTERSECTION
ALL MOVEMENTS				357							0								706							677			1740
% HV			7.0%							#N/A							2.8%							3.5%		4.0%			
PEAK HOUR FACTOR				0.74							#DIV/0!							0.73							0.85			0.89	

HV = Heavy Vehicle

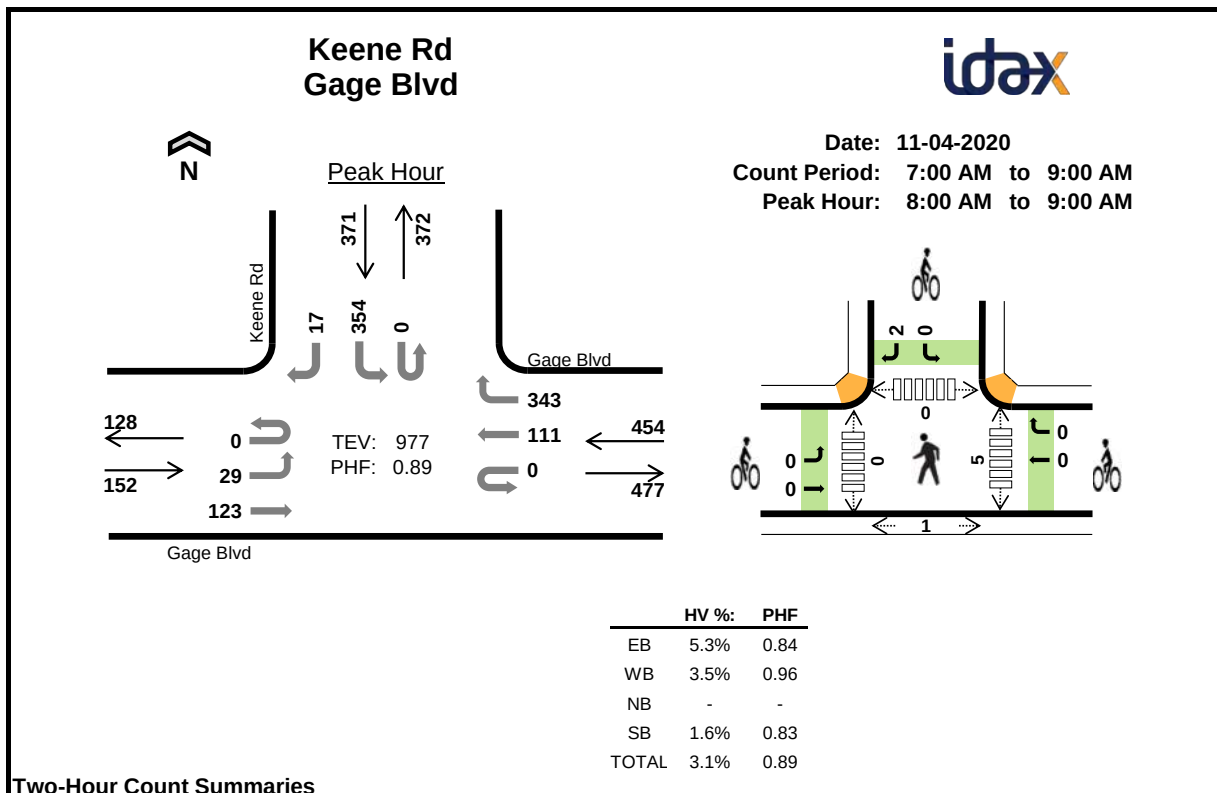
PHF = Peak Hour Factor

7:00 AM - 9:00 AM PEAK HOUR:

7:15 AM - 8:15 AM

ROLLING HOUR COUNT

TIME INTERVAL	SOUTHBOUND Queensgate Drive							NORTHBOUND 0							WESTBOUND Keene Road							EASTBOUND Keene Road							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
7:00 AM - 8:00 AM	0	0	29	0	241	0	59	0	0	0	0	0	0	0	0	0	25	1	0	226	470	0	1	24	0	333	298	0	1628
7:15 AM - 8:15 AM	1	0	25	0	286	0	71	0	0	0	0	0	0	0	0	0	20	0	0	242	464	1	1	24	0	344	333	0	1740
7:30 AM - 8:30 AM	1	0	20	0	322	0	75	0	0	0	0	0	0	0	0	0	21	0	0	263	473	1	0	17	0	290	285	0	1708
7:45 AM - 8:45 AM	1	0	23	0	358	0	75	0	0	0	0	0	0	0	0	0	23	0	0	263	444	1	0	21	0	227	292	0	1659
8:00 AM - 9:00 AM	1	0	23	0	386	0	78	0	0	0	0	0	0	0	0	0	28	0	0	305	439	1	0	19	0	159	285	0	1652
7:00 AM - 9:00 AM Total:	1	0	52	0	627	0	137	0	0	0	0	0	0	0	0	0	53	1	0	531	909	1	1	43	0	492	583	0	3280

**Two-Hour Count Summaries**

Interval Start		Gage Blvd				Gage Blvd				0				Keene Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	5	25	0	0	0	10	60	0	0	0	0	0	51	0	3	154	0
7:15 AM		0	6	27	0	0	0	14	61	0	0	0	0	0	71	0	2	181	0
7:30 AM		0	15	38	0	0	0	18	79	0	0	0	0	0	85	0	7	242	0
7:45 AM		0	6	44	0	0	0	19	84	0	0	0	0	0	87	0	4	244	821
8:00 AM		0	13	26	0	0	0	30	82	0	0	0	0	0	98	0	4	253	920
8:15 AM		0	5	31	0	0	0	24	82	0	0	0	0	0	63	0	6	211	950
8:30 AM		0	2	30	0	0	0	25	93	0	0	0	0	0	87	0	1	238	946
8:45 AM		0	9	36	0	0	0	32	86	0	0	0	0	0	106	0	6	275	977
Count Total		0	61	257	0	0	0	172	627	0	0	0	0	0	648	0	33	1,798	0
Peak Hour	All	0	29	123	0	0	0	111	343	0	0	0	0	0	354	0	17	977	0
	HV	0	2	6	0	0	0	3	13	0	0	0	0	0	4	0	2	30	0
	HV%	-	7%	5%	-	-	-	3%	4%	-	-	-	-	-	1%	-	12%	3%	0

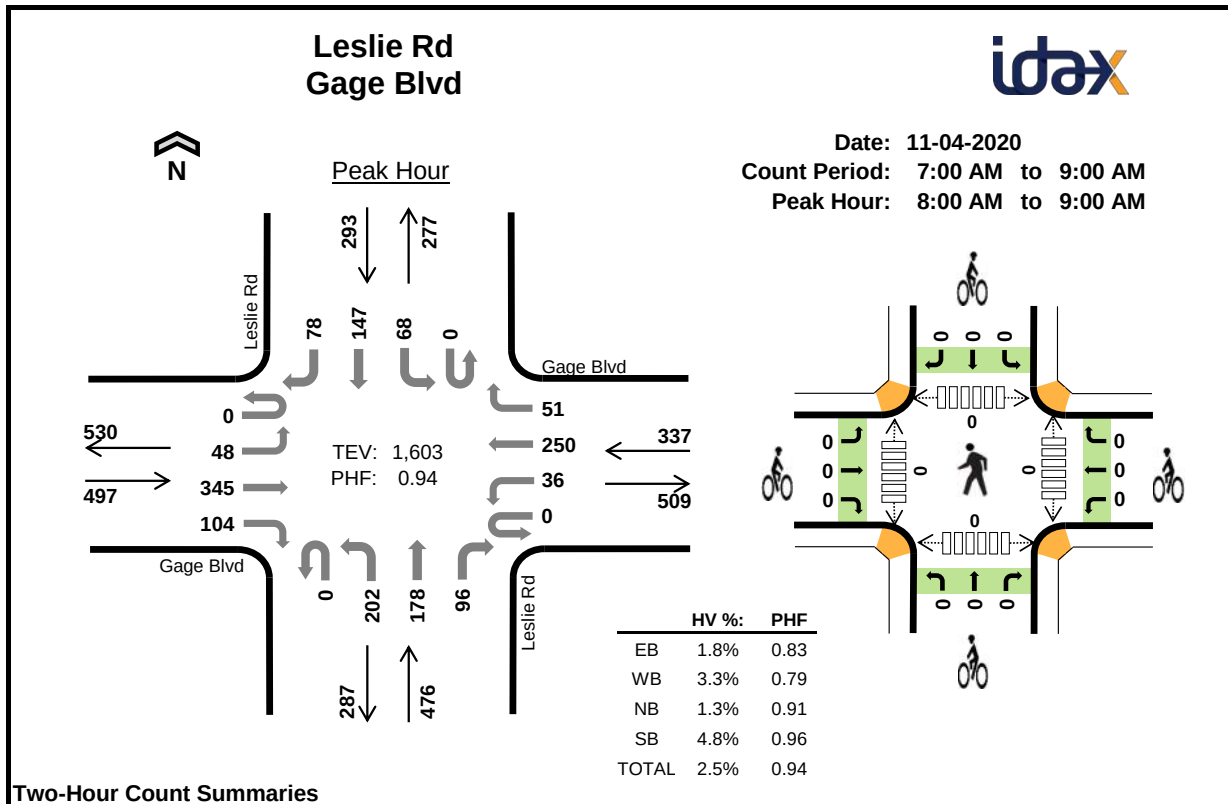
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	3	0	2	6	2	0	0	0	2	0	0	0	0	0
7:15 AM	0	3	0	2	5	0	0	0	0	0	1	0	0	0	1
7:30 AM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0
8:00 AM	2	3	0	2	7	0	0	0	2	2	3	0	0	1	4
8:15 AM	2	4	0	2	8	0	0	0	0	0	0	0	0	0	0
8:30 AM	2	4	0	2	8	0	0	0	0	0	0	0	0	0	0
8:45 AM	2	5	0	0	7	0	0	0	0	0	2	0	0	0	2
Count Total	10	26	0	10	46	2	0	0	2	4	6	0	0	1	7
Peak Hr	8	16	0	6	30	0	0	0	2	2	5	0	0	1	6

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Gage Blvd				Gage Blvd				0				Keene Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	1	0	0	0	1	2	0	0	0	0	0	2	0	0	6	0
7:15 AM	0	0	0	0	0	0	1	2	0	0	0	0	0	2	0	0	5	0
7:30 AM	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0
7:45 AM	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	3	16
8:00 AM	0	1	1	0	0	0	0	3	0	0	0	0	0	2	0	0	7	17
8:15 AM	0	1	1	0	0	0	1	3	0	0	0	0	0	1	0	1	8	20
8:30 AM	0	0	2	0	0	0	1	3	0	0	0	0	0	1	0	1	8	26
8:45 AM	0	0	2	0	0	0	1	4	0	0	0	0	0	0	0	0	7	30
Count Total	0	2	8	0	0	0	6	20	0	0	0	0	0	8	0	2	46	0
Peak Hour	0	2	6	0	0	0	3	13	0	0	0	0	0	4	0	2	30	0

Two-Hour Count Summaries - Bikes																		
Interval Start	Gage Blvd			Gage Blvd			0			Keene Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	2	0	0	0	0	0	0	0	0	0	0	0	2	0				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2				
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	2	2	2				
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2				
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2				
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2				
Count Total	2	0	0	0	0	0	0	0	0	0	0	2	4	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	2	2	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Gage Blvd				Gage Blvd				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	11	49	16	0	2	42	9	0	34	51	12	0	7	13	10	256	0
7:15 AM		0	11	64	25	0	8	37	2	0	41	38	16	0	12	25	12	291	0
7:30 AM		0	16	86	31	0	5	54	8	0	38	70	18	0	14	33	12	385	0
7:45 AM		0	17	105	30	0	11	66	11	0	49	46	19	0	18	40	14	426	1,358
8:00 AM		0	17	77	33	0	11	53	14	0	54	52	22	0	12	38	24	407	1,509
8:15 AM		0	11	70	23	0	5	51	12	0	47	49	17	0	13	44	19	361	1,579
8:30 AM		0	9	83	25	0	8	66	11	0	51	50	30	0	25	32	18	408	1,602
8:45 AM		0	11	115	23	0	12	80	14	0	50	27	27	0	18	33	17	427	1,603
Count Total		0	103	649	206	0	62	449	81	0	364	383	161	0	119	258	126	2,961	0
Peak Hour	All	0	48	345	104	0	36	250	51	0	202	178	96	0	68	147	78	1,603	0
	HV	0	1	5	3	0	1	8	2	0	3	2	1	0	1	9	4	40	0
	HV%	-	2%	1%	3%	-	3%	3%	4%	-	1%	1%	1%	-	1%	6%	5%	2%	0

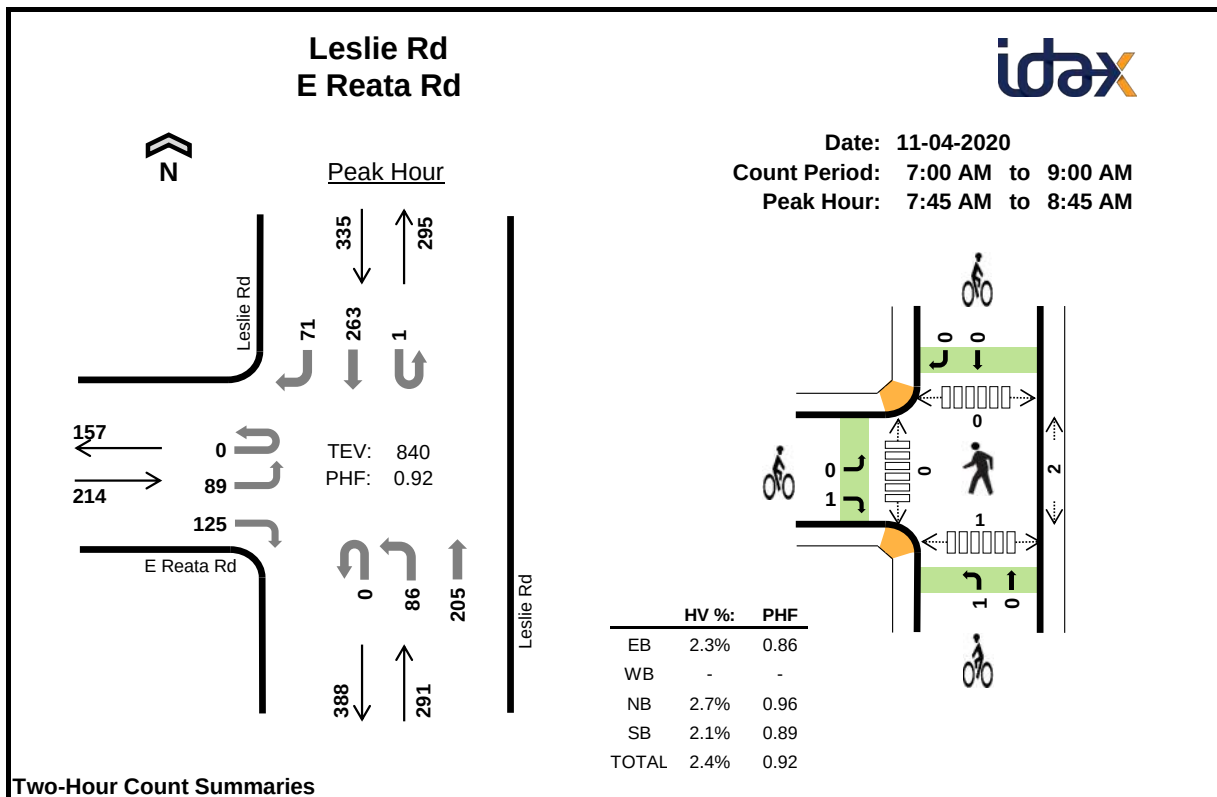
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	3	2	3	0	8	0	0	0	0	0	0	0	0	1	1
7:15 AM	2	2	1	3	8	0	0	0	0	0	0	1	0	0	1
7:30 AM	1	1	0	1	3	0	0	0	0	0	0	5	0	0	5
7:45 AM	0	2	1	3	6	0	0	0	0	0	0	0	0	0	0
8:00 AM	3	4	1	3	11	0	0	0	0	0	0	0	0	0	0
8:15 AM	2	1	1	3	7	0	0	0	0	0	0	0	0	0	0
8:30 AM	2	3	2	5	12	0	0	0	0	0	0	0	0	0	0
8:45 AM	2	3	2	3	10	0	0	0	0	0	0	0	0	0	0
Count Total	15	18	11	21	65	0	0	0	0	0	0	6	0	1	7
Peak Hour	9	11	6	14	40	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Gage Blvd				Gage Blvd				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	3	0	0	0	2	0	0	1	2	0	0	0	0	0	8	0
7:15 AM	0	0	2	0	0	0	2	0	0	0	1	0	0	0	2	1	8	0
7:30 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	3	0
7:45 AM	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	2	6	25
8:00 AM	0	1	1	1	0	1	2	1	0	0	1	0	0	0	3	0	11	28
8:15 AM	0	0	1	1	0	0	1	0	0	1	0	0	0	0	1	2	7	27
8:30 AM	0	0	1	1	0	0	3	0	0	1	0	1	0	1	3	1	12	36
8:45 AM	0	0	2	0	0	0	2	1	0	1	1	0	0	0	2	1	10	40
Count Total	0	1	11	3	0	2	14	2	0	5	5	1	0	1	13	7	65	0
Peak Hour	0	1	5	3	0	1	8	2	0	3	2	1	0	1	9	4	40	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Gage Blvd			Gage Blvd			Leslie Rd			Leslie Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		E Reata Rd				0				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	18	0	24	0	0	0	0	0	9	27	0	0	0	45	5	128	0
7:15 AM		0	11	0	19	0	0	0	0	0	8	38	0	0	0	47	9	132	0
7:30 AM		0	17	0	37	0	0	0	0	0	15	30	0	0	0	75	10	184	0
7:45 AM		0	28	0	34	0	0	0	0	0	25	48	0	0	0	74	20	229	673
8:00 AM		0	22	0	29	0	0	0	0	0	17	52	0	1	0	70	13	204	749
8:15 AM		0	17	0	32	0	0	0	0	0	24	52	0	0	0	60	19	204	821
8:30 AM		0	22	0	30	0	0	0	0	0	20	53	0	0	0	59	19	203	840
8:45 AM		0	17	0	39	0	0	0	0	0	21	51	0	0	0	42	12	182	793
Count Total		0	152	0	244	0	0	0	0	0	139	351	0	1	0	472	107	1,466	0
Peak Hour	All	0	89	0	125	0	0	0	0	0	86	205	0	1	0	263	71	840	0
	HV	0	1	0	4	0	0	0	0	0	6	2	0	1	0	3	3	20	0
	HV%	-	1%	-	3%	-	-	-	-	-	7%	1%	-	100%	-	1%	4%	2%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	0	0	0	2	0	0	0	0	0	0	2	0	0	2
7:15 AM	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	2	1	3	0	0	0	0	0	0	0	0	0	0
7:45 AM	1	0	3	0	4	0	0	1	0	1	2	0	0	1	3
8:00 AM	1	0	1	4	6	0	0	0	0	0	0	0	0	0	0
8:15 AM	2	0	2	1	5	1	0	0	0	1	0	0	0	0	0
8:30 AM	1	0	2	2	5	0	0	0	0	0	0	0	0	0	0
8:45 AM	1	0	2	2	5	0	0	0	0	0	0	0	0	0	0
Count Total	9	0	13	10	32	1	0	1	0	2	2	2	0	1	5
Peak Hr	5	0	8	7	20	1	0	1	0	2	2	0	0	1	3

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	E Reata Rd				0				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0
7:15 AM	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	3	0
7:45 AM	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	4	11
8:00 AM	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	2	6	15
8:15 AM	0	1	0	1	0	0	0	0	0	0	2	0	0	0	0	1	5	18
8:30 AM	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	5	20
8:45 AM	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	2	5	21
Count Total	0	2	0	7	0	0	0	0	0	0	9	4	0	1	0	6	32	0
Peak Hour	0	1	0	4	0	0	0	0	0	0	6	2	0	1	0	3	20	0

Two-Hour Count Summaries - Bikes																	
Interval Start	E Reata Rd			0			Leslie Rd			Leslie Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0
Peak Hour	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



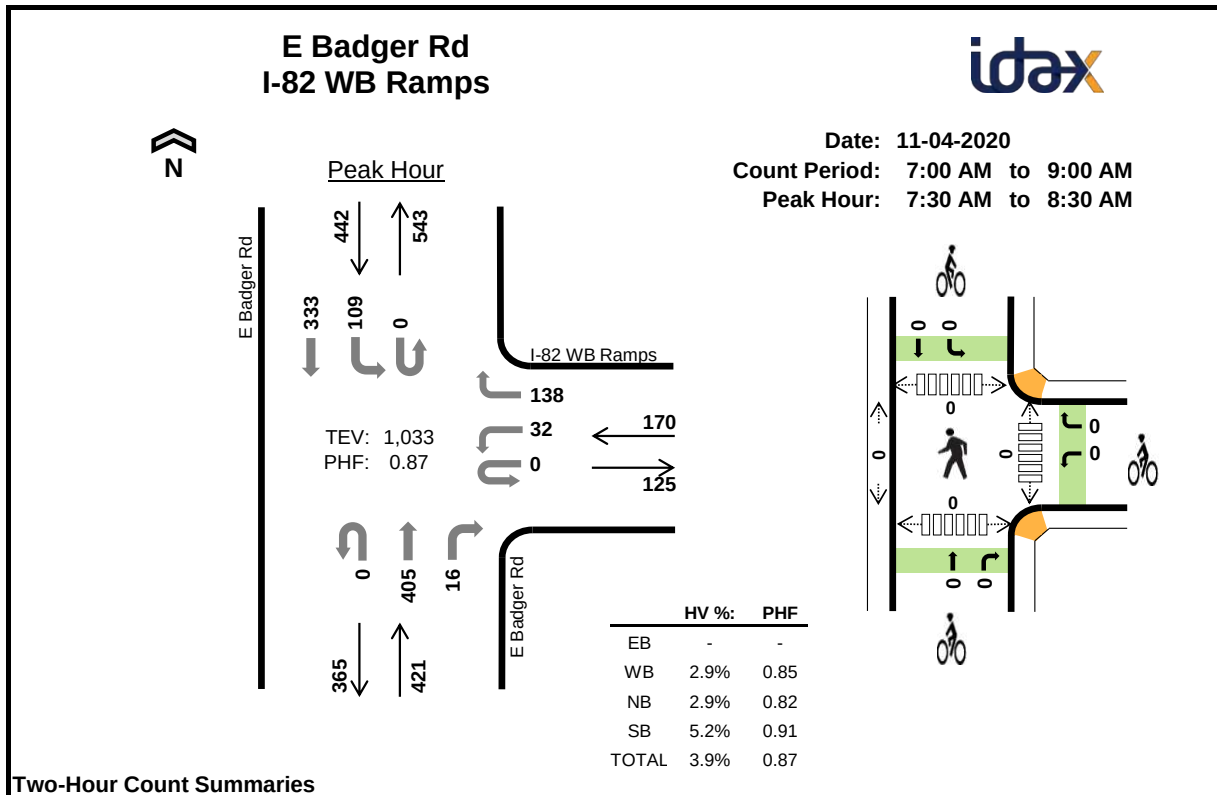
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	1	4	1	8	0	0	0	0	0	0	0	0	0	0
7:15 AM	1	1	4	3	9	0	0	0	0	0	0	0	0	0	0
7:30 AM	1	3	2	5	11	0	0	0	0	0	1	0	0	0	1
7:45 AM	1	8	5	6	20	0	1	0	0	1	0	0	0	0	0
8:00 AM	3	1	3	0	7	0	0	0	0	0	0	0	0	0	0
8:15 AM	2	2	4	4	12	1	0	0	0	1	0	0	0	0	0
8:30 AM	1	3	5	3	12	0	0	0	0	0	0	0	0	0	0
8:45 AM	3	2	6	6	17	0	0	0	0	0	0	0	0	0	0
Count Total	14	21	33	28	96	1	1	0	0	2	1	0	0	0	1
Peak Hour	7	14	14	15	50	1	1	0	0	2	1	0	0	0	1

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Leslie Rd				Ridgeline Dr				E Badger Rd				W Clearwater Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	1	0	1	0	1	0	0	0	0	2	2	0	0	1	0	8	0
7:15 AM	0	0	0	1	0	1	0	0	0	0	2	2	0	0	2	1	9	0
7:30 AM	0	0	1	0	0	2	0	1	0	0	0	2	0	1	2	2	11	0
7:45 AM	0	1	0	0	0	8	0	0	0	1	4	0	0	0	4	2	20	48
8:00 AM	0	0	0	3	0	1	0	0	0	1	1	1	0	0	0	0	7	47
8:15 AM	0	1	0	1	0	1	0	1	0	0	2	2	0	1	1	2	12	50
8:30 AM	0	1	0	0	0	2	0	1	0	2	2	1	0	0	3	0	12	51
8:45 AM	0	1	0	2	0	0	2	0	0	1	4	1	0	2	4	0	17	48
Count Total	0	5	1	8	0	16	2	3	0	5	17	11	0	4	17	7	96	0
Peak Hour	0	2	1	4	0	12	0	2	0	2	7	5	0	2	7	6	50	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Leslie Rd			Ridgeline Dr			E Badger Rd			W Clearwater Ave			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	1			
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
8:15 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	2			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
Count Total	0	1	0	0	1	0	0	0	0	0	0	0	2	0			
Peak Hour	0	1	0	0	1	0	0	0	0	0	0	0	2	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		0				I-82 WB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	0	0	0	7	0	23	0	0	96	4	0	18	68	0	216	0
7:15 AM		0	0	0	0	0	7	0	41	0	0	76	1	0	29	63	0	217	0
7:30 AM		0	0	0	0	0	4	0	24	0	0	95	7	0	31	83	0	244	0
7:45 AM		0	0	0	0	0	6	0	42	0	0	122	6	0	31	90	0	297	974
8:00 AM		0	0	0	0	0	11	0	39	0	0	98	2	0	20	81	0	251	
8:15 AM		0	0	0	0	0	11	0	33	0	0	90	1	0	27	79	0	241	1,033
8:30 AM		0	0	0	0	0	7	0	31	0	0	91	4	0	27	73	0	233	1,022
8:45 AM		0	0	0	0	0	7	0	51	0	0	92	1	0	17	62	0	230	955
Count Total		0	0	0	0	0	60	0	284	0	0	760	26	0	200	599	0	1,929	0
Peak Hour	All	0	0	0	0	0	32	0	138	0	0	405	16	0	109	333	0	1,033	0
	HV	0	0	0	0	0	1	0	4	0	0	10	2	0	9	14	0	40	0
	HV%	-	-	-	-	-	3%	-	3%	-	-	2%	13%	-	8%	4%	-	4%	0

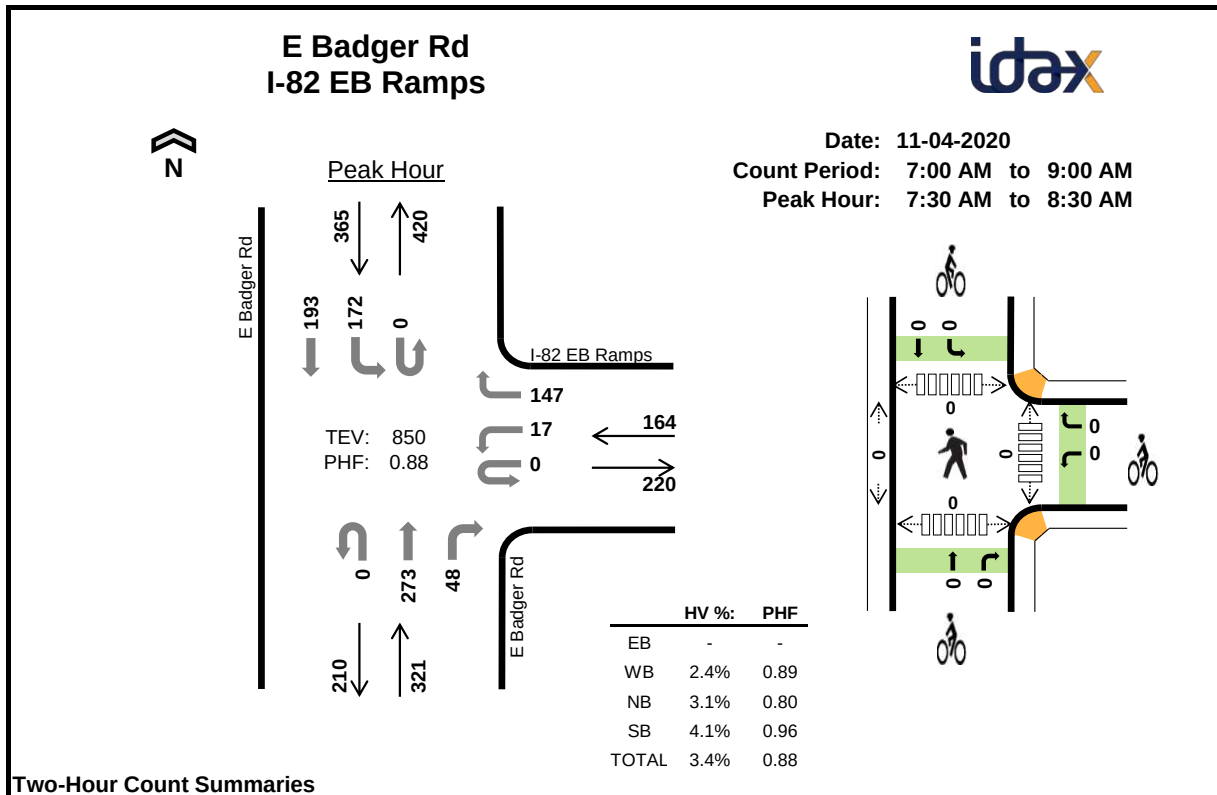
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	5	3	8	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	2	3	4	9	0	0	0	0	0	0	2	0	0	2
7:30 AM	0	0	2	4	6	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	5	12	17	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	4	2	4	10	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	1	3	3	7	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	6	5	11	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	4	2	6	12	0	0	0	0	0	0	0	0	0	0
Count Total	0	11	28	41	80	0	0	0	0	0	0	2	0	0	2
Peak Hr	0	5	12	23	40	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	0				I-82 WB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	4	1	0	2	1	0	8	0
7:15 AM	0	0	0	0	0	1	0	1	0	0	3	0	0	3	1	0	9	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	6	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	5	0	0	7	5	0	17	40
8:00 AM	0	0	0	0	0	1	0	3	0	0	0	2	0	1	3	0	10	42
8:15 AM	0	0	0	0	0	0	0	1	0	0	3	0	0	1	2	0	7	40
8:30 AM	0	0	0	0	0	0	0	0	0	0	5	1	0	3	2	0	11	45
8:45 AM	0	0	0	0	0	0	0	4	0	0	2	0	0	4	2	0	12	40
Count Total	0	0	0	0	0	2	0	9	0	0	24	4	0	21	20	0	80	0
Peak Hour	0	0	0	0	0	1	0	4	0	0	10	2	0	9	14	0	40	0

Two-Hour Count Summaries - Bikes																		
Interval Start	0			I-82 WB Ramps			E Badger Rd			E Badger Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		0				I-82 EB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour	
		Eastbound				Westbound				Northbound				Southbound						
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
7:00 AM		0	0	0	0	0	5	0	17	0	0	82	10	0	41	34	0	189	0	
7:15 AM		0	0	0	0	0	2	0	22	0	0	55	11	0	35	35	0	160	0	
7:30 AM		0	0	0	0	0	4	0	41	0	0	61	13	0	49	39	0	207	0	
7:45 AM		0	0	0	0	0	6	0	40	0	0	86	14	0	51	44	0	241	797	
8:00 AM		0	0	0	0	0	4	0	39	0	0	62	13	0	35	57	0	210		818
8:15 AM		0	0	0	0	0	3	0	27	0	0	64	8	0	37	53	0	192		850
8:30 AM		0	0	0	0	0	4	0	23	0	0	71	6	0	35	46	0	185	828	
8:45 AM		0	0	0	0	0	2	0	28	0	0	64	10	0	23	45	0	172	759	
Count Total		0	0	0	0	0	30	0	237	0	0	545	85	0	306	353	0	1,556	0	
Peak Hour	All	0	0	0	0	0	17	0	147	0	0	273	48	0	172	193	0	850	0	
	HV	0	0	0	0	0	0	0	4	0	0	7	3	0	9	6	0	29	0	
	HV%	-	-	-	-	-	0%	-	3%	-	-	3%	6%	-	5%	3%	-	3%	0	

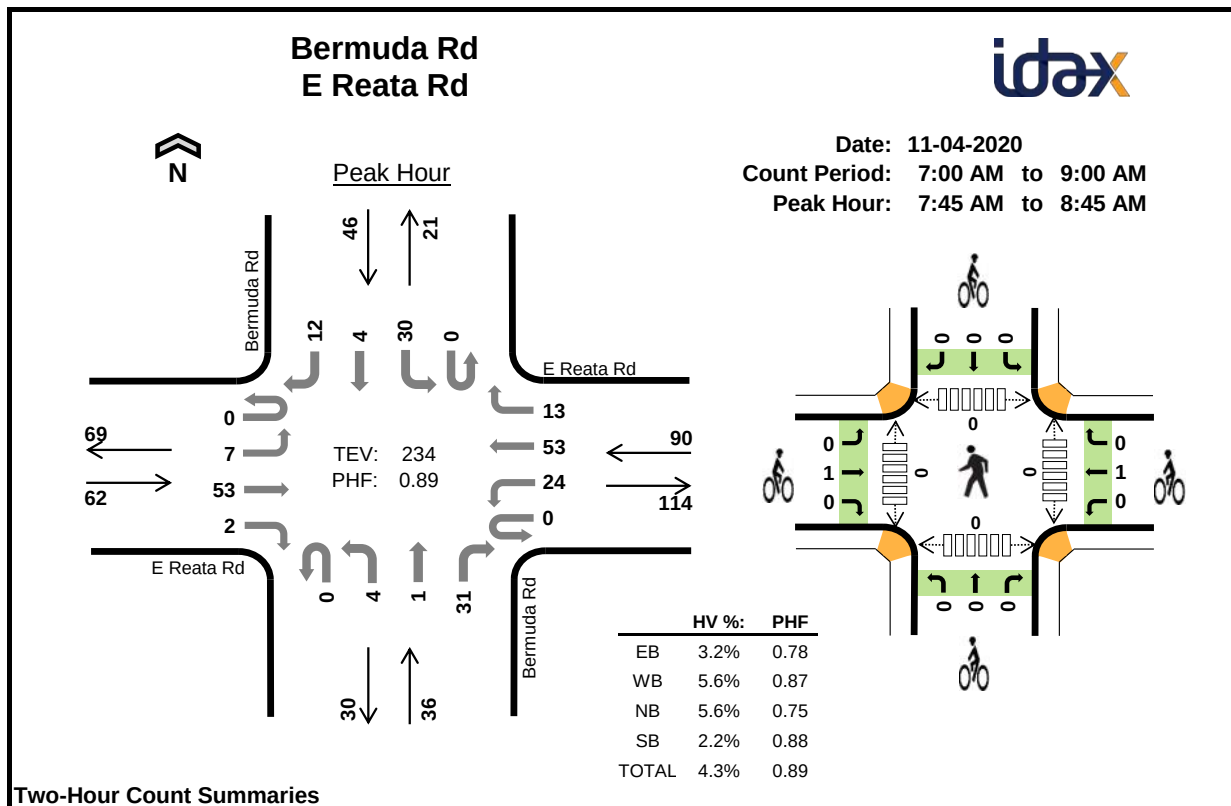
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	1	4	1	6	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	5	1	2	8	0	0	0	0	0	0	1	0	0	1
7:30 AM	0	1	2	4	7	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	1	5	5	11	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	2	4	6	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	2	1	2	5	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	4	3	2	9	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	1	2	4	0	0	0	0	0	0	0	0	0	0
Count Total	0	15	19	22	56	0	0	0	0	0	0	1	0	0	1
Peak Hr	0	4	10	15	29	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	0				I-82 EB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	1	0	0	4	0	0	0	1	0	6	0
7:15 AM	0	0	0	0	0	2	0	3	0	0	1	0	0	1	1	0	8	0
7:30 AM	0	0	0	0	0	0	0	1	0	0	0	2	0	3	1	0	7	0
7:45 AM	0	0	0	0	0	0	0	1	0	0	4	1	0	4	1	0	11	32
8:00 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	1	3	0	6	32
8:15 AM	0	0	0	0	0	0	0	2	0	0	1	0	0	1	1	0	5	29
8:30 AM	0	0	0	0	0	1	0	3	0	0	3	0	0	2	0	0	9	31
8:45 AM	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	4	24
Count Total	0	0	0	0	0	3	0	12	0	0	16	3	0	13	9	0	56	0
Peak Hour	0	0	0	0	0	0	0	4	0	0	7	3	0	9	6	0	29	0

Two-Hour Count Summaries - Bikes																	
Interval Start	0			I-82 EB Ramps			E Badger Rd			E Badger Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		E Reata Rd				E Reata Rd				Bermuda Rd				Bermuda Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	10	0	0	3	9	1	0	0	1	4	0	5	1	1	35	0
7:15 AM		0	1	10	0	0	3	4	4	0	0	0	6	0	2	0	1	31	0
7:30 AM		0	0	16	2	0	2	9	3	0	3	0	9	0	5	2	3	54	0
7:45 AM		0	1	18	1	0	7	14	3	0	0	0	8	0	4	1	5	62	182
8:00 AM		0	3	8	0	0	3	12	3	0	1	0	6	0	8	2	2	48	195
8:15 AM		0	1	10	1	0	10	12	4	0	1	0	8	0	7	1	3	58	222
8:30 AM		0	2	17	0	0	4	15	3	0	2	1	9	0	11	0	2	66	234
8:45 AM		0	0	18	0	0	5	12	3	0	1	0	7	0	4	1	3	54	226
Count Total		0	8	107	4	0	37	87	24	0	8	2	57	0	46	8	20	408	0
Peak Hour	All	0	7	53	2	0	24	53	13	0	4	1	31	0	30	4	12	234	0
	HV	0	1	1	0	0	3	1	1	0	1	0	1	0	1	0	0	10	0
	HV%	-	14%	2%	0%	-	13%	2%	8%	-	25%	0%	3%	-	3%	0%	0%	4%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
7:15 AM	1	1	1	0	3	0	0	0	0	0	0	0	0	1	1
7:30 AM	0	2	0	2	4	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	3	1	1	5	0	1	0	0	1	0	0	0	0	0
8:15 AM	1	1	1	0	3	1	0	0	0	1	0	0	0	0	0
8:30 AM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0
Count Total	3	10	3	4	20	1	1	0	0	2	0	0	0	1	1
Peak Hour	2	5	2	1	10	1	1	0	0	2	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	E Reata Rd				E Reata Rd				Bermuda Rd				Bermuda Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
7:15 AM	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0
7:30 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	4	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
8:00 AM	0	0	0	0	0	1	1	1	0	0	0	1	0	1	0	0	5	12
8:15 AM	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	3	12
8:30 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	10
8:45 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	12
Count Total	0	2	1	0	0	3	5	2	0	1	0	2	0	1	1	2	20	0
Peak Hour	0	1	1	0	0	3	1	1	0	1	0	1	0	1	0	0	10	0

Two-Hour Count Summaries - Bikes																	
Interval Start	E Reata Rd			E Reata Rd			Bermuda Rd			Bermuda Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:00 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	1			
8:15 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	2			
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2			
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2			
Count Total	0	1	0	0	1	0	0	0	0	0	0	0	2	0			
Peak Hour	0	1	0	0	1	0	0	0	0	0	0	0	2	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



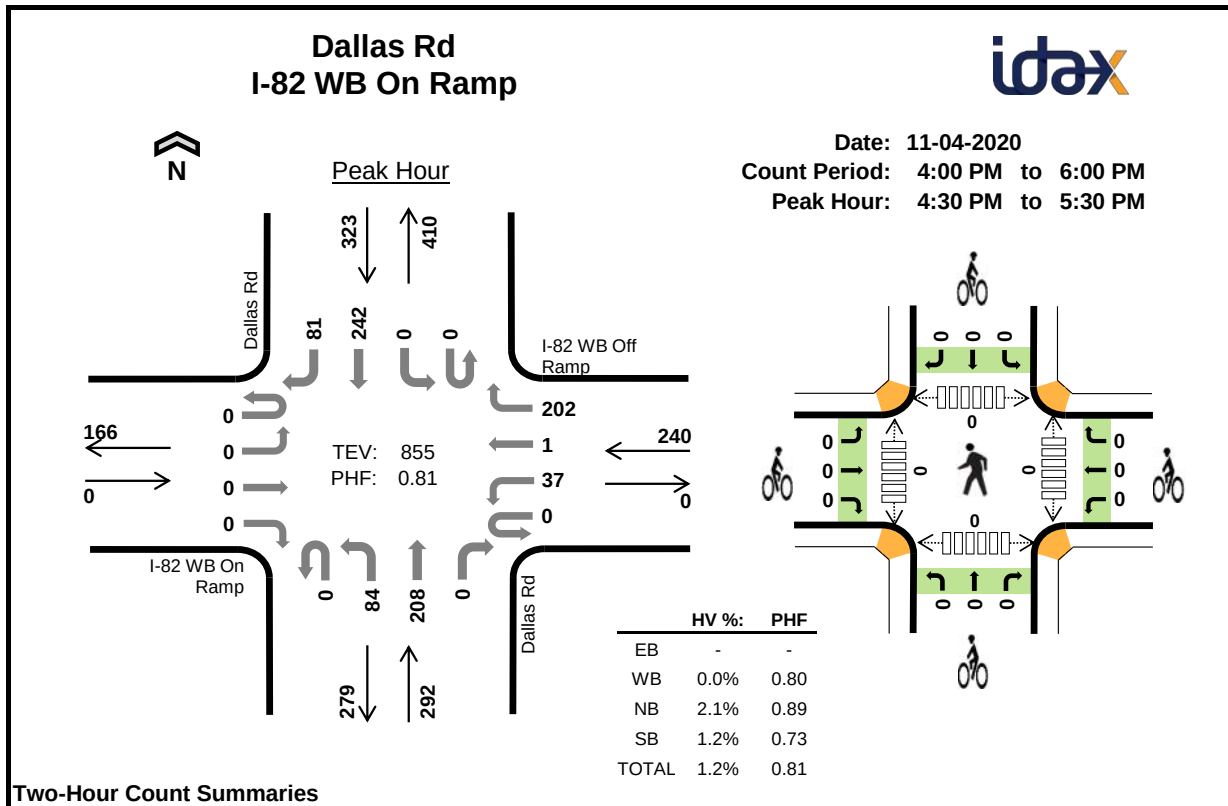
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

[illegible]

Two-Hour Count Summaries - Heavy Vehicles																			
Interval Start	I-82 EB Off Ramp				I-82 EB On Ramp				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
4:00 PM	0	2	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0
4:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	3	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
4:45 PM	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2	11
5:00 PM	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	3	9
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	7
5:30 PM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	3	9
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Count Total	0	4	0	4	0	0	0	0	0	0	0	4	1	0	5	0	0	18	0
Peak Hour	0	1	0	1	0	0	0	0	0	0	0	4	0	0	1	0	0	7	0

Two-Hour Count Summaries - Bikes																	
Interval Start	I-82 EB Off Ramp			I-82 EB On Ramp			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		I-82 WB On Ramp				I-82 WB Off Ramp				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
	4:00 PM	0	0	0	0	0	5	0	42	0	42	46	0	0	0	52	22	209	0
	4:15 PM	0	0	0	0	0	7	0	39	0	21	48	0	0	0	53	17	185	0
	4:30 PM	0	0	0	0	0	7	0	35	0	31	44	0	0	0	50	24	191	0
	4:45 PM	0	0	0	0	0	7	0	44	0	13	44	0	0	0	51	7	166	751
	5:00 PM	0	0	0	0	0	12	0	60	0	25	57	0	0	0	74	37	265	807
	5:15 PM	0	0	0	0	0	11	1	63	0	15	63	0	0	0	67	13	233	855
	5:30 PM	0	0	0	0	0	3	0	39	0	9	42	0	0	0	57	10	160	824
	5:45 PM	0	0	0	0	0	2	0	47	0	16	29	0	0	0	46	11	151	809
Count Total		0	0	0	0	0	54	1	369	0	172	373	0	0	0	450	141	1,560	0
Peak Hour	All	0	0	0	0	0	37	1	202	0	84	208	0	0	0	242	81	855	0
	HV	0	0	0	0	0	0	0	0	0	3	3	0	0	0	1	3	10	0
	HV%	-	-	-	-	-	0%	0%	0%	-	4%	1%	-	-	-	0%	4%	1%	0

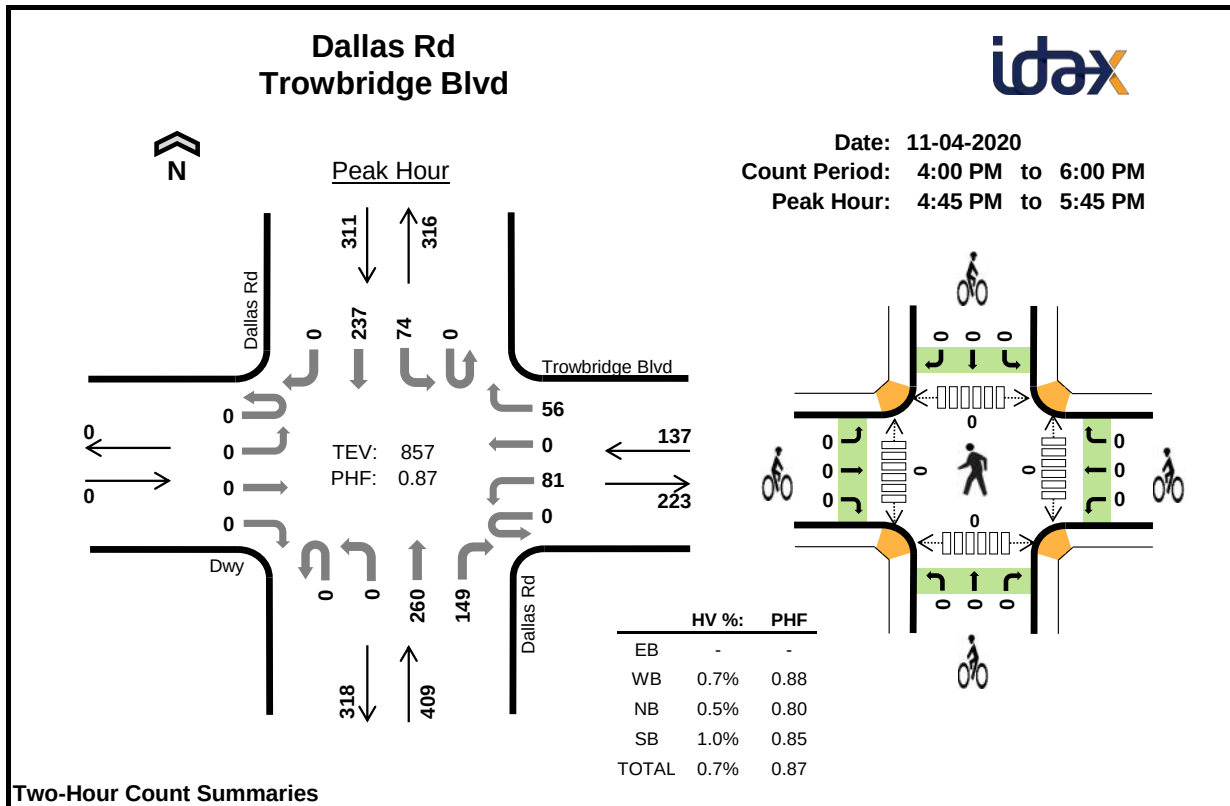
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	1	2	2	5	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	2	1	3	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	2	2	4	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1
Count Total	0	1	8	9	18	0	0	0	0	0	1	0	0	0	1
Peak Hour	0	0	6	4	10	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	I-82 WB On Ramp				I-82 WB Off Ramp				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	1	0	0	2	0	0	0	2	0	5	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
4:30 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	3	0
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	11
5:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	1	4	10
5:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	10
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	7
Count Total	0	0	0	0	0	0	0	1	0	3	5	0	0	0	5	4	18	0
Peak Hour	0	0	0	0	0	0	0	0	0	3	3	0	0	0	1	3	10	0

Two-Hour Count Summaries - Bikes																		
Interval Start	I-82 WB On Ramp				I-82 WB Off Ramp				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	LT	TH	RT		LT	TH	RT		LT	TH	RT		LT	TH	RT			
4:00 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
4:15 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
4:30 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
4:45 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
5:00 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
5:15 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
5:30 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
5:45 PM	0	0	0		0	0	0		0	0	0		0	0	0		0	0
Count Total	0	0	0		0	0	0		0	0	0		0	0	0		0	0
Peak Hour	0	0	0		0	0	0		0	0	0		0	0	0		0	0

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Dwy				Trowbridge Blvd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	0	0	0	25	0	11	0	0	59	26	0	11	50	0	182	0
4:15 PM		0	0	0	0	0	23	0	10	0	0	60	27	0	8	47	0	175	0
4:30 PM		0	0	0	0	0	27	0	9	0	0	51	30	0	8	46	0	171	0
4:45 PM		0	0	0	0	0	11	0	17	0	0	58	29	0	15	49	0	179	707
5:00 PM		0	0	0	0	0	30	0	8	0	0	80	35	0	12	80	0	245	770
5:15 PM		0	0	0	0	0	18	0	14	0	0	80	48	0	25	62	0	247	842
5:30 PM		0	0	0	0	0	22	0	17	0	0	42	37	0	22	46	0	186	857
5:45 PM		0	0	0	0	0	17	0	19	0	0	54	25	0	15	38	0	168	846
Count Total		0	0	0	0	0	173	0	105	0	0	484	257	0	116	418	0	1,553	0
Peak Hour	All	0	0	0	0	0	81	0	56	0	0	260	149	0	74	237	0	857	0
	HV	0	0	0	0	0	1	0	0	0	0	2	0	0	0	3	0	6	0
	HV%	-	-	-	-	-	1%	-	0%	-	-	1%	0%	-	0%	1%	-	1%	0

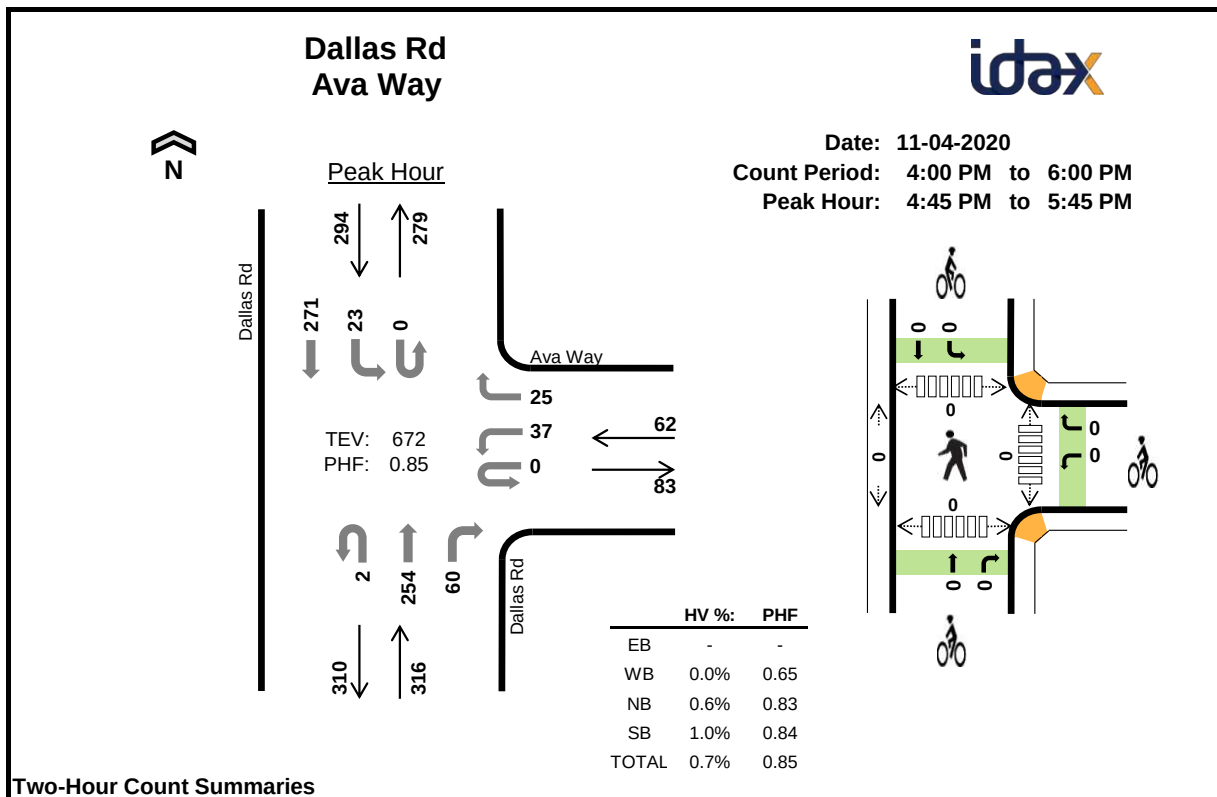
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	3	2	5	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	2	2	4	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Count Total	0	1	6	9	16	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	1	2	3	6	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Dwy				Trowbridge Blvd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	5	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	10
5:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	4	9
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
5:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	6
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	6
Count Total	0	0	0	0	0	1	0	0	0	0	6	0	0	1	8	0	16	0
Peak Hour	0	0	0	0	0	1	0	0	0	0	2	0	0	0	3	0	6	0

Two-Hour Count Summaries - Bikes																		
Interval Start	Dwy			Trowbridge Blvd			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		0				Ava Way				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	0	0	0	17	0	3	0	0	58	13	0	9	48	0	148	0
4:15 PM		0	0	0	0	0	12	0	3	0	0	56	11	0	4	40	0	126	0
4:30 PM		0	0	0	0	0	8	0	4	0	0	48	12	0	6	48	0	126	0
4:45 PM		0	0	0	0	0	5	0	7	0	0	60	17	0	2	56	0	147	547
5:00 PM		0	0	0	0	0	16	0	8	1	0	69	17	0	10	77	0	198	597
5:15 PM		0	0	0	0	0	12	0	6	1	0	79	15	0	9	74	0	196	667
5:30 PM		0	0	0	0	0	4	0	4	0	0	46	11	0	2	64	0	131	672
5:45 PM		0	0	0	0	0	4	0	5	0	0	64	8	0	4	48	0	133	658
Count Total		0	0	0	0	0	78	0	40	2	0	480	104	0	46	455	0	1,205	0
Peak Hour	All	0	0	0	0	0	37	0	25	2	0	254	60	0	23	271	0	672	0
	HV	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	5	0
	HV%	-	-	-	-	-	0%	-	0%	0%	-	1%	0%	-	0%	1%	-	1%	0

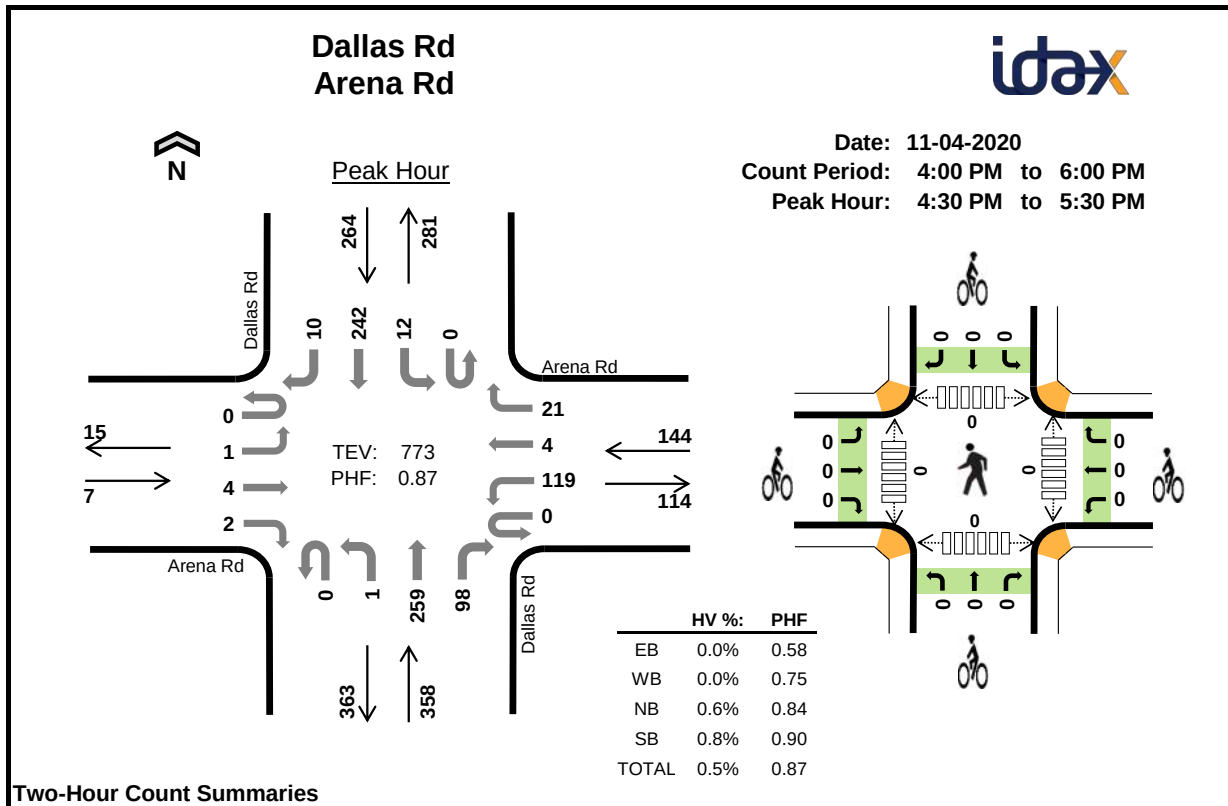
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	3	2	5	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	2	0	1	3	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	2	2	4	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Count Total	0	2	6	7	15	0	0	0	0	0	0	0	0	0	0
Peak Hr	0	0	2	3	5	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	0				Ava Way				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	1	2	0	0	2	0	5	0
4:15 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	3	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	10
5:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	4	9
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5
Count Total	0	0	0	0	0	2	0	0	0	0	4	2	0	0	7	0	15	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	5	0

Two-Hour Count Summaries - Bikes																		
Interval Start	0			Ava Way			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		Arena Rd				Arena Rd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	2	1	0	0	19	4	6	0	0	50	23	0	5	44	1	155	0
4:15 PM		0	1	0	1	0	21	1	6	0	0	64	21	0	5	43	2	165	0
4:30 PM		0	1	1	0	0	26	0	5	0	1	51	23	0	3	58	5	174	0
4:45 PM		0	0	2	1	0	30	1	4	0	0	64	23	0	4	51	1	181	675
5:00 PM		0	0	1	1	0	24	1	5	0	0	64	26	0	1	69	3	195	715
5:15 PM		0	0	0	0	0	39	2	7	0	0	80	26	0	4	64	1	223	773
5:30 PM		0	2	1	0	0	22	2	4	0	0	63	23	0	7	42	1	167	766
5:45 PM		0	1	2	0	0	17	3	5	0	1	50	26	0	3	40	3	151	736
Count Total		0	7	8	3	0	198	14	42	0	2	486	191	0	32	411	17	1,411	0
Peak Hour	All	0	1	4	2	0	119	4	21	0	1	259	98	0	12	242	10	773	0
	HV	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	4	0
	HV%	-	0%	0%	0%	-	0%	0%	0%	-	0%	1%	0%	-	0%	1%	0%	1%	0

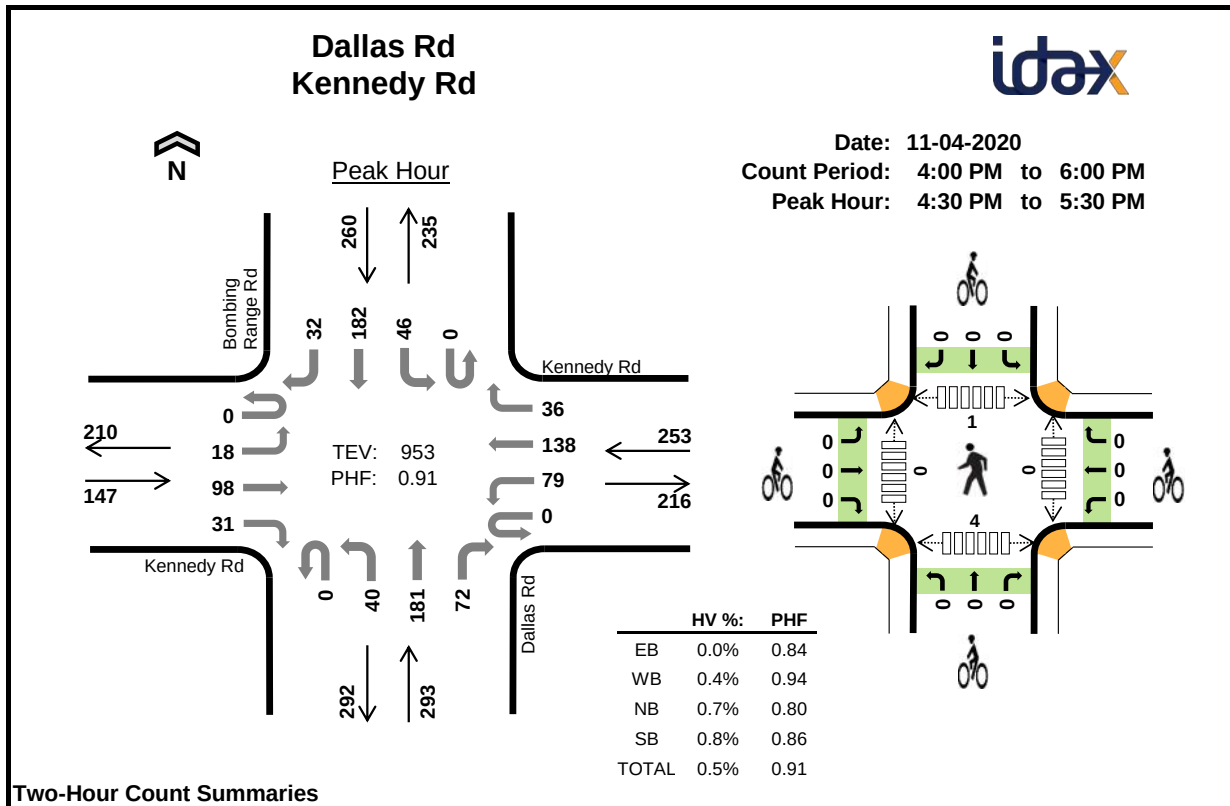
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	3	1	4	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	1	1	0	0	1	0	1	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1
Count Total	0	0	5	5	10	0	0	1	0	1	0	0	1	0	1
Peak Hour	0	0	2	2	4	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Arena Rd				Arena Rd				Dallas Rd				Dallas Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	4	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	6
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	4
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	4
Count Total	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5	0	10	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	4	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Arena Rd			Arena Rd			Dallas Rd			Dallas Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0			
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	1	0	0	0	0	1	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Kennedy Rd				Kennedy Rd				Dallas Rd				Bombing Range Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	5	19	8	0	10	29	11	0	11	36	18	0	2	37	4	190	0
4:15 PM		0	7	32	3	0	13	30	5	0	11	47	21	0	6	32	7	214	0
4:30 PM		0	5	31	8	0	21	36	8	0	7	36	18	0	8	40	12	230	0
4:45 PM		0	7	25	6	0	14	37	6	0	15	37	13	0	8	39	7	214	848
5:00 PM		0	1	22	9	0	21	32	11	0	6	48	21	0	18	51	7	247	905
5:15 PM		0	5	20	8	0	23	33	11	0	12	60	20	0	12	52	6	262	953
5:30 PM		0	6	24	5	0	20	30	8	0	2	35	30	0	4	32	4	200	923
5:45 PM		0	6	23	2	0	19	36	5	0	4	32	21	0	3	27	5	183	892
Count Total		0	42	196	49	0	141	263	65	0	68	331	162	0	61	310	52	1,740	0
Peak Hour	All	0	18	98	31	0	79	138	36	0	40	181	72	0	46	182	32	953	0
	HV	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	1	5	0
	HV%	-	0%	0%	0%	-	0%	1%	0%	-	0%	1%	1%	-	2%	0%	3%	1%	0

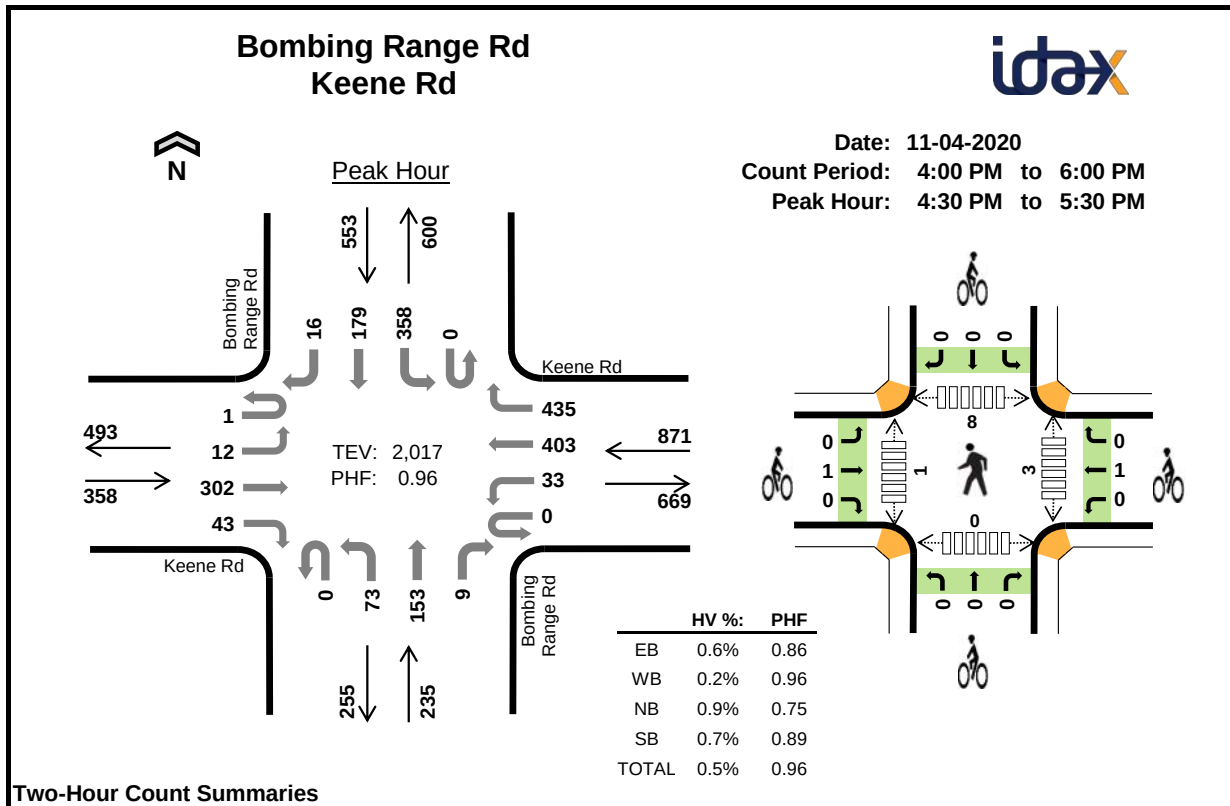
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	1	2	2	2	7	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	1	0	1	3	0	0	1	0	1	0	0	0	0	0
4:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1
4:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	4	4
5:00 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	2	5	4	5	16	0	0	1	0	1	0	0	1	4	5
Peak Hour	0	1	2	2	5	0	0	0	0	0	0	0	1	4	5

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Kennedy Rd				Kennedy Rd				Dallas Rd				Bombing Range Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	1	0	0	0	2	0	0	0	2	0	0	1	1	0	7	0
4:15 PM	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	3	0
4:30 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	12
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	7
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	5
5:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	5
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Count Total	0	0	1	1	0	0	3	2	0	0	3	1	0	3	1	1	16	0
Peak Hour	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	1	5	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Kennedy Rd			Kennedy Rd			Dallas Rd			Bombing Range Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0		
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Count Total	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0		
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Keene Rd				Keene Rd				Bombing Range Rd				Bombing Range Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	6	67	11	0	7	80	108	0	10	35	3	0	74	24	4	429	0
4:15 PM		0	4	62	8	0	4	82	113	0	19	42	2	0	94	37	2	469	0
4:30 PM		1	2	74	8	0	12	101	97	0	14	34	2	0	93	39	6	483	0
4:45 PM		0	5	72	5	0	9	109	102	0	15	36	1	0	86	40	4	484	1,865
5:00 PM		0	0	88	16	0	3	89	122	0	17	35	3	0	98	55	2	528	1,964
5:15 PM		0	5	68	14	0	9	104	114	0	27	48	3	0	81	45	4	522	2,017
5:30 PM		0	1	67	6	1	6	98	113	0	17	25	5	1	83	28	2	453	1,987
5:45 PM		0	0	66	6	0	7	98	99	1	13	32	3	0	87	23	3	438	1,941
Count Total		1	23	564	74	1	57	761	868	1	132	287	22	1	696	291	27	3,806	0
Peak Hour	All	1	12	302	43	0	33	403	435	0	73	153	9	0	358	179	16	2,017	0
	HV	0	0	2	0	0	0	2	0	0	0	2	0	0	2	2	0	10	0
	HV%	0%	0%	1%	0%	-	0%	0%	0%	-	0%	1%	0%	-	1%	1%	0%	0%	0

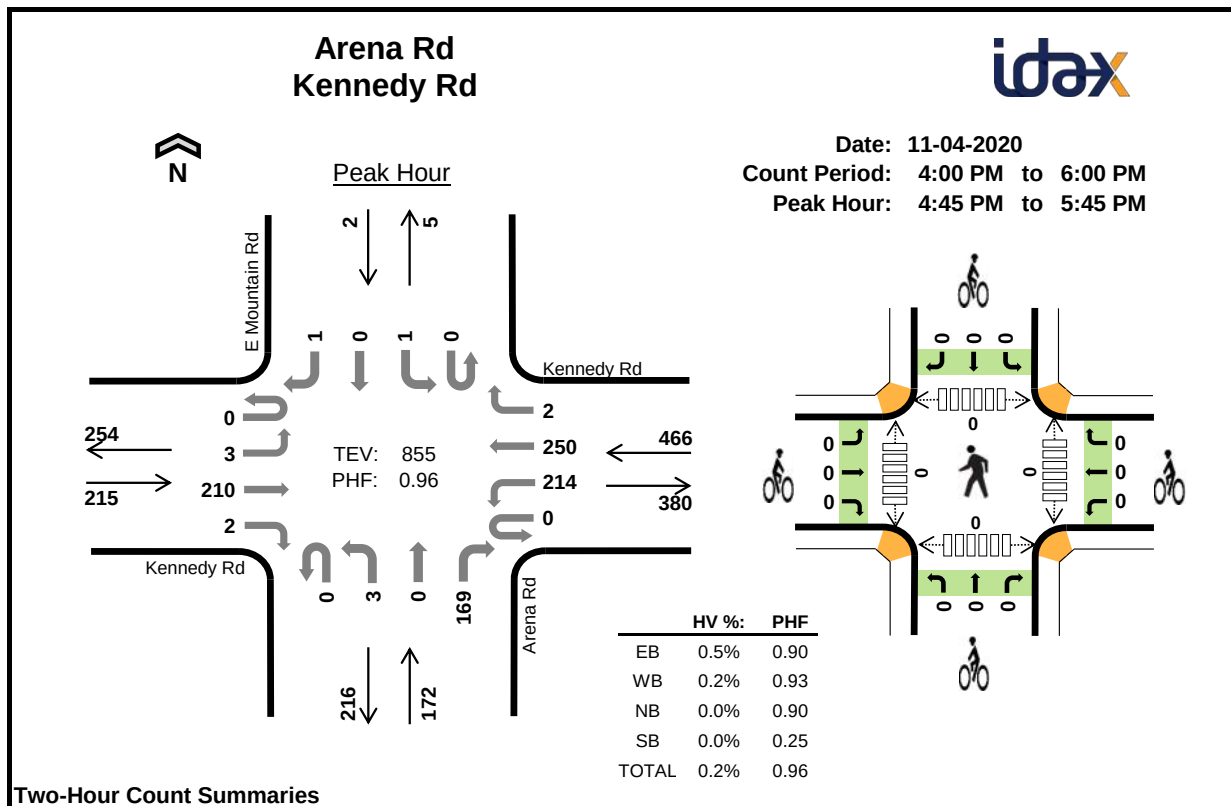
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	2	0	2	4	8	0	1	0	0	1	0	0	0	0	0
4:15 PM	0	1	1	1	3	0	0	0	0	0	0	0	1	0	1
4:30 PM	0	1	1	0	2	1	0	0	0	1	2	1	1	0	4
4:45 PM	0	1	0	2	3	0	0	0	0	0	0	0	3	0	3
5:00 PM	2	0	0	2	4	0	1	0	0	1	1	0	1	0	2
5:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	3	0	3
5:30 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0
5:45 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Count Total	4	4	6	9	23	1	3	0	0	4	3	1	9	0	13
Peak Hour	2	2	2	4	10	1	1	0	0	2	3	1	8	0	12

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Keene Rd				Keene Rd				Bombing Range Rd				Bombing Range Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	2	0	0	0	0	0	0	0	2	0	0	1	3	0	8	0
4:15 PM	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	3	0
4:30 PM	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0
4:45 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	3	16
5:00 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	4	12
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	10
5:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	9
5:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	7
Count Total	0	0	4	0	0	0	2	2	0	0	6	0	0	4	5	0	23	0
Peak Hour	0	0	2	0	0	0	2	0	0	0	2	0	0	2	2	0	10	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Keene Rd			Keene Rd			Bombing Range Rd			Bombing Range Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	0			
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	0			
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2			
5:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	2			
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2			
5:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	2			
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2			
Count Total	0	1	0	0	3	0	0	0	0	0	0	0	4	0			
Peak Hour	0	1	0	0	1	0	0	0	0	0	0	0	2	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		Kennedy Rd				Kennedy Rd				Arena Rd				E Mountain Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	46	3	0	40	55	0	0	1	0	42	0	0	0	0	187	0
4:15 PM		0	0	58	0	0	34	60	0	0	0	0	30	0	1	0	0	183	0
4:30 PM		0	0	57	0	0	42	59	1	0	0	0	37	0	0	0	1	197	0
4:45 PM		0	0	48	0	0	52	60	0	0	1	0	41	0	0	0	0	202	769
5:00 PM		0	1	57	1	0	47	65	1	0	0	0	37	0	0	0	0	209	791
5:15 PM		0	2	46	0	0	60	64	1	0	1	0	47	0	1	0	1	223	831
5:30 PM		0	0	59	1	0	55	61	0	0	1	0	44	0	0	0	0	221	855
5:45 PM		0	0	51	0	0	38	57	0	0	1	0	46	0	0	0	0	193	846
Count Total		0	3	422	5	0	368	481	3	0	5	0	324	0	2	0	2	1,615	0
Peak Hour	All	0	3	210	2	0	214	250	2	0	3	0	169	0	1	0	1	855	0
	HV	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0
	HV%	-	0%	0%	0%	-	0%	0%	0%	-	0%	-	0%	-	0%	-	0%	0%	0

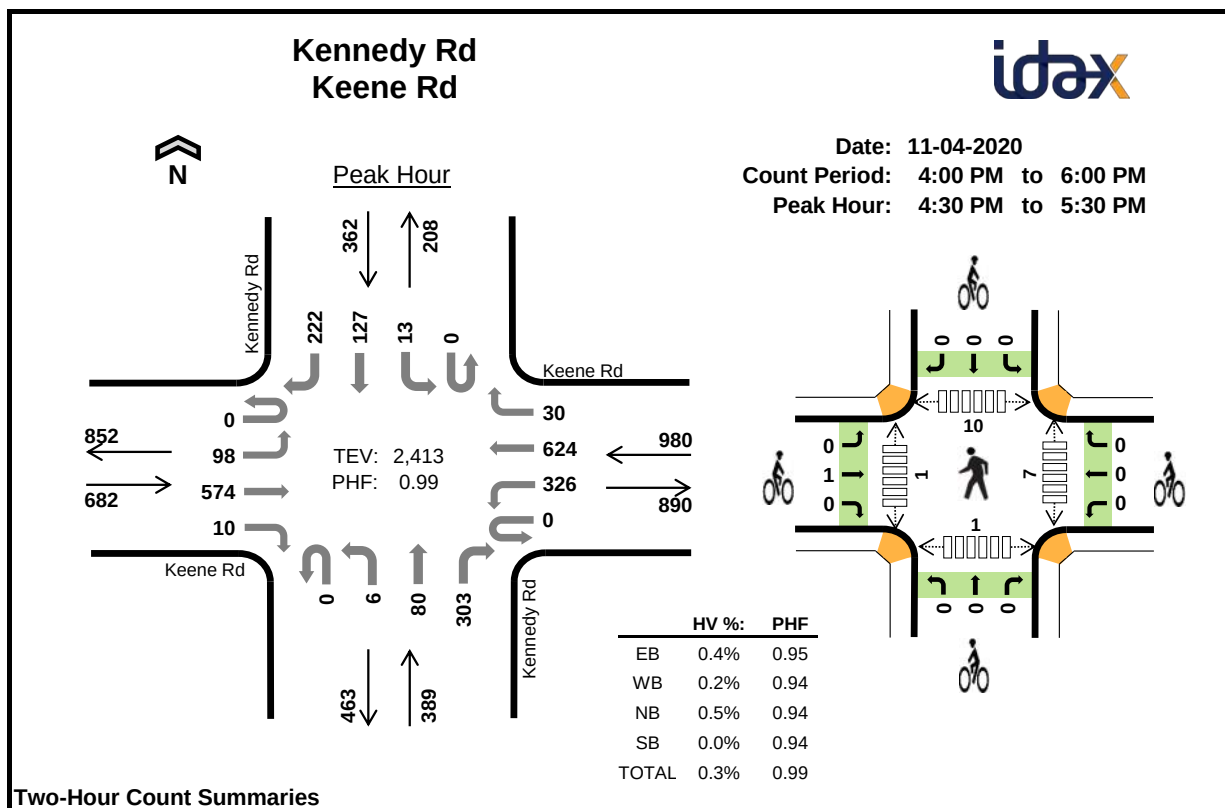
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	2	2	1	0	5	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	2	0	1	3	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	3	5	1	1	10	0	0	0	0	0	0	0	0	1	1
Peak Hour	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Kennedy Rd				Kennedy Rd				Arena Rd				E Mountain Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	2	0	0	0	2	0	0	0	0	1	0	0	0	0	5	0
4:15 PM	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	3	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
5:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Count Total	0	0	3	0	0	0	5	0	0	0	0	1	0	1	0	0	10	0
Peak Hour	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Kennedy Rd			Kennedy Rd			Arena Rd			E Mountain Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		Keene Rd				Keene Rd				Kennedy Rd				Kennedy Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	20	126	3	0	73	126	3	0	2	17	77	0	4	23	65	539	0
4:15 PM		0	20	121	7	0	72	141	7	0	4	23	74	0	0	31	52	552	0
4:30 PM		0	24	151	4	0	74	142	9	0	5	19	80	0	7	30	54	599	0
4:45 PM		0	24	143	3	0	88	166	7	0	0	19	75	0	4	28	55	612	2,302
5:00 PM		0	28	144	1	0	84	148	6	0	1	20	76	0	2	35	59	604	2,367
5:15 PM		0	22	136	2	0	80	168	8	0	0	22	72	0	0	34	54	598	2,413
5:30 PM		0	17	138	2	0	85	145	5	0	2	25	75	0	4	33	57	588	2,402
5:45 PM		0	23	135	1	0	64	146	4	0	2	23	72	0	2	40	52	564	2,354
Count Total		0	178	1,094	23	0	620	1,182	49	0	16	168	601	0	23	254	448	4,656	0
Peak Hour	All	0	98	574	10	0	326	624	30	0	6	80	303	0	13	127	222	2,413	0
	HV	0	0	3	0	0	0	2	0	0	0	0	2	0	0	0	0	7	0
	HV%	-	0%	1%	0%	-	0%	0%	0%	-	0%	0%	1%	-	0%	0%	0%	0%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	2	0	3	3	8	0	0	0	0	0	1	0	2	0	3
4:15 PM	2	4	0	0	6	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	1	1	0	2	1	0	0	0	1	3	1	0	1	5
4:45 PM	2	1	0	0	3	0	0	0	0	0	0	0	0	0	0
5:00 PM	1	0	1	0	2	0	0	0	0	0	2	0	6	0	8
5:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	4	0	6
5:30 PM	0	1	0	1	2	0	0	0	0	0	0	0	1	0	1
5:45 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Count Total	7	8	5	4	24	1	0	0	0	1	8	1	13	1	23
Peak Hour	3	2	2	0	7	1	0	0	0	1	7	1	10	1	19

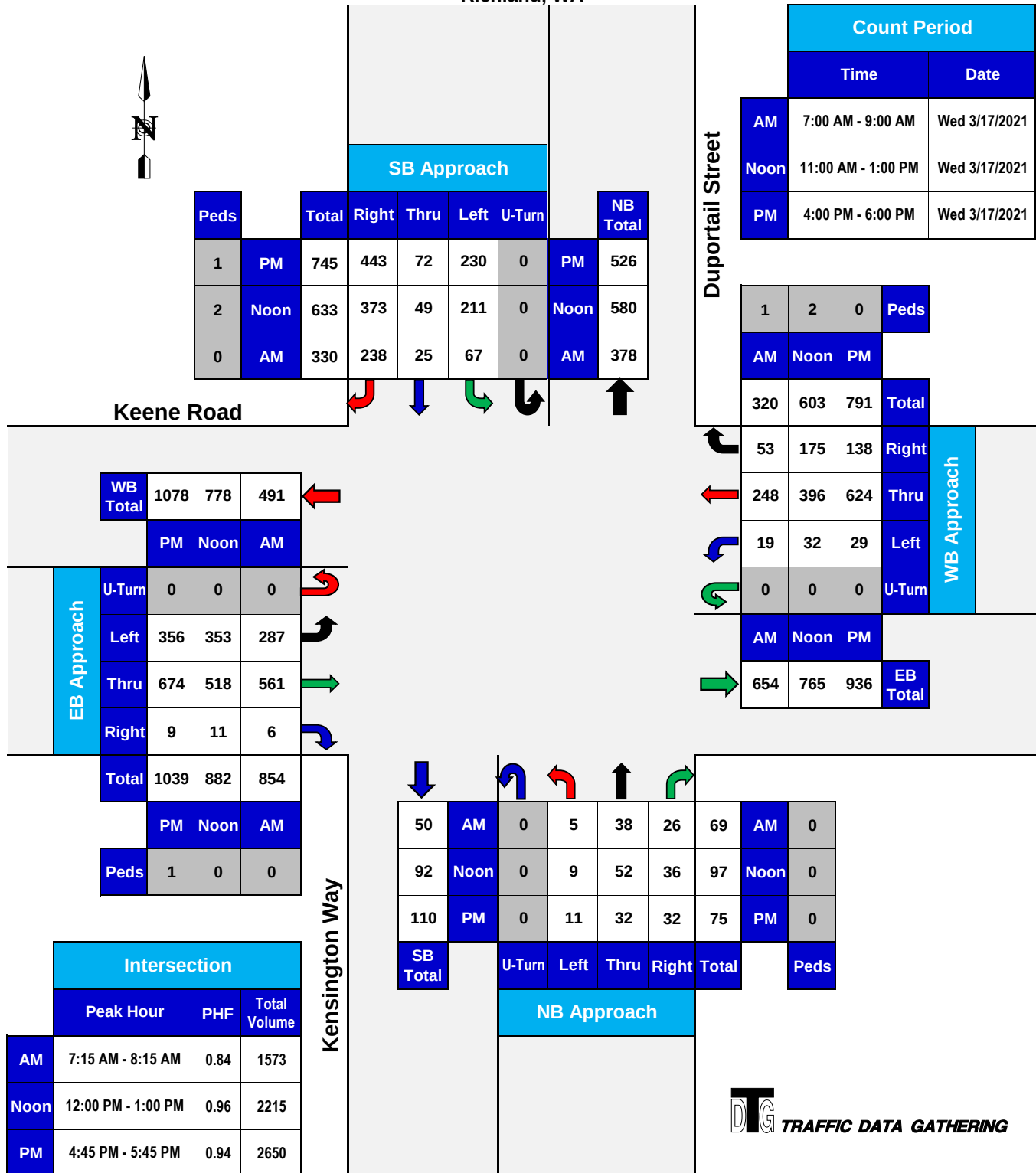
Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Keene Rd				Keene Rd				Kennedy Rd				Kennedy Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	2	0	0	0	0	0	0	0	0	3	0	1	2	0	8	0
4:15 PM	0	1	1	0	0	2	1	1	0	0	0	0	0	0	0	0	6	0
4:30 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0
4:45 PM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	19
5:00 PM	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2	13
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
5:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	7
5:45 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	5
Count Total	0	1	6	0	0	3	4	1	0	0	0	5	0	1	2	1	24	0
Peak Hour	0	0	3	0	0	0	2	0	0	0	0	2	0	0	0	0	7	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Keene Rd			Keene Rd			Kennedy Rd			Kennedy Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	0			
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	1	0	0	0	0	0	0	0	0	0	0	1	0			
Peak Hour	0	1	0	0	0	0	0	0	0	0	0	0	1	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Keene Road @ Duportail Street

Richland, WA



TURNING MOVEMENTS DIAGRAM - Daily Summary

#10 PM



TRAFFIC DATA GATHERING

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: Keene Road @ Duportail Street
Richland, WA

DATE OF COUNT: Wed. 3/17/2021COUNTED BY: TDGSTART OF COUNT: 4:00 PMDATE OF REDUCTION: 3/31/2021TIME OF COUNT: 4:00 PM - 6:00 PMDURATION OF COUNT: 2

TIME INTERVAL ENDING AT	SOUTHBOUND							NORTHBOUND							WESTBOUND							EASTBOUND							INTERVAL TOTALS
	Kensington Way							Duportail Street							Keene Road							Keene Road							
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
04:15 PM	0	0	1	0	47	14	98	0	0	0	0	1	10	12	0	0	2	0	4	140	33	0	0	9	0	83	181	1	624
04:30 PM	1	0	2	0	54	18	117	0	0	1	0	1	11	10	0	0	1	0	7	132	40	0	0	12	0	94	156	2	642
04:45 PM	0	0	2	0	37	13	110	0	0	0	0	4	5	8	0	0	1	0	7	123	43	0	0	7	0	90	172	1	613
05:00 PM	0	0	4	0	58	16	115	0	0	0	0	2	12	5	0	0	2	0	5	133	33	0	0	4	0	99	167	1	646
05:15 PM	0	0	2	0	70	23	101	0	0	0	0	4	7	8	0	0	4	0	9	147	32	1	0	6	0	86	154	2	643
05:30 PM	0	0	2	0	59	18	108	0	0	1	0	4	10	9	0	0	2	0	8	178	27	0	0	5	0	91	189	2	703
05:45 PM	1	0	3	0	43	15	119	0	0	0	0	1	3	10	0	0	2	0	7	166	46	0	0	6	0	80	164	4	658
06:00 PM	1	0	1	0	60	11	103	0	0	0	0	0	4	7	0	0	3	0	12	120	54	0	0	2	0	93	125	1	590
PEAK HOUR TOTALS	1	0	11	0	230	72	443	0	0	1	0	11	32	32	0	0	10	0	29	624	138	1	0	21	0	356	674	9	INTERSECTION
ALL MOVEMENTS				745							75							791							1039				2650
% HV			1.5%							1.3%							1.3%							2.0%					1.6%
PEAK HOUR FACTOR				0.96							0.82							0.90							0.92				0.94

HV = Heavy Vehicle

PHF = Peak Hour Factor

4:00 PM - 6:00 PM PEAK HOUR:

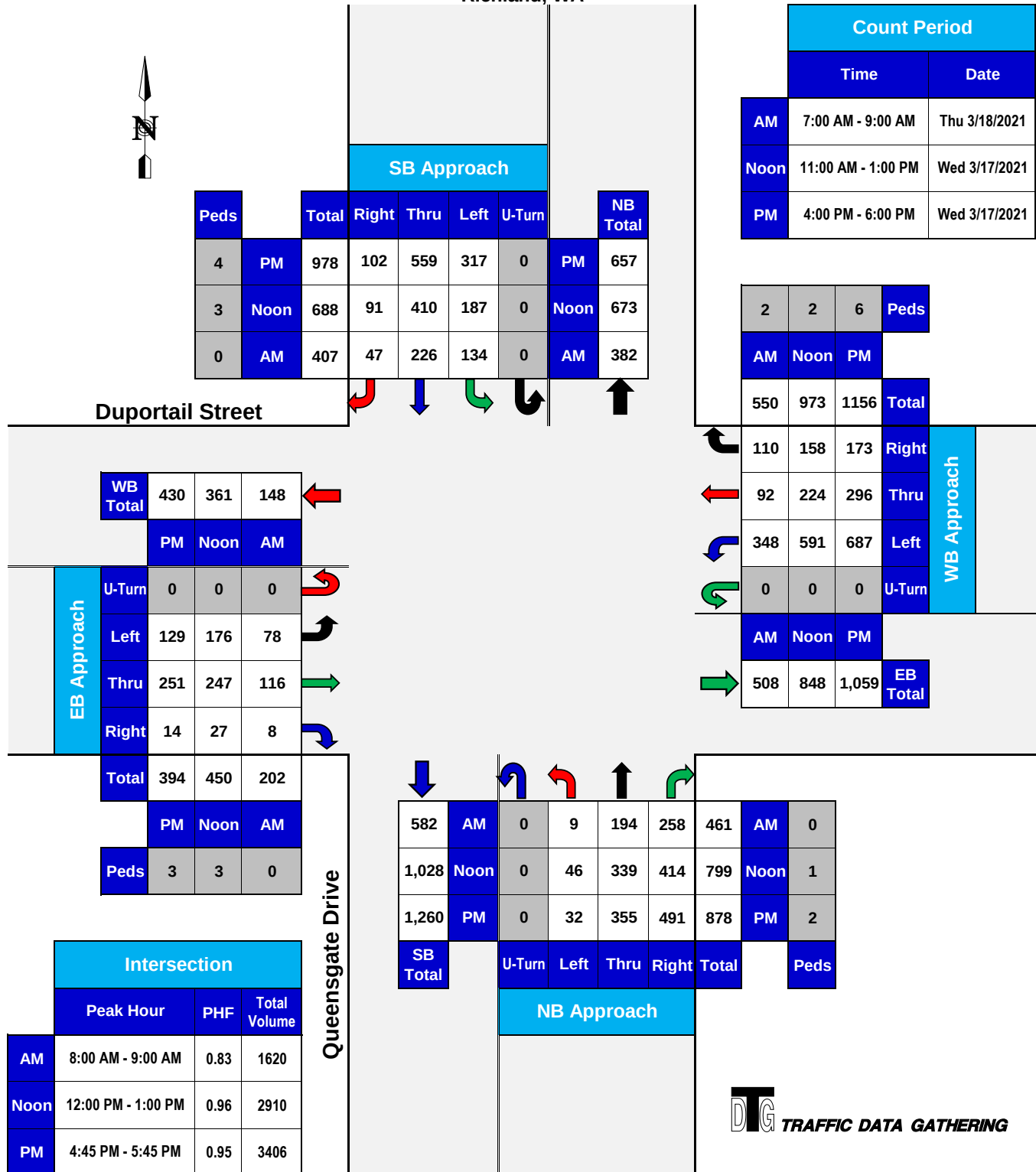
4:45 PM - 5:45 PM

ROLLING HOUR COUNT

TIME INTERVAL	SOUTHBOUND Kensington Way							NORTHBOUND Duportail Street							WESTBOUND Keene Road							EASTBOUND Keene Road							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
4:00 PM - 5:00 PM	1	0	9	0	196	61	440	0	0	1	0	8	38	35	0	0	6	0	23	528	149	0	0	32	0	366	676	5	2525
4:15 PM - 5:15 PM	1	0	10	0	219	70	443	0	0	1	0	11	35	31	0	0	8	0	28	535	148	1	0	29	0	369	649	6	2544
4:30 PM - 5:30 PM	0	0	10	0	224	70	434	0	0	1	0	14	34	30	0	0	9	0	29	581	135	1	0	22	0	366	682	6	2605
4:45 PM - 5:45 PM	1	0	11	0	230	72	443	0	0	1	0	11	32	32	0	0	10	0	29	624	138	1	0	21	0	356	674	9	2650
5:00 PM - 6:00 PM	2	0	8	0	232	67	431	0	0	1	0	9	24	34	0	0	11	0	36	611	159	1	0	19	0	350	632	9	2594
4:00 PM - 6:00 PM Total:	3	0	17	0	428	128	871	0	0	2	0	17	62	69	0	0	17	0	59	1139	308	1	0	51	0	716	1308	14	5119

Duportail Street @ Queensgate Drive

Richland, WA



TURNING MOVEMENTS DIAGRAM - Daily Summary



TRAFFIC DATA GATHERING

#11 PM

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: Duportail Street @ Queensgate Drive
Richland, WA

DATE OF COUNT: Wed. 3/17/2021

COUNTED BY: TDG

START OF COUNT: 4:00 PM

DATE OF REDUCTION: 3/31/2021

TIME OF COUNT: 4:00 PM - 6:00 PM

DURATION OF COUNT: 2

TIME INTERVAL ENDING AT	SOUTHBOUND Queensgate Drive							NORTHBOUND Queensgate Drive							WESTBOUND Duportail Street							EASTBOUND Duportail Street							INTERVAL TOTALS				
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right					
04:15 PM	1	0	0	0	55	113	30	0	0	7	0	9	89	121	3	0	1	0	168	57	34	0	0	2	0	27	71	11	785				
04:30 PM	0	0	0	0	57	115	19	1	0	5	0	7	92	129	2	0	5	0	191	61	23	1	0	0	0	45	63	3	805				
04:45 PM	0	1	3	0	72	110	22	0	0	2	0	11	79	98	1	0	4	0	168	65	34	0	0	0	0	36	79	6	780				
05:00 PM	0	0	2	0	62	141	22	2	0	2	0	5	96	121	0	0	4	0	186	65	56	0	0	0	0	31	59	6	850				
05:15 PM	0	0	0	0	92	147	31	0	0	2	0	11	97	127	4	0	3	0	159	72	38	0	0	1	0	25	64	3	866				
05:30 PM	1	0	0	0	90	159	25	0	0	3	0	8	77	121	1	0	6	0	182	94	41	0	0	0	0	31	66	2	896				
05:45 PM	3	0	0	0	73	112	24	0	0	1	0	8	85	122	1	0	4	0	160	65	38	3	0	0	0	42	62	3	794				
06:00 PM	1	0	2	0	66	111	27	0	0	2	0	10	73	104	1	0	2	0	175	79	38	0	0	0	0	42	53	3	781				
PEAK HOUR TOTALS	4	0	2	0	317	559	102	2	0	8	0	32	355	491	6	0	17	0	687	296	173	3	0	1	0	129	251	14	INTERSECTION				
ALL MOVEMENTS				978								878								1156								394				3406	
% HV			0.2%								0.9%								1.5%								0.3%						0.8%
PEAK HOUR FACTOR				0.89								0.93								0.91								0.92				0.95	

HV = Heavy Vehicle

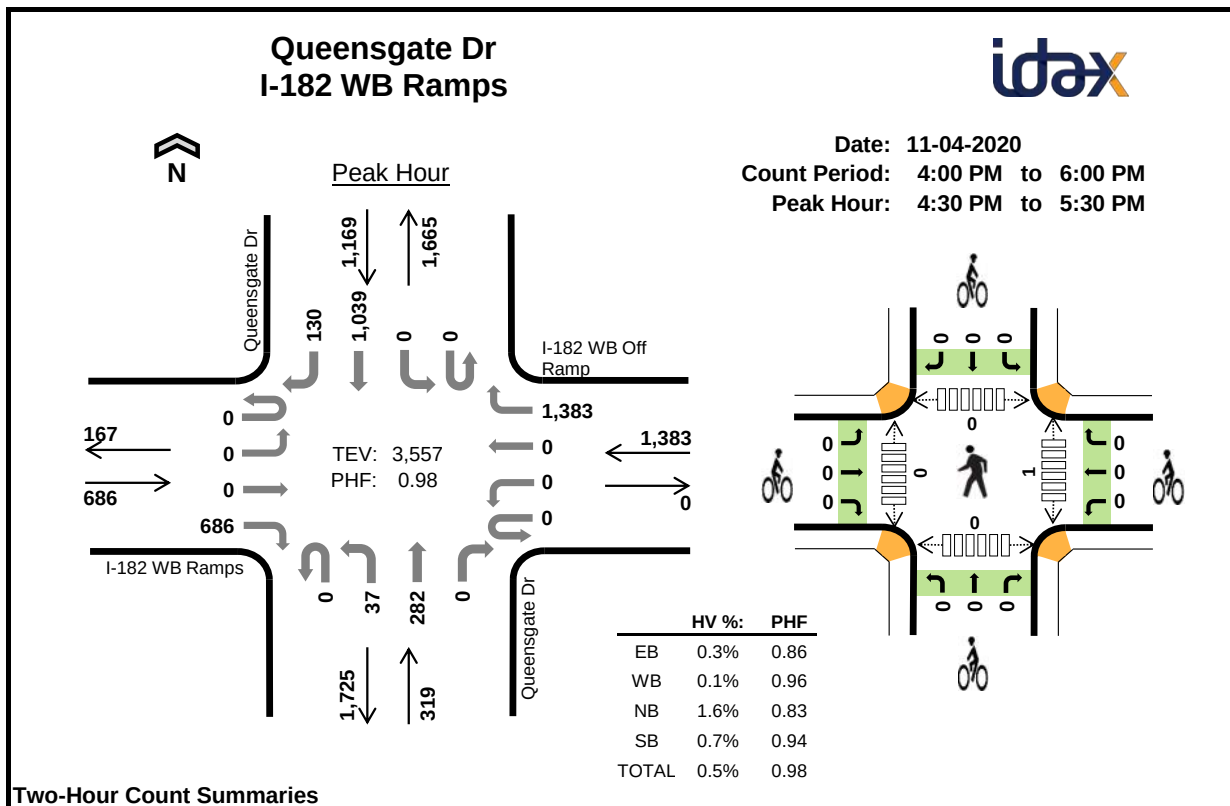
PHF = Peak Hour Factor

4:00 PM - 6:00 PM PEAK HOUR:

4:45 PM - 5:45 PM

ROLLING HOUR COUNT

TIME INTERVAL	SOUTHBOUND Queensgate Drive							NORTHBOUND Queensgate Drive							WESTBOUND Duportail Street							EASTBOUND Duportail Street							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
4:00 PM - 5:00 PM	1	1	5	0	246	479	93	3	0	16	0	32	356	469	6	0	14	0	713	248	147	1	0	2	0	139	272	26	3220
4:15 PM - 5:15 PM	0	1	5	0	283	513	94	3	0	11	0	34	364	475	7	0	16	0	704	263	151	1	0	1	0	137	265	18	3301
4:30 PM - 5:30 PM	1	1	5	0	316	557	100	2	0	9	0	35	349	467	6	0	17	0	695	296	169	0	0	1	0	123	268	17	3392
4:45 PM - 5:45 PM	4	0	2	0	317	559	102	2	0	8	0	32	355	491	6	0	17	0	687	296	173	3	0	1	0	129	251	14	3406
5:00 PM - 6:00 PM	5	0	2	0	321	529	107	0	0	8	0	37	332	474	7	0	15	0	676	310	155	3	0	1	0	140	245	11	3337
4:00 PM - 6:00 PM Total:	6	1	7	0	567	1008	200	3	0	24	0	69	688	943	13	0	29	0	1389	558	302	4	0	3	0	279	517	37	6557



Interval Start		I-182 WB Ramps				I-182 WB Off Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	0	155	0	0	0	256	0	14	54	0	0	0	273	37	789	0
4:15 PM		0	0	0	155	0	0	0	329	0	5	76	0	0	0	224	27	816	0
4:30 PM		0	0	0	155	0	0	0	343	0	8	67	0	0	0	278	32	883	0
4:45 PM		0	0	0	167	0	0	0	343	0	13	83	0	0	0	262	39	907	3,395
5:00 PM		0	0	0	165	0	0	0	337	0	9	67	0	0	0	261	30	869	3,475
5:15 PM		0	0	0	199	0	0	0	360	0	7	65	0	0	0	238	29	898	3,557
5:30 PM		0	0	0	140	0	0	0	323	0	10	51	0	0	0	273	33	830	3,504
5:45 PM		0	0	0	127	0	0	0	296	0	6	58	0	0	0	236	29	752	3,349
Count Total		0	0	0	1,263	0	0	0	2,587	0	72	521	0	0	0	2,045	256	6,744	0
Peak Hour	All	0	0	0	686	0	0	0	1,383	0	37	282	0	0	0	1,039	130	3,557	0
	HV	0	0	0	2	0	0	0	2	0	0	5	0	0	0	6	2	17	0
	HV%	-	-	-	0%	-	-	-	0%	-	0%	2%	-	-	-	1%	2%	0%	0

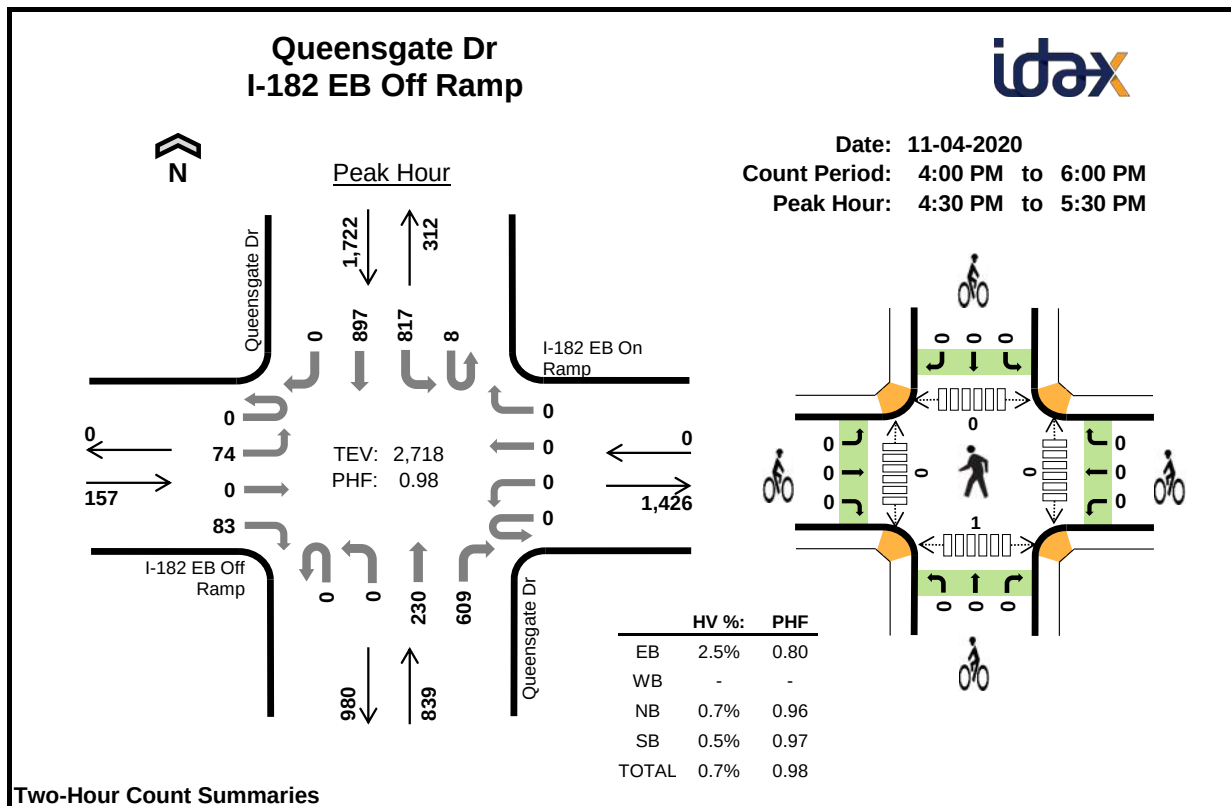
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	1	0	1	6	8	0	0	0	0	0	0	0	0	0	0
4:15 PM	3	2	2	3	10	0	0	0	0	0	0	0	0	0	0
4:30 PM	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0
4:45 PM	1	1	3	2	7	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	1	0	5	6	0	0	0	0	0	1	0	0	0	1
5:15 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	2	0	2	4	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	2	0	2	4	0	0	0	0	0	0	0	0	0	0
Count Total	6	8	8	21	43	0	0	0	0	0	1	0	0	0	1
Peak Hour	2	2	5	8	17	0	0	0	0	0	1	0	0	0	1

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	I-182 WB Ramps				I-182 WB Off Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	1	0	0	0	0	0	0	1	0	0	0	5	1	8	0
4:15 PM	0	0	0	3	0	0	0	2	0	0	2	0	0	0	3	0	10	0
4:30 PM	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2	0
4:45 PM	0	0	0	1	0	0	0	1	0	0	3	0	0	0	1	1	7	27
5:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4	1	6	25
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	17
5:30 PM	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	4	19
5:45 PM	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	1	4	16
Count Total	0	0	0	6	0	0	0	8	0	0	8	0	0	0	17	4	43	0
Peak Hour	0	0	0	2	0	0	0	2	0	0	5	0	0	0	6	2	17	0

Two-Hour Count Summaries - Bikes																	
Interval Start	I-182 WB Ramps			I-182 WB Off Ramp			Queensgate Dr			Queensgate Dr			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		I-182 EB Off Ramp				I-182 EB On Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	17	0	21	0	0	0	0	0	0	46	183	2	208	215	0	692	0
4:15 PM		0	16	0	18	0	0	0	0	0	0	63	142	0	186	194	0	619	0
4:30 PM		0	17	0	17	0	0	0	0	0	0	58	154	4	206	223	0	679	0
4:45 PM		0	25	0	24	0	0	0	0	0	0	65	152	1	207	222	0	696	2,686
5:00 PM		0	19	0	19	0	0	0	0	0	0	55	163	0	208	206	0	670	2,664
5:15 PM		0	13	0	23	0	0	0	0	0	0	52	140	3	196	246	0	673	2,718
5:30 PM		0	12	1	26	0	0	0	0	0	0	45	139	1	211	202	0	637	2,676
5:45 PM		0	16	0	20	0	0	0	0	0	0	45	126	1	195	174	0	577	2,557
Count Total		0	135	1	168	0	0	0	0	0	0	429	1,199	12	1,617	1,682	0	5,243	0
Peak Hour	All	0	74	0	83	0	0	0	0	0	0	230	609	8	817	897	0	2,718	0
	HV	0	3	0	1	0	0	0	0	0	0	2	4	0	5	3	0	18	0
	HV%	-	4%	-	1%	-	-	-	-	-	-	1%	1%	0%	1%	0%	-	1%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	2	0	5	6	13	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	2	6	8	0	0	0	0	0	0	0	0	0	0
4:30 PM	1	0	2	1	4	0	0	0	0	0	0	0	0	0	0
4:45 PM	3	0	1	2	6	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	2	4	6	0	0	0	0	0	0	0	0	1	1
5:15 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
Count Total	6	0	14	23	43	0	0	0	0	0	0	0	0	1	1
Peak Hour	4	0	6	8	18	0	0	0	0	0	0	0	0	1	1

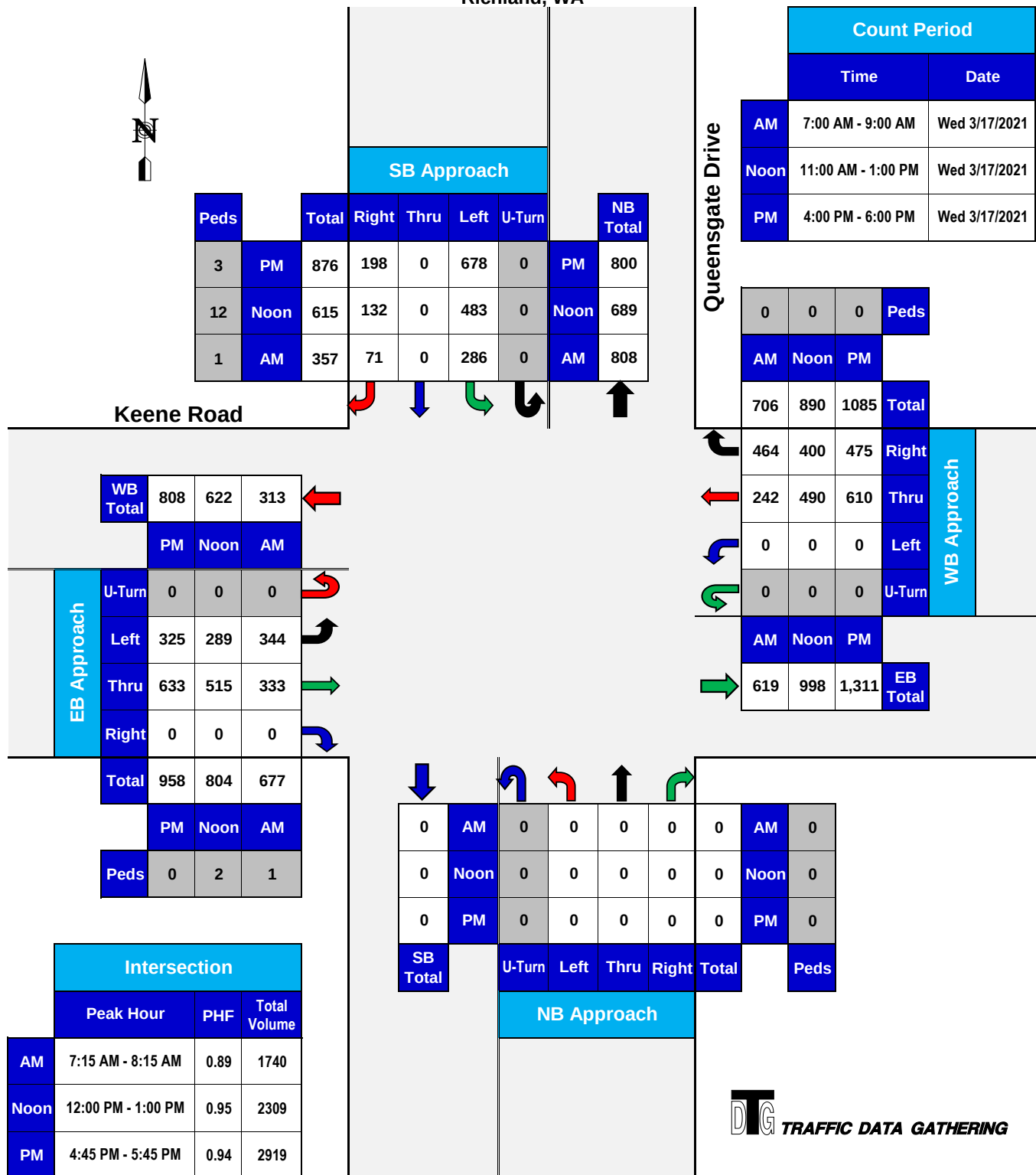
Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	I-182 EB Off Ramp				I-182 EB On Ramp				Queensgate Dr				Queensgate Dr				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	2	0	0	0	0	0	0	0	0	0	5	0	4	2	0	13	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	3	3	0	8	0
4:30 PM	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	0	4	0
4:45 PM	0	2	0	1	0	0	0	0	0	0	1	0	0	1	1	0	6	31
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	3	1	0	6	24
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	18
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	16
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	12
Count Total	0	5	0	1	0	0	0	0	0	0	3	11	0	15	8	0	43	0
Peak Hour	0	3	0	1	0	0	0	0	0	0	2	4	0	5	3	0	18	0

Two-Hour Count Summaries - Bikes																		
Interval Start	I-182 EB Off Ramp			I-182 EB On Ramp			Queensgate Dr			Queensgate Dr			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Keene Road @ Queensgate Drive

Richland, WA



TURNING MOVEMENTS DIAGRAM - Daily Summary



TRAFFIC DATA GATHERING

#14 PM

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: Keene Road @ Queensgate Drive
Richland, WA

DATE OF COUNT: Wed. 3/17/2021COUNTED BY: TDGSTART OF COUNT: 4:00 PMDATE OF REDUCTION: 3/31/2021TIME OF COUNT: 4:00 PM - 6:00 PMDURATION OF COUNT: 2

TIME INTERVAL ENDING AT	SOUTHBOUND Queensgate Drive							NORTHBOUND 0							WESTBOUND Keene Road							EASTBOUND Keene Road							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
04:15 PM	0	0	3	0	145	0	34	0	0	0	0	0	0	0	0	0	5	0	0	148	118	0	0	6	0	92	143	0	680
04:30 PM	0	0	1	0	128	0	40	0	0	0	0	0	0	0	0	0	5	0	0	139	100	0	0	13	0	88	152	0	647
04:45 PM	2	0	2	0	145	0	45	0	0	0	0	0	0	0	0	0	7	0	0	152	112	0	0	5	0	77	129	0	660
05:00 PM	1	0	4	0	146	0	43	0	0	0	0	0	0	0	0	0	5	0	0	121	120	0	0	5	0	88	155	0	673
05:15 PM	0	0	2	0	187	0	54	0	0	0	0	0	0	0	0	0	1	0	0	161	123	0	0	6	0	83	166	0	774
05:30 PM	1	0	1	0	166	0	56	0	0	0	0	0	0	0	0	0	4	0	0	174	113	0	0	3	0	70	178	0	757
05:45 PM	1	0	1	0	179	0	45	0	0	0	0	0	0	0	0	0	1	0	0	154	119	0	0	5	0	84	134	0	715
06:00 PM	0	0	1	0	158	0	54	2	0	0	0	0	0	0	0	0	2	0	0	142	107	0	0	4	0	61	149	0	671
PEAK HOUR TOTALS	3	0	8	0	678	0	198	0	0	0	0	0	0	0	0	0	11	0	0	610	475	0	0	19	0	325	633	0	INTERSECTION
ALL MOVEMENTS				876							0							1085							958				2919
% HV			0.9%							#N/A							1.0%							2.0%					1.3%
PEAK HOUR FACTOR				0.91							#DIV/0!							0.95							0.96				0.94

HV = Heavy Vehicle

PHF = Peak Hour Factor

4:00 PM - 6:00 PM PEAK HOUR:

4:45 PM - 5:45 PM

ROLLING HOUR COUNT

TIME INTERVAL	SOUTHBOUND Queensgate Drive							NORTHBOUND 0							WESTBOUND Keene Road							EASTBOUND Keene Road							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
4:00 PM - 5:00 PM	3	0	10	0	564	0	162	0	0	0	0	0	0	0	0	0	22	0	0	560	450	0	0	29	0	345	579	0	2660
4:15 PM - 5:15 PM	3	0	9	0	606	0	182	0	0	0	0	0	0	0	0	0	18	0	0	573	455	0	0	29	0	336	602	0	2754
4:30 PM - 5:30 PM	4	0	9	0	644	0	198	0	0	0	0	0	0	0	0	0	17	0	0	608	468	0	0	19	0	318	628	0	2864
4:45 PM - 5:45 PM	3	0	8	0	678	0	198	0	0	0	0	0	0	0	0	0	11	0	0	610	475	0	0	19	0	325	633	0	2919
5:00 PM - 6:00 PM	2	0	5	0	690	0	209	2	0	0	0	0	0	0	0	0	8	0	0	631	462	0	0	18	0	298	627	0	2917
4:00 PM - 6:00 PM Total:	5	0	15	0	1254	0	371	2	0	0	0	0	0	0	0	0	30	0	0	1191	912	0	0	47	0	643	1206	0	5577

Two-Hour Count Summaries

Interval Start		Gage Blvd				Gage Blvd				0				Keene Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	10	39	0	0	0	43	122	0	0	0	0	0	144	0	6	364	0
4:15 PM		0	9	38	0	0	0	44	153	0	0	0	0	0	155	0	10	409	0
4:30 PM		0	8	40	0	0	0	52	157	0	0	0	0	0	170	0	14	441	0
4:45 PM		0	12	46	0	0	0	55	155	0	0	0	0	0	169	0	12	449	1,663
5:00 PM		0	6	33	0	0	0	61	171	0	0	0	0	0	123	0	7	401	1,700
5:15 PM		0	12	31	0	0	0	66	165	0	0	0	0	0	136	0	12	422	1,713
5:30 PM		0	7	40	0	0	0	65	136	0	0	0	0	0	154	0	9	411	1,683
5:45 PM		0	5	31	0	0	0	45	130	0	0	0	0	0	150	0	4	365	1,599
Count Total		0	69	298	0	0	0	431	1,189	0	0	0	0	0	1,201	0	74	3,262	0
Peak Hour	All	0	38	150	0	0	0	234	648	0	0	0	0	0	598	0	45	1,713	0
	HV	0	0	4	0	0	0	0	2	0	0	0	0	0	5	0	0	11	0
	HV%	-	0%	3%	-	-	-	0%	0%	-	-	-	-	-	1%	-	0%	1%	0

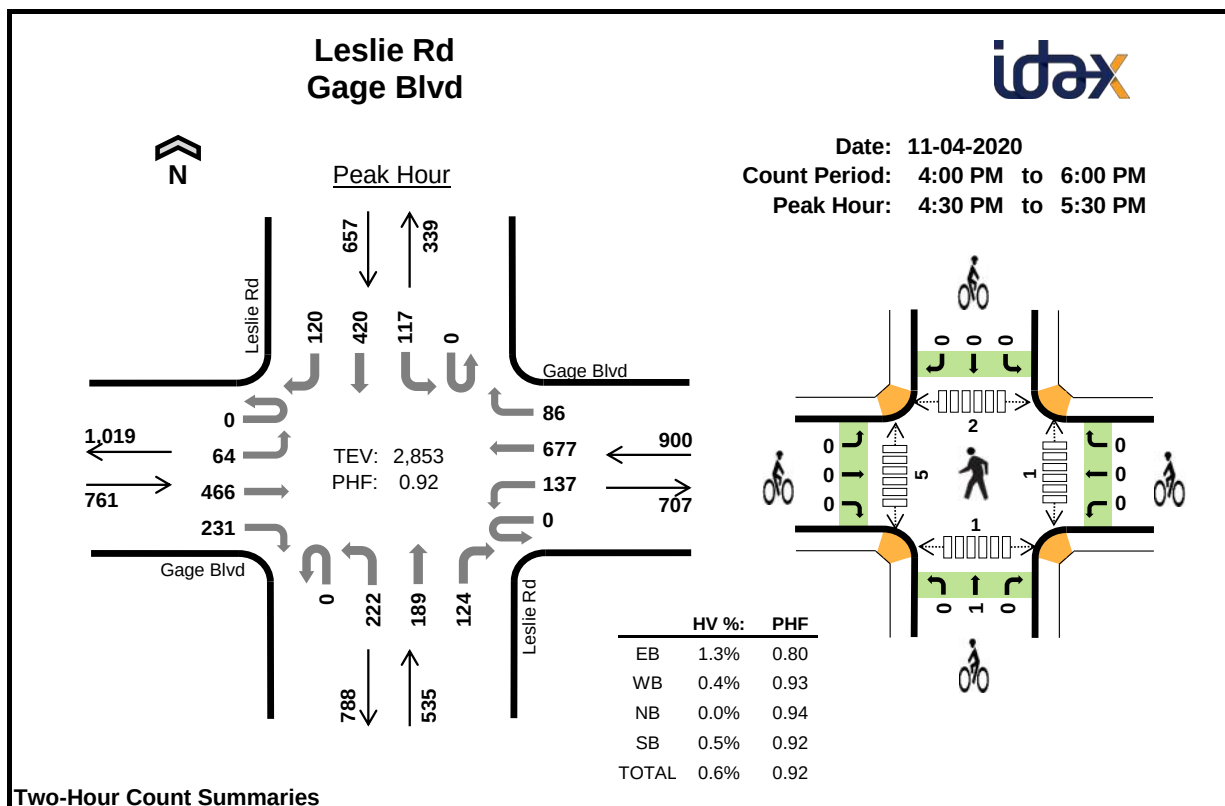
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

[illegible]

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Gage Blvd				Gage Blvd				0				Keene Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	1	2	0	0	0	0	1	0	0	0	0	0	1	0	0	5	0
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	0	4	0
4:30 PM	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0
4:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	3	14
5:00 PM	0	0	2	0	0	0	0	1	0	0	0	0	0	2	0	0	5	14
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	11
5:30 PM	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	4	13
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	11
Count Total	0	1	8	0	0	0	0	6	0	0	0	0	0	10	0	0	25	0
Peak Hour	0	0	4	0	0	0	0	2	0	0	0	0	0	5	0	0	11	0

Two-Hour Count Summaries - Bikes																		
Interval Start	Gage Blvd			Gage Blvd			0			Keene Rd						15-min Total	Rolling One Hour	
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT			
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Two-Hour Count Summaries

Interval Start		Gage Blvd				Gage Blvd				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	10	117	44	0	27	121	21	0	54	41	29	0	31	89	22	606	0
4:15 PM		0	19	139	51	0	26	138	15	0	54	47	37	0	26	85	29	666	0
4:30 PM		0	19	117	57	0	32	140	17	0	66	50	26	0	26	95	31	676	0
4:45 PM		0	19	146	72	0	32	169	28	0	50	52	32	0	20	130	28	778	2,726
5:00 PM		0	17	104	48	0	38	181	20	0	61	39	32	0	35	85	29	689	2,809
5:15 PM		0	9	99	54	0	35	187	21	0	45	48	34	0	36	110	32	710	2,853
5:30 PM		0	12	119	49	0	29	135	11	0	62	37	33	0	44	103	29	663	2,840
5:45 PM		0	19	137	43	0	34	149	23	0	35	40	31	0	27	67	21	626	2,688
Count Total		0	124	978	418	0	253	1,220	156	0	427	354	254	0	245	764	221	5,414	0
Peak Hour	All	0	64	466	231	0	137	677	86	0	222	189	124	0	117	420	120	2,853	0
	HV	0	1	8	1	0	2	2	0	0	0	0	0	0	2	1	0	17	0
	HV%	-	2%	2%	0%	-	1%	0%	0%	-	0%	0%	0%	-	2%	0%	0%	1%	0

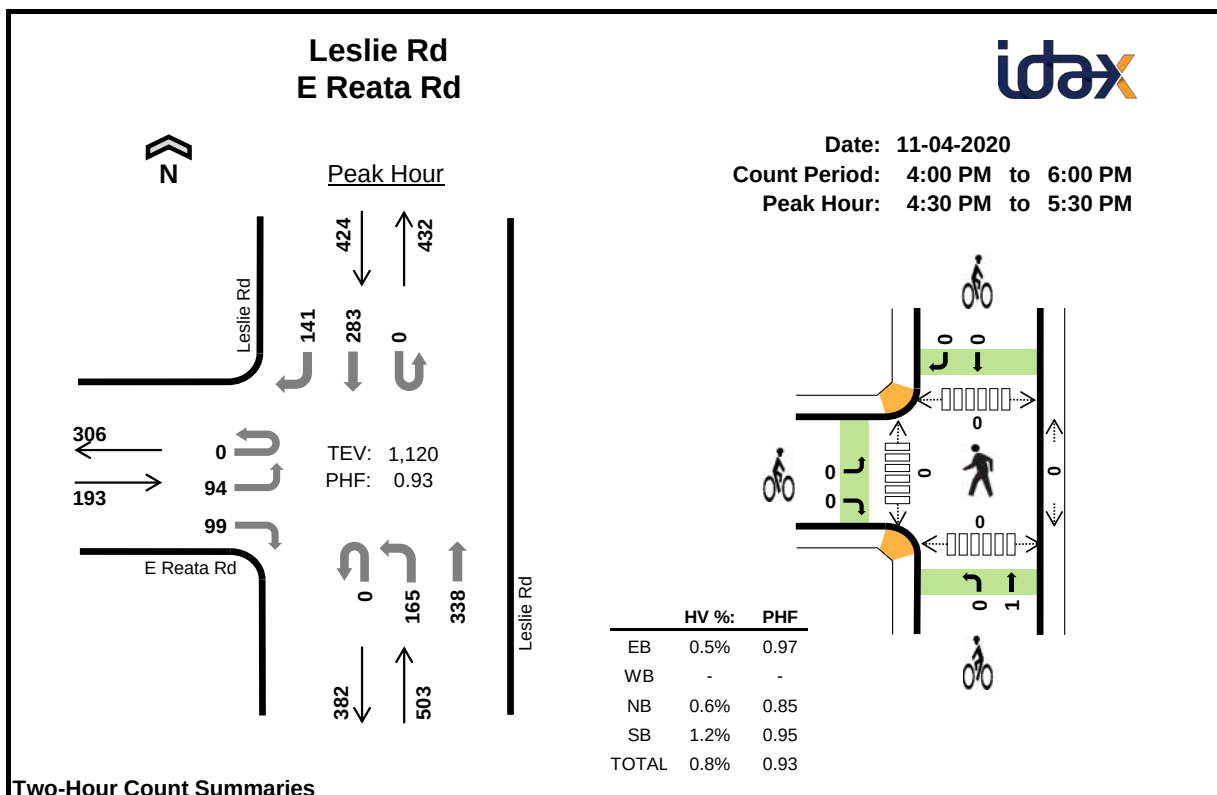
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	3	2	0	2	7	0	0	0	1	1	0	2	0	1	3
4:15 PM	1	1	0	0	2	0	0	1	0	1	0	1	1	1	3
4:30 PM	2	1	0	1	4	0	0	0	0	0	1	1	2	0	4
4:45 PM	2	1	0	1	4	0	0	0	0	0	0	2	0	1	3
5:00 PM	5	1	0	1	7	0	0	1	0	1	0	1	0	0	1
5:15 PM	1	1	0	0	2	0	0	0	0	0	0	1	0	0	1
5:30 PM	2	1	1	0	4	0	0	0	0	0	0	1	0	0	1
5:45 PM	1	1	0	1	3	0	0	0	0	0	0	0	0	0	0
Count Total	17	9	1	6	33	0	0	2	1	3	1	9	3	3	16
Peak Hour	10	4	0	3	17	0	0	1	0	1	1	5	2	1	9

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Gage Blvd				Gage Blvd				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	1	2	0	0	0	1	1	0	0	0	0	0	0	2	0	7	0
4:15 PM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0
4:30 PM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	1	0	4	0
4:45 PM	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	1	0	4
5:00 PM	0	1	4	0	0	0	1	0	0	0	0	0	0	0	1	0	0	7
5:15 PM	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	2	0	0	0	1	0	0	1	0	0	0	0	0	0	0	4
5:45 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	3
Count Total	0	3	13	1	0	3	5	1	0	1	0	0	0	0	2	4	0	33
Peak Hour	0	1	8	1	0	2	2	0	0	0	0	0	0	0	2	1	0	17

Two-Hour Count Summaries - Bikes																		
Interval Start	Gage Blvd			Gage Blvd			Leslie Rd			Leslie Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	0				
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0				
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0				
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
Count Total	0	0	0	0	0	0	0	2	0	0	1	0	3	0				
Peak Hour	0	0	0	0	0	0	0	1	0	0	0	0	1	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		E Reata Rd				0				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	18	0	23	0	0	0	0	0	44	84	0	0	0	53	40	262	0
4:15 PM		0	22	0	24	0	0	0	0	0	49	65	0	0	0	68	38	266	0
4:30 PM		0	23	0	23	0	0	0	0	0	41	72	0	0	0	74	30	263	0
4:45 PM		0	27	0	23	0	0	0	0	0	34	90	0	0	0	77	34	285	1,076
5:00 PM		0	23	0	26	0	0	0	0	0	53	95	0	0	0	67	38	302	1,116
5:15 PM		0	21	0	27	0	0	0	0	0	37	81	0	0	0	65	39	270	1,120
5:30 PM		0	18	0	27	0	0	0	0	0	33	73	0	0	0	71	29	251	1,108
5:45 PM		0	16	0	18	0	0	0	0	0	39	79	0	0	0	60	29	241	1,064
Count Total		0	168	0	191	0	0	0	0	0	330	639	0	0	0	535	277	2,140	0
Peak Hour	All	0	94	0	99	0	0	0	0	0	165	338	0	0	0	283	141	1,120	0
	HV	0	0	0	1	0	0	0	0	0	3	0	0	0	0	5	0	9	0
	HV%	-	0%	-	1%	-	-	-	-	-	2%	0%	-	-	-	2%	0%	1%	0

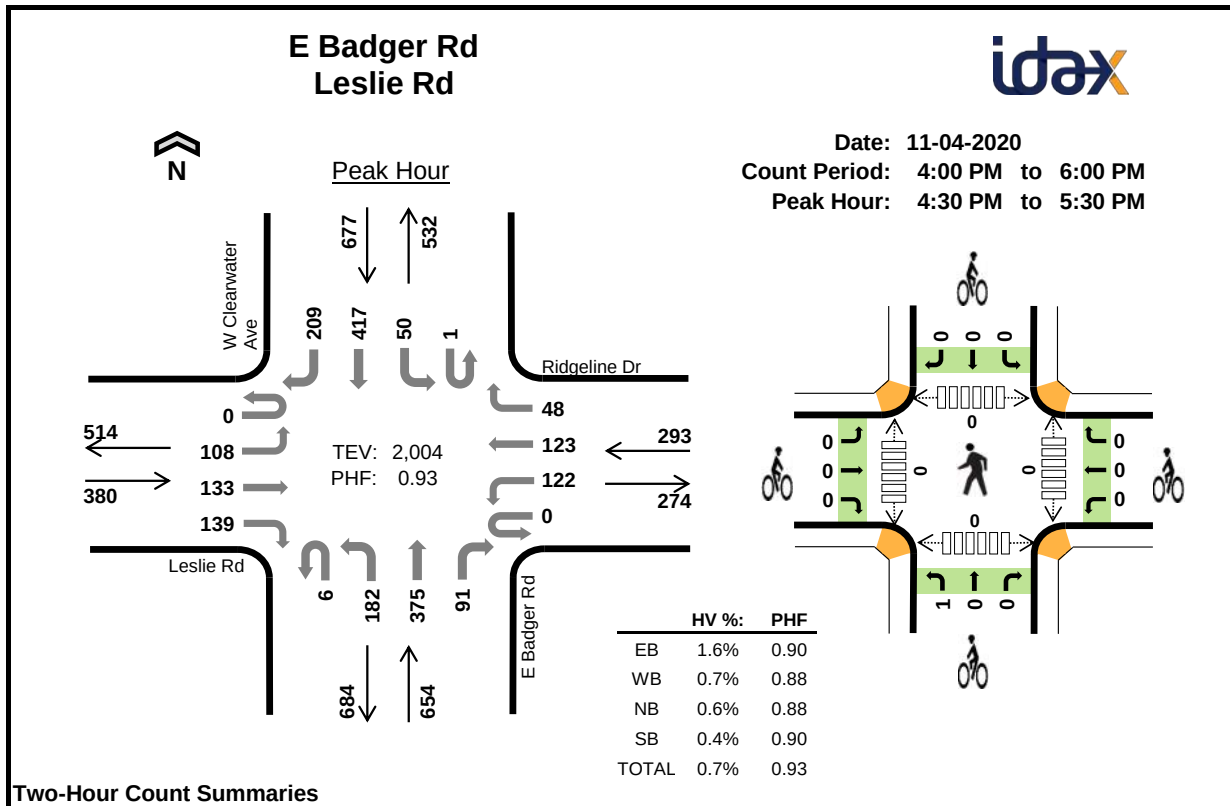
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	2	0	4	1	7	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0
4:45 PM	1	0	0	2	3	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	2	2	0	0	1	0	1	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Count Total	4	0	7	7	18	0	0	1	0	1	0	0	0	0	0
Peak Hr	1	0	3	5	9	0	0	1	0	1	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																			
Interval Start	E Reata Rd				0				Leslie Rd				Leslie Rd				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
4:00 PM	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0	1	0	7	0
4:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
4:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0
4:45 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	3	13
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2	8
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	9
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5
Count Total	0	0	0	4	0	0	0	0	0	7	0	0	0	0	0	6	1	18	0
Peak Hour	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0	5	0	9	0

Two-Hour Count Summaries - Bikes																			
Interval Start	E Reata Rd			0			Leslie Rd			Leslie Rd			15-min Total	Rolling One Hour					
	Eastbound			Westbound			Northbound			Southbound									
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT							
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
Peak Hour	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		Leslie Rd				Ridgeline Dr				E Badger Rd				W Clearwater Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	21	21	32	0	25	26	13	0	45	91	24	1	10	98	52	459	0
4:15 PM		0	32	30	31	0	30	26	13	0	39	99	23	0	9	94	51	477	0
4:30 PM		0	25	34	32	0	23	32	17	2	35	103	24	1	12	88	51	479	0
4:45 PM		0	29	43	33	0	36	30	13	2	46	82	22	0	13	103	48	500	1,915
5:00 PM		0	29	26	40	0	32	40	11	1	57	102	25	0	12	109	52	536	1,992
5:15 PM		0	25	30	34	0	31	21	7	1	44	88	20	0	13	117	58	489	2,004
5:30 PM		0	34	25	39	1	19	21	6	1	39	78	24	1	7	108	45	448	1,973
5:45 PM		0	26	27	25	0	27	37	7	1	39	80	25	0	12	87	39	432	1,905
Count Total		0	221	236	266	1	223	233	87	8	344	723	187	3	88	804	396	3,820	0
Peak Hour	All	0	108	133	139	0	122	123	48	6	182	375	91	1	50	417	209	2,004	0
	HV	0	3	2	1	0	1	0	1	1	1	2	0	0	0	2	1	15	0
	HV%	-	3%	2%	1%	-	1%	0%	2%	17%	1%	1%	0%	0%	0%	0%	0%	1%	0

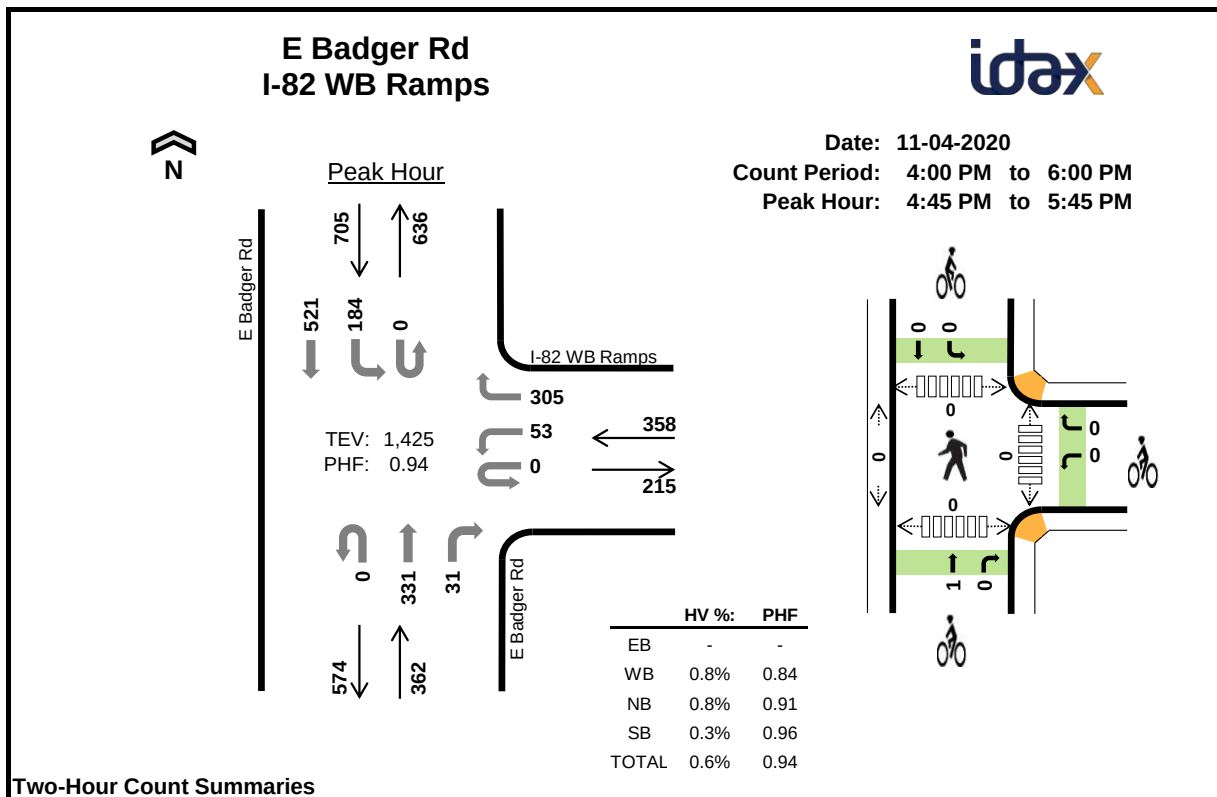
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	3	1	6	1	11	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	2	3	2	7	0	0	0	0	0	0	0	0	0	0
4:45 PM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
5:00 PM	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0
5:15 PM	2	0	0	1	3	0	0	1	0	1	0	0	0	0	0
5:30 PM	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0
Count Total	10	3	15	5	33	0	0	1	0	1	0	0	0	0	0
Peak Hour	6	2	4	3	15	0	0	1	0	1	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	Leslie Rd				Ridgeline Dr				E Badger Rd				W Clearwater Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	1	1	1	0	0	1	0	0	3	3	0	0	0	1	0	11	0
4:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0
4:30 PM	0	0	0	0	0	1	0	1	1	0	2	0	0	0	1	1	7	0
4:45 PM	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3	23
5:00 PM	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	14
5:15 PM	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	3	15
5:30 PM	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3	11
5:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	10
Count Total	0	4	3	3	0	1	1	1	1	4	8	2	0	0	3	2	33	0
Peak Hour	0	3	2	1	0	1	0	1	1	1	2	0	0	0	2	1	15	0

Two-Hour Count Summaries - Bikes																	
Interval Start	Leslie Rd			Ridgeline Dr			E Badger Rd			W Clearwater Ave			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Peak Hour	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		0				I-82 WB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	0	0	0	12	0	61	0	0	102	5	0	39	116	0	335	0
4:15 PM		0	0	0	0	0	13	0	57	0	0	107	4	0	37	118	0	336	0
4:30 PM		0	0	0	0	0	15	0	71	0	0	90	5	0	27	115	0	323	0
4:45 PM		0	0	0	0	0	15	0	77	0	0	78	8	0	46	129	0	353	1,347
5:00 PM		0	0	0	0	0	7	0	100	0	0	84	10	0	47	133	0	381	1,393
5:15 PM		0	0	0	0	0	18	0	61	0	0	93	6	0	46	138	0	362	1,419
5:30 PM		0	0	0	0	0	13	0	67	0	0	76	7	0	45	121	0	329	1,425
5:45 PM		0	0	0	0	0	6	0	50	0	0	93	1	0	36	103	0	289	1,361
Count Total		0	0	0	0	0	99	0	544	0	0	723	46	0	323	973	0	2,708	0
Peak Hour	All	0	0	0	0	0	53	0	305	0	0	331	31	0	184	521	0	1,425	0
	HV	0	0	0	0	0	1	0	2	0	0	3	0	0	0	2	0	8	0
	HV%	-	-	-	-	-	2%	-	1%	-	-	1%	0%	-	0%	0%	-	1%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	2	4	2	8	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	2	1	3	6	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	1	1	0	0	1	0	1	0	0	0	0	0
5:30 PM	0	2	2	0	4	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Count Total	0	7	10	8	25	0	0	1	0	1	0	0	0	0	0
Peak Hr	0	3	3	2	8	0	0	1	0	1	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	0				I-82 WB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	2	0	0	4	0	0	0	2	0	8	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0
4:30 PM	0	0	0	0	0	1	0	1	0	0	1	0	0	2	1	0	6	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	17
5:00 PM	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2	11
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	10
5:30 PM	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4	8
5:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	8
Count Total	0	0	0	0	0	2	0	5	0	0	10	0	0	2	6	0	25	0
Peak Hour	0	0	0	0	0	1	0	2	0	0	3	0	0	0	2	0	8	0

Two-Hour Count Summaries - Bikes																		
Interval Start	0			I-82 WB Ramps			E Badger Rd			E Badger Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	1				
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
Count Total	0	0	0	0	0	0	0	1	0	0	0	0	1	0				
Peak Hour	0	0	0	0	0	0	0	1	0	0	0	0	1	0				

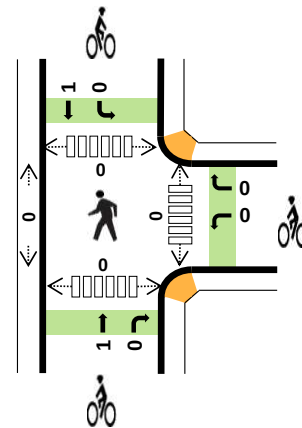
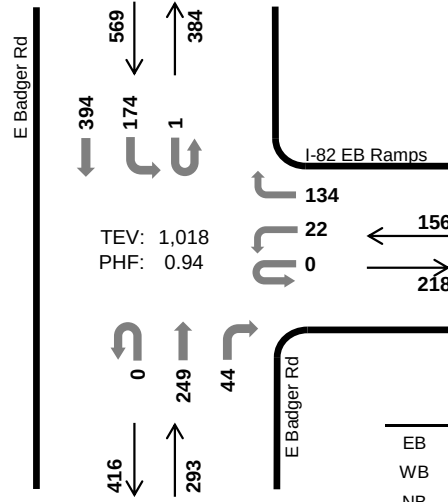
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Badger Rd I-82 EB Ramps



Peak Hour

Date: 11-04-2020
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:30 PM to 5:30 PM



	HV %:	PHF
EB	-	-
WB	1.9%	0.85
NB	0.0%	0.93
SB	0.9%	0.91
TOTAL	0.8%	0.94

Two-Hour Count Summaries

Interval Start		0				I-82 EB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	0	0	0	3	0	34	0	0	75	6	1	46	82	0	247	0
4:15 PM		0	0	0	0	0	1	0	47	0	0	60	3	1	50	79	0	241	0
4:30 PM		0	0	0	0	0	5	0	36	0	0	62	10	0	35	94	0	242	0
4:45 PM		0	0	0	0	0	6	0	23	0	0	67	12	0	43	101	0	252	982
5:00 PM		0	0	0	0	0	8	0	32	0	0	65	8	0	50	90	0	253	988
5:15 PM		0	0	0	0	0	3	0	43	0	0	55	14	1	46	109	0	271	1,018
5:30 PM		0	0	0	0	0	8	0	36	0	0	47	9	0	42	88	0	230	1,006
5:45 PM		0	0	0	0	0	5	0	47	0	0	50	8	0	37	75	0	222	976
Count Total		0	0	0	0	0	39	0	298	0	0	481	70	3	349	718	0	1,958	0
Peak Hour	All	0	0	0	0	0	22	0	134	0	0	249	44	1	174	394	0	1,018	0
	HV	0	0	0	0	0	1	0	2	0	0	0	0	0	2	3	0	8	0
	HV%	-	-	-	-	-	5%	-	1%	-	-	0%	0%	0%	1%	1%	-	1%	0

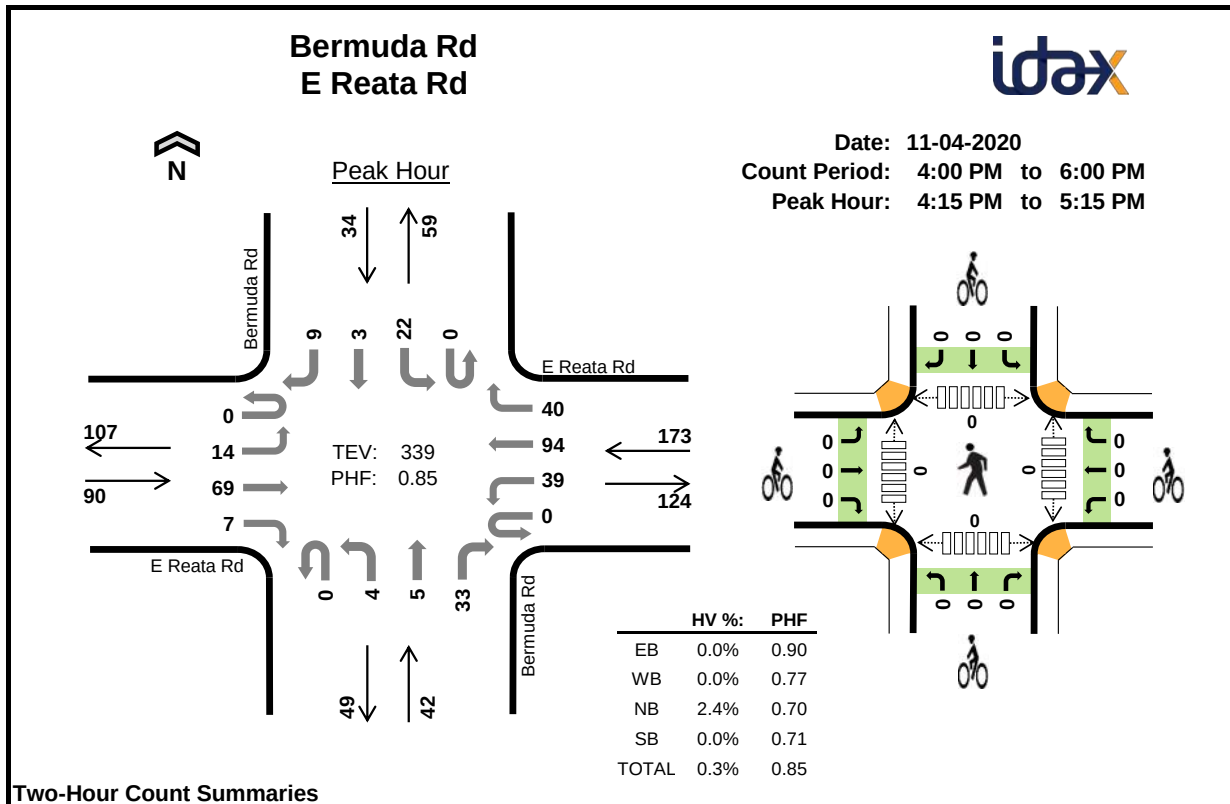
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	4	2	6	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	1	0	2	3	0	0	0	1	1	0	0	0	0	0
4:45 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	2	0	1	3	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	1	1	0	0	1	0	1	0	0	0	0	0
5:30 PM	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Count Total	0	8	4	8	20	0	0	1	1	2	0	0	0	0	0
Peak Hr	0	3	0	5	8	0	0	1	1	2	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	0				I-82 EB Ramps				E Badger Rd				E Badger Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	1	1	0	6	0
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2	0
4:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	3	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	12
5:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	3	9
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	8
5:30 PM	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3	8
5:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	8
Count Total	0	0	0	0	0	2	0	6	0	0	4	0	0	3	5	0	20	0
Peak Hour	0	0	0	0	0	1	0	2	0	0	0	0	0	2	3	0	8	0

Two-Hour Count Summaries - Bikes																		
Interval Start	0			I-82 EB Ramps			E Badger Rd			E Badger Rd			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	0				
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	2				
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
Count Total	0	0	0	0	0	0	0	1	0	0	1	0	2	0				
Peak Hour	0	0	0	0	0	0	0	1	0	0	1	0	2	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.



Interval Start		E Reata Rd				E Reata Rd				Bermuda Rd				Bermuda Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	2	11	1	0	15	26	8	0	2	0	5	0	3	2	2	77	0
4:15 PM		0	4	18	1	0	15	30	11	0	0	1	8	0	7	1	4	100	0
4:30 PM		0	4	18	1	0	6	12	13	0	1	2	12	0	3	1	1	74	0
4:45 PM		0	2	21	2	0	10	21	10	0	0	0	7	0	4	0	1	78	329
5:00 PM		0	4	12	3	0	8	31	6	0	3	2	6	0	8	1	3	87	339
5:15 PM		0	1	12	1	0	20	23	10	0	1	0	11	0	8	0	1	88	327
5:30 PM		0	4	17	0	0	6	23	12	0	0	0	8	0	7	1	1	79	332
5:45 PM		0	3	17	1	0	11	9	12	0	1	0	3	0	3	0	1	61	315
Count Total		0	24	126	10	0	91	175	82	0	8	5	60	0	43	6	14	644	0
Peak Hour	All	0	14	69	7	0	39	94	40	0	4	5	33	0	22	3	9	339	0
	HV	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
	HV%	-	0%	0%	0%	-	0%	0%	0%	-	0%	0%	3%	-	0%	0%	0%	0%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	1	2	1	0	4	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	E Reata Rd				E Reata Rd				Bermuda Rd				Bermuda Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	4	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0

Two-Hour Count Summaries - Bikes																	
Interval Start	E Reata Rd			E Reata Rd			Bermuda Rd			Bermuda Rd			15-min Total	Rolling One Hour			
	Eastbound			Westbound			Northbound			Southbound							
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Appendix B

Level of Service (LOS) Calculations at Off-Site Study Intersections

2021 Existing AM Peak Hour

Lanes, Volumes, Timings
1: Dallas Rd & I-82 EB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	1	59	0	0	0	0	220	38	183	82	0
Future Volume (vph)	67	1	59	0	0	0	0	220	38	183	82	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			-3%			5%			-11%	
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		106			198			377			305	
Travel Time (s)		2.4			4.5			5.1			4.2	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	4%	100%	4%	0%	0%	0%	0%	5%	0%	4%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Free			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
1: Dallas Rd & I-82 EB Ramps

05/12/2021

Intersection												
Int Delay, s/veh	6.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↕			↕	
Traffic Vol, veh/h	67	1	59	0	0	0	0	220	38	183	82	0
Future Vol, veh/h	67	1	59	0	0	0	0	220	38	183	82	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	3	-	-	-3	-	-	5	-	-	-11	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	4	100	4	0	0	0	0	5	0	4	0	0
Mvmt Flow	81	1	71	0	0	0	0	265	46	220	99	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	827	850	99	-	0	0	311	0	0
Stage 1	539	539	-	-	-	-	-	-	-
Stage 2	288	311	-	-	-	-	-	-	-
Critical Hdwy	7.04	8.1	6.54	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.04	7.1	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.04	7.1	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.9	3.336	-	-	-	2.236	-	-
Pot Cap-1 Maneuver	295	183	943	0	-	-	1238	-	0
Stage 1	531	358	-	0	-	-	-	-	0
Stage 2	721	488	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	240	0	943	-	-	-	1238	-	-
Mov Cap-2 Maneuver	240	0	-	-	-	-	-	-	-
Stage 1	531	0	-	-	-	-	-	-	-
Stage 2	585	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.5	0	5.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	369	1238	-
HCM Lane V/C Ratio	-	-	0.415	0.178	-
HCM Control Delay (s)	-	-	21.5	8.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2	0.6	-

Lanes, Volumes, Timings

2: Dallas Rd & I-82 WB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	15	1	113	154	127	0	0	252	97
Future Volume (vph)	0	0	0	15	1	113	154	127	0	0	252	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-5%			0%			0%	
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		233			450			305			1186	
Travel Time (s)		5.3			10.2			4.2			16.2	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	0%	0%	0%	0%	0%	9%	3%	6%	0%	0%	4%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
2: Dallas Rd & I-82 WB Ramps

05/12/2021

Intersection												
Int Delay, s/veh	3.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕			↕			↕	
Traffic Vol, veh/h	0	0	0	15	1	113	154	127	0	0	252	97
Future Vol, veh/h	0	0	0	15	1	113	154	127	0	0	252	97
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-3	-	-	-5	-	-	0	-	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82	82	82	82	82	82
Heavy Vehicles, %	0	0	0	0	0	9	3	6	0	0	4	0
Mvmt Flow	0	0	0	18	1	138	188	155	0	0	307	118
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				897	956	155	425	0	-	-	-	0
Stage 1				531	531	-	-	-	-	-	-	-
Stage 2				366	425	-	-	-	-	-	-	-
Critical Hdwy				5.4	5.5	5.79	4.13	-	-	-	-	-
Critical Hdwy Stg 1				4.4	4.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2				4.4	4.5	-	-	-	-	-	-	-
Follow-up Hdwy				3.5	4	3.381	2.227	-	-	-	-	-
Pot Cap-1 Maneuver				401	339	892	1129	-	0	0	-	-
Stage 1				688	614	-	-	-	0	0	-	-
Stage 2				782	664	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				328	0	892	1129	-	-	-	-	-
Mov Cap-2 Maneuver				328	0	-	-	-	-	-	-	-
Stage 1				563	0	-	-	-	-	-	-	-
Stage 2				782	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				11.2		4.8		0				
HCM LOS				B								
Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR							
Capacity (veh/h)	1129	-	742	-	-							
HCM Lane V/C Ratio	0.166	-	0.212	-	-							
HCM Control Delay (s)	8.8	0	11.2	-	-							
HCM Lane LOS	A	A	B	-	-							
HCM 95th %tile Q(veh)	0.6	-	0.8	-	-							

Lanes, Volumes, Timings

3: Dallas Rd & Trowbridge Blvd

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	L	L
Traffic Volume (vph)	110	61	181	93	26	209
Future Volume (vph)	110	61	181	93	26	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		330	180	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Link Speed (mph)	25		50			50
Link Distance (ft)	317		1186			1047
Travel Time (s)	8.6		16.2			14.3
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	1%	4%	5%	7%	10%	4%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
3: Dallas Rd & Trowbridge Blvd

05/12/2021

Intersection

Int Delay, s/veh 3.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	110	61	181	93	26	209
Future Vol, veh/h	110	61	181	93	26	209
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	-	-	330	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	4	5	7	10	4
Mvmt Flow	129	72	213	109	31	246

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	521	213	0
Stage 1	213	-	-
Stage 2	308	-	-
Critical Hdwy	6.41	6.24	-
Critical Hdwy Stg 1	5.41	-	-
Critical Hdwy Stg 2	5.41	-	-
Follow-up Hdwy	3.509	3.336	-
Pot Cap-1 Maneuver	517	822	-
Stage 1	825	-	-
Stage 2	748	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	504	822	-
Mov Cap-2 Maneuver	504	-	-
Stage 1	825	-	-
Stage 2	729	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.3	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	585	1194
HCM Lane V/C Ratio	-	-	0.344	0.026
HCM Control Delay (s)	-	-	14.3	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	1.5	0.1

Lanes, Volumes, Timings 4: Dallas Rd & Ava Way

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	45	26	214	29	6	191
Future Volume (vph)	45	26	214	29	6	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	25		50			50
Link Distance (ft)	380		1047			11825
Travel Time (s)	10.4		14.3			161.3
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	6%	5%	5%	4%	20%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
4: Dallas Rd & Ava Way

05/12/2021

Intersection						
Int Delay, s/veh	1.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	26	214	29	6	191
Future Vol, veh/h	45	26	214	29	6	191
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	6	5	5	4	20	5
Mvmt Flow	48	28	230	31	6	205
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	463	246	0	0	261	0
Stage 1	246	-	-	-	-	-
Stage 2	217	-	-	-	-	-
Critical Hdwy	6.46	6.25	-	-	4.3	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	-	-	2.38	-
Pot Cap-1 Maneuver	550	785	-	-	1206	-
Stage 1	786	-	-	-	-	-
Stage 2	810	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	547	785	-	-	1206	-
Mov Cap-2 Maneuver	547	-	-	-	-	-
Stage 1	786	-	-	-	-	-
Stage 2	805	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	11.7	0		0.2		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	615	1206	-	
HCM Lane V/C Ratio	-	-	0.124	0.005	-	
HCM Control Delay (s)	-	-	11.7	8	0	
HCM Lane LOS	-	-	B	A	A	
HCM 95th %tile Q(veh)	-	-	0.4	0	-	

Lanes, Volumes, Timings
5: Dallas Rd & Arena Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	13	0	67	1	8	1	200	95	9	175	3
Future Volume (vph)	5	13	0	67	1	8	1	200	95	9	175	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			4%			-5%			4%	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		259			1543			11825			569	
Travel Time (s)		7.1			42.1			230.4			11.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	10%	0%	6%	0%	0%	0%	4%	1%	0%	5%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
5: Dallas Rd & Arena Rd

05/12/2021

Intersection													
Int Delay, s/veh	2.6												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕			↕			↕			↕		
Traffic Vol, veh/h	5	13	0	67	1	8	1	200	95	9	175	3	
Future Vol, veh/h	5	13	0	67	1	8	1	200	95	9	175	3	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None	
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	
Grade, %	-	0	-	-	4	-	-	-5	-	-	4	-	
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88	
Heavy Vehicles, %	0	10	0	6	0	0	0	4	1	0	5	0	
Mvmt Flow	6	15	0	76	1	9	1	227	108	10	199	3	
Major/Minor	Minor2		Minor1			Major1			Major2				
Conflicting Flow All	509	558	201	511	505	281	202	0	0	335	0	0	
Stage 1	221	221	-	283	283	-	-	-	-	-	-	-	
Stage 2	288	337	-	228	222	-	-	-	-	-	-	-	
Critical Hdwy	7.1	6.6	6.2	7.96	7.3	6.6	4.1	-	-	4.1	-	-	
Critical Hdwy Stg 1	6.1	5.6	-	6.96	6.3	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	6.1	5.6	-	6.96	6.3	-	-	-	-	-	-	-	
Follow-up Hdwy	3.5	4.09	3.3	3.554	4	3.3	2.2	-	-	2.2	-	-	
Pot Cap-1 Maneuver	478	427	845	417	422	739	1382	-	-	1236	-	-	
Stage 1	786	706	-	672	639	-	-	-	-	-	-	-	
Stage 2	724	627	-	728	689	-	-	-	-	-	-	-	
Platoon blocked, %								-	-		-	-	
Mov Cap-1 Maneuver	467	423	845	403	418	739	1382	-	-	1236	-	-	
Mov Cap-2 Maneuver	467	423	-	403	418	-	-	-	-	-	-	-	
Stage 1	785	700	-	671	638	-	-	-	-	-	-	-	
Stage 2	713	626	-	706	683	-	-	-	-	-	-	-	
Approach	EB		WB			NB			SB				
HCM Control Delay, s	13.7		15.7			0			0.4				
HCM LOS	B		C										
Minor Lane/Major Mvmt	NBL		NBT	NBR	EBLn1WBLn1		SBL	SBT	SBR				
Capacity (veh/h)	1382		-	-	434	423	1236	-	-				
HCM Lane V/C Ratio	0.001		-	-	0.047	0.204	0.008	-	-				
HCM Control Delay (s)	7.6		0	-	13.7	15.7	7.9	0	-				
HCM Lane LOS	A		A	-	B	C	A	A	-				
HCM 95th %tile Q(veh)	0		-	-	0.1	0.8	0	-	-				

Lanes, Volumes, Timings

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	97	19	32	57	22	20	121	72	25	129	22
Future Volume (vph)	16	97	19	32	57	22	20	121	72	25	129	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		896			1478			569			1455	
Travel Time (s)		15.3			25.2			11.1			28.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	8%	1%	7%	4%	4%	6%	6%	4%	5%	5%	1%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th AWSC
6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	97	19	32	57	22	20	121	72	25	129	22
Future Vol, veh/h	16	97	19	32	57	22	20	121	72	25	129	22
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	8	1	7	4	4	6	6	4	5	5	1	0
Mvmt Flow	16	100	20	33	59	23	21	125	74	26	133	23
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	9.6	9.3	10	9.6
HCM LOS	A	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	63%	0%	84%	0%	72%	0%	85%
Vol Right, %	0%	37%	0%	16%	0%	28%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	20	193	16	116	32	79	25	151
LT Vol	20	0	16	0	32	0	25	0
Through Vol	0	121	0	97	0	57	0	129
RT Vol	0	72	0	19	0	22	0	22
Lane Flow Rate	21	199	16	120	33	81	26	156
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.034	0.287	0.029	0.185	0.057	0.126	0.043	0.23
Departure Headway (Hd)	5.984	5.184	6.3	5.56	6.259	5.558	6.002	5.327
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	595	688	564	640	568	639	593	668
Service Time	3.757	2.956	4.085	3.345	4.047	3.346	3.779	3.104
HCM Lane V/C Ratio	0.035	0.289	0.028	0.188	0.058	0.127	0.044	0.234
HCM Control Delay	9	10.1	9.3	9.6	9.4	9.2	9.1	9.7
HCM Lane LOS	A	B	A	A	A	A	A	A
HCM 95th-tile Q	0.1	1.2	0.1	0.7	0.2	0.4	0.1	0.9

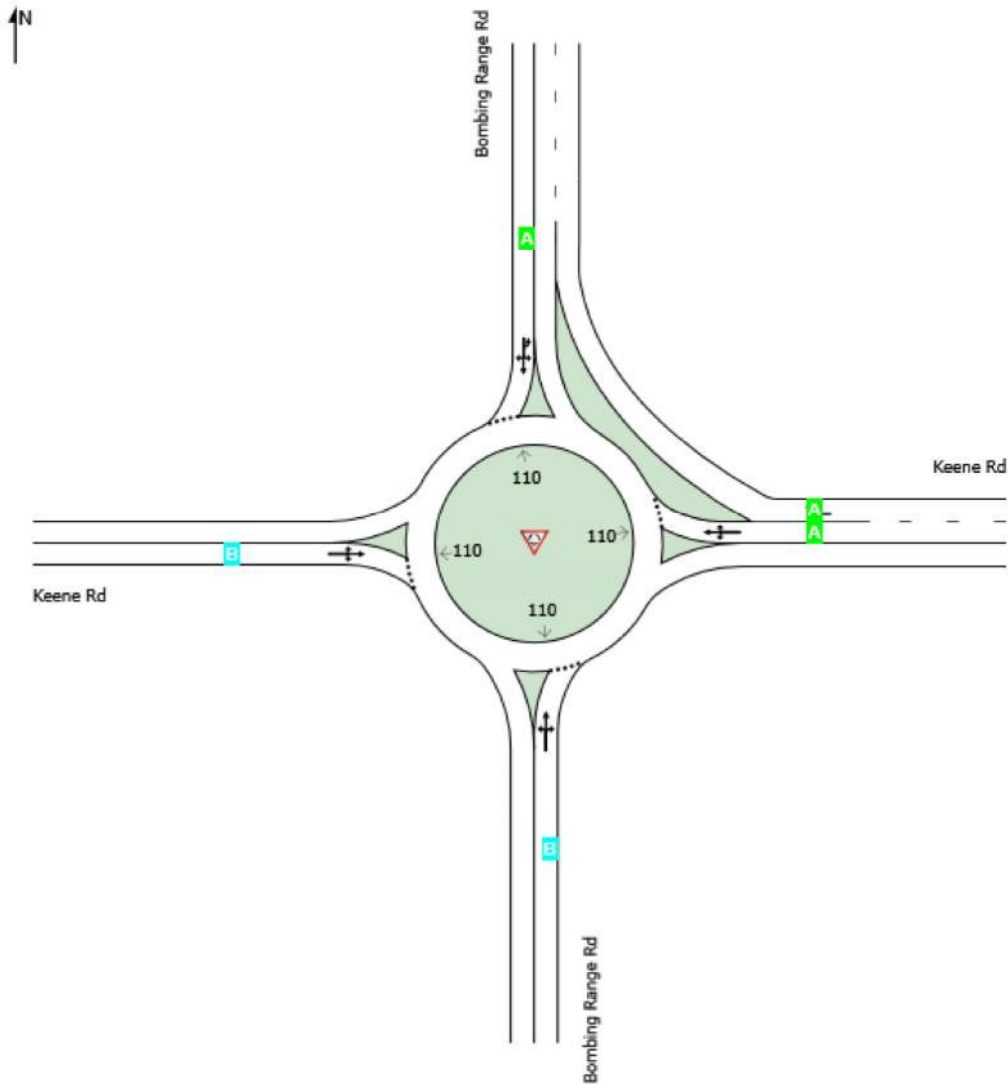
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 7 [Keene Rd / Bombing Range Rd (Site Folder: 2021 Existing - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	A	A	B	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 7 [Keene Rd / Bombing Range Rd (Site Folder: 2021 Existing - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] ft				
South: Bombing Range Rd														
3	L2	49	8.0	52	8.0	0.301	10.5	LOS B	1.2	32.0	0.68	0.69	0.70	26.8
8	T1	97	5.0	103	5.0	0.301	10.3	LOS B	1.2	32.0	0.68	0.69	0.70	26.5
18	R2	19	0.0	20	0.0	0.301	10.0	LOS A	1.2	32.0	0.68	0.69	0.70	25.8
Approach		165	5.3	176	5.3	0.301	10.3	LOS B	1.2	32.0	0.68	0.69	0.70	26.5
East: Keene Rd														
1	L2	13	0.0	14	0.0	0.211	4.9	LOS A	0.9	23.8	0.34	0.21	0.34	38.1
6	T1	216	4.0	230	4.0	0.211	5.0	LOS A	0.9	23.8	0.34	0.21	0.34	37.5
16	R2	191	5.0	203	5.0	0.127	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	39.7
Approach		420	4.3	447	4.3	0.211	2.7	LOS A	0.9	23.8	0.18	0.12	0.18	38.5
North: Bombing Range Rd														
7u	U	1	0.0	1	0.0	0.505	9.7	LOS A	3.6	90.9	0.63	0.58	0.70	27.0
7	L2	349	0.0	371	0.0	0.505	9.7	LOS A	3.6	90.9	0.63	0.58	0.70	26.3
4	T1	114	1.0	121	1.0	0.505	9.7	LOS A	3.6	90.9	0.63	0.58	0.70	25.9
14	R2	13	0.0	14	0.0	0.505	9.7	LOS A	3.6	90.9	0.63	0.58	0.70	25.3
Approach		477	0.2	507	0.2	0.505	9.7	LOS A	3.6	90.9	0.63	0.58	0.70	26.2
West: Keene Rd														
5	L2	15	17.0	16	17.0	0.582	14.1	LOS B	5.1	128.7	0.76	0.96	1.19	26.3
2	T1	374	1.0	398	1.0	0.582	13.4	LOS B	5.1	128.7	0.76	0.96	1.19	26.0
12	R2	53	2.0	56	2.0	0.582	13.4	LOS B	5.1	128.7	0.76	0.96	1.19	25.3
Approach		442	1.7	470	1.7	0.582	13.4	LOS B	5.1	128.7	0.76	0.96	1.19	25.9
All Vehicles		1504	2.4	1600	2.4	0.582	8.9	LOS A	5.1	128.7	0.55	0.57	0.70	28.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings

8: Arena Rd/E Mountain Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	200	1	109	143	1	0	0	143	5	0	4
Future Volume (vph)	1	200	1	109	143	1	0	0	143	5	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1478			1363			1543			354	
Travel Time (s)		25.2			23.2			42.1			9.7	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	2%	0%	4%	4%	0%	0%	0%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
8: Arena Rd/E Mountain Rd & Kennedy Rd

05/12/2021

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	1	200	1	109	143	1	0	0	143	5	0	4
Future Vol, veh/h	1	200	1	109	143	1	0	0	143	5	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	2	0	4	4	0	0	0	2	0	0	0
Mvmt Flow	1	235	1	128	168	1	0	0	168	6	0	5
Major/Minor	Major1		Major2			Minor1			Minor2			
Conflicting Flow All	169	0	0	236	0	0	665	663	236	747	663	169
Stage 1	-	-	-	-	-	-	238	238	-	425	425	-
Stage 2	-	-	-	-	-	-	427	425	-	322	238	-
Critical Hdwy	4.1	-	-	4.14	-	-	7.1	6.5	6.22	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.236	-	-	3.5	4	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	1421	-	-	1319	-	-	376	384	803	332	384	880
Stage 1	-	-	-	-	-	-	770	712	-	611	590	-
Stage 2	-	-	-	-	-	-	610	590	-	694	712	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1421	-	-	1319	-	-	343	343	803	241	343	880
Mov Cap-2 Maneuver	-	-	-	-	-	-	343	343	-	241	343	-
Stage 1	-	-	-	-	-	-	769	711	-	610	527	-
Stage 2	-	-	-	-	-	-	542	527	-	548	711	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	0		3.5			10.7			15.4			
HCM LOS						B			C			
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	803	1421	-	-	1319	-	-	356				
HCM Lane V/C Ratio	0.21	0.001	-	-	0.097	-	-	0.03				
HCM Control Delay (s)	10.7	7.5	0	-	8	0	-	15.4				
HCM Lane LOS	B	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.8	0	-	-	0.3	-	-	0.1				

Lanes, Volumes, Timings

9: Kennedy Rd & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	533	32	180	340	11	22	53	282	8	73	108
Future Volume (vph)	61	533	32	180	340	11	22	53	282	8	73	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	260		0	375		0	160		0	0		330
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			40			40	
Link Distance (ft)		3063			2930			1363			832	
Travel Time (s)		46.4			44.4			23.2			14.2	
Confl. Peds. (#/hr)			1			2	2		7	7		2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	2%	0%	4%	3%	11%	0%	2%	1%	17%	5%	4%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			6			2	
Permitted Phases							6		6	2		2
Detector Phase	7	4		3	8		6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	14.0	33.0		27.0	46.0		30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	15.6%	36.7%		30.0%	51.1%		33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	5.0	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.0	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	-1.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?		Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 90

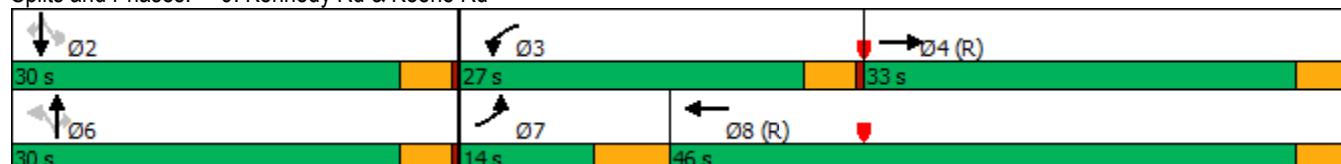
Actuated Cycle Length: 90

Offset: 4 (4%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 9: Kennedy Rd & Keene Rd



HCM 6th Signalized Intersection Summary

9: Kennedy Rd & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	61	533	32	180	340	11	22	53	282	8	73	108
Future Volume (veh/h)	61	533	32	180	340	11	22	53	282	8	73	108
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		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	1870	1900	1841	1856	1737	1900	1870	1885	1648	1826	1841
Adj Flow Rate, veh/h	64	561	34	189	358	12	23	56	297	8	77	114
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	0	4	3	11	0	2	1	17	5	4
Cap, veh/h	101	1785	108	225	2074	69	127	281	338	57	366	330
Arrive On Green	0.06	0.52	0.52	0.26	1.00	1.00	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1781	3404	206	1753	3481	116	352	1314	1582	62	1713	1545
Grp Volume(v), veh/h	64	292	303	189	181	189	79	0	297	85	0	114
Grp Sat Flow(s),veh/h/ln	1781	1777	1833	1753	1763	1834	1666	0	1582	1775	0	1545
Q Serve(g_s), s	3.2	8.4	8.5	9.2	0.0	0.0	0.0	0.0	16.4	0.0	0.0	5.6
Cycle Q Clear(g_c), s	3.2	8.4	8.5	9.2	0.0	0.0	3.1	0.0	16.4	3.5	0.0	5.6
Prop In Lane	1.00		0.11	1.00		0.06	0.29		1.00	0.09		1.00
Lane Grp Cap(c), veh/h	101	932	961	225	1050	1093	408	0	338	423	0	330
V/C Ratio(X)	0.63	0.31	0.31	0.84	0.17	0.17	0.19	0.00	0.88	0.20	0.00	0.35
Avail Cap(c_a), veh/h	198	932	961	448	1050	1093	528	0	457	550	0	446
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.96	0.96	0.96	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	41.5	12.2	12.2	32.6	0.0	0.0	29.0	0.0	34.2	29.2	0.0	30.0
Incr Delay (d2), s/veh	2.4	0.9	0.9	7.8	0.3	0.3	0.2	0.0	13.8	0.2	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	3.2	3.3	3.7	0.1	0.1	1.4	0.0	7.2	1.5	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.9	13.1	13.0	40.4	0.3	0.3	29.3	0.0	48.1	29.4	0.0	30.6
LnGrp LOS	D	B	B	D	A	A	C	A	D	C	A	C
Approach Vol, veh/h	659			559			376			199		
Approach Delay, s/veh	16.1			13.9			44.1			30.1		
Approach LOS	B			B			D			C		
Timer - Assigned Phs	2		3	4	6		7	8				
Phs Duration (G+Y+Rc), s	23.2		15.6	51.2	23.2		9.1	57.6				
Change Period (Y+Rc), s	4.0		4.0	4.0	4.0		5.0	4.0				
Max Green Setting (Gmax), s	26.0		23.0	29.0	26.0		9.0	42.0				
Max Q Clear Time (g_c+l1), s	7.6		11.2	10.5	18.4		5.2	2.0				
Green Ext Time (p_c), s	0.7		0.4	3.0	0.9		0.0	2.0				
Intersection Summary												
HCM 6th Ctrl Delay	22.8											
HCM 6th LOS	C											

Lanes, Volumes, Timings

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	645	7	22	285	61	6	44	30	77	29	274
Future Volume (vph)	330	645	7	22	285	61	6	44	30	77	29	274
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	300		300	65		0	250		0
Storage Lanes	2		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			25			35	
Link Distance (ft)		2930			4647			563			1514	
Travel Time (s)		44.4			70.4			15.4			29.5	
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	1%	1%	1%	7%	7%	7%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov
Protected Phases	7	4		3	8	5	1	6		5	2	7
Permitted Phases				4		8	2			6		2
Detector Phase	7	4		3	8	5	1	6		5	2	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0	9.0	9.0	20.0		9.0	20.0	9.0
Total Split (s)	23.0	42.0		9.0	28.0	12.0	9.0	27.0		12.0	30.0	23.0
Total Split (%)	25.6%	46.7%		10.0%	31.1%	13.3%	10.0%	30.0%		13.3%	33.3%	25.6%
Yellow Time (s)	5.0	3.5		5.0	3.5	5.0	5.0	3.5		5.0	3.5	5.0
All-Red Time (s)	0.0	0.5		0.0	0.5	0.0	0.0	0.5		0.0	0.5	0.0
Lost Time Adjust (s)	-1.0	0.0		-1.0	0.0	0.0	0.0	0.0		-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0	5.0	5.0	4.0		4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?		Yes			Yes			Yes			Yes	
Recall Mode	None	C-Max		None	C-Max	None	None	None		None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 90

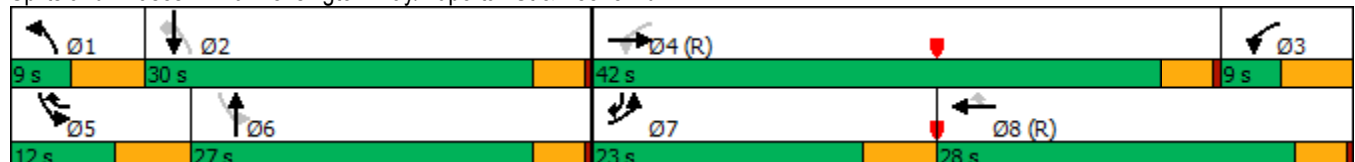
Actuated Cycle Length: 90

Offset: 60 (67%), Referenced to phase 4:EBWB and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 10: Kensington Way/Duportail St & Keene Rd



HCM 6th Signalized Intersection Summary

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 							
Traffic Volume (veh/h)	330	645	7	22	285	61	6	44	30	77	29	274
Future Volume (veh/h)	330	645	7	22	285	61	6	44	30	77	29	274
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1796	1796	1796	1885	1885	1885	1796	1796	1796
Adj Flow Rate, veh/h	393	768	8	26	339	73	7	52	36	92	35	326
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	7	7	7	1	1	1	7	7	7
Cap, veh/h	501	1509	16	542	1489	754	293	164	114	357	378	525
Arrive On Green	0.10	0.28	0.28	0.17	0.44	0.44	0.01	0.16	0.16	0.07	0.21	0.21
Sat Flow, veh/h	3428	3574	37	1711	3413	1522	1795	1037	718	1711	1796	1520
Grp Volume(v), veh/h	393	379	397	26	339	73	7	0	88	92	35	326
Grp Sat Flow(s),veh/h/ln	1714	1763	1849	1711	1706	1522	1795	0	1754	1711	1796	1520
Q Serve(g_s), s	10.1	16.2	16.2	0.0	5.6	2.3	0.3	0.0	4.0	3.9	1.4	16.1
Cycle Q Clear(g_c), s	10.1	16.2	16.2	0.0	5.6	2.3	0.3	0.0	4.0	3.9	1.4	16.1
Prop In Lane	1.00		0.02	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	501	744	781	542	1489	754	293	0	278	357	378	525
V/C Ratio(X)	0.78	0.51	0.51	0.05	0.23	0.10	0.02	0.00	0.32	0.26	0.09	0.62
Avail Cap(c_a), veh/h	724	744	781	542	1489	754	360	0	448	389	519	645
HCM Platoon Ratio	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.91	0.91	0.91	0.99	0.99	0.99	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.2	24.5	24.5	15.5	15.9	12.0	27.7	0.0	33.5	27.6	28.6	24.5
Incr Delay (d2), s/veh	1.9	2.3	2.2	0.0	0.4	0.3	0.0	0.0	0.6	0.1	0.1	1.3
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	4.3	7.3	7.7	0.3	2.1	0.7	0.1	0.0	1.8	1.6	0.6	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.1	26.7	26.6	15.5	16.2	12.3	27.7	0.0	34.2	27.7	28.7	25.8
LnGrp LOS	D	C	C	B	B	B	C	A	C	C	C	C
Approach Vol, veh/h		1169			438			95			453	
Approach Delay, s/veh		31.5			15.5			33.7			26.4	
Approach LOS		C			B			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.6	22.9	19.4	42.0	10.3	18.3	17.2	44.3				
Change Period (Y+Rc), s	5.0	4.0	5.0	4.0	5.0	4.0	5.0	* 5				
Max Green Setting (Gmax), s	4.0	26.0	4.0	38.0	7.0	23.0	18.0	* 24				
Max Q Clear Time (g_c+I1), s	2.3	18.1	2.0	18.2	5.9	6.0	12.1	7.6				
Green Ext Time (p_c), s	0.0	0.8	0.0	4.2	0.0	0.4	0.1	2.0				

Intersection Summary

HCM 6th Ctrl Delay	27.3
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings
11: Duportail St & Queensgate Dr

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	133	9	400	106	127	10	223	297	154	260	54
Future Volume (vph)	90	133	9	400	106	127	10	223	297	154	260	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	200		125	200		250	200		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			35	
Link Distance (ft)		1398			1249			1078			1088	
Travel Time (s)		31.8			28.4			24.5			21.2	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	4%	4%	4%	4%	4%	4%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	D.P+P	NA	pt+ov	Prot	NA	
Protected Phases	7	4		3	8	8 5	1	6	6 3	5	2	
Permitted Phases							2					
Detector Phase	7	4		3	8	8 5	1	6	6 3	5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	35.0		30.0	30.0		9.0	35.0		9.0	35.0	
Total Split (s)	15.0	35.0		30.0	50.0		9.0	35.0		10.0	36.0	
Total Split (%)	13.6%	31.8%		27.3%	45.5%		8.2%	31.8%		9.1%	32.7%	
Yellow Time (s)	5.0	4.0		4.0	4.0		5.0	4.0		5.0	4.0	
All-Red Time (s)	0.0	1.0		1.0	1.0		0.0	1.0		0.0	1.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	None		None	None	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 58.3

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Splits and Phases: 11: Duportail St & Queensgate Dr

			
9 s	36 s	30 s	35 s
			
10 s	35 s	15 s	50 s

HCM 6th Signalized Intersection Summary

11: Duportail St & Queensgate Dr

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	133	9	400	106	127	10	223	297	154	260	54
Future Volume (veh/h)	90	133	9	400	106	127	10	223	297	154	260	54
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1811	1811	1826	1826	1826	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	108	160	11	482	128	153	12	269	358	186	313	65
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	6	6	6	5	5	5	4	4	4	4	4	4
Cap, veh/h	196	412	28	838	476	598	493	993	831	221	1045	214
Arrive On Green	0.11	0.13	0.11	0.25	0.26	0.26	0.05	0.28	0.28	0.13	0.36	0.34
Sat Flow, veh/h	1725	3269	223	3374	1826	1547	1753	3497	1560	1753	2890	592
Grp Volume(v), veh/h	108	84	87	482	128	153	12	269	358	186	188	190
Grp Sat Flow(s),veh/h/ln	1725	1721	1771	1687	1826	1547	1753	1749	1560	1753	1749	1734
Q Serve(g_s), s	3.3	2.5	2.5	7.0	3.1	3.7	0.2	3.3	7.7	5.8	4.3	4.4
Cycle Q Clear(g_c), s	3.3	2.5	2.5	7.0	3.1	3.7	0.2	3.3	7.7	5.8	4.3	4.4
Prop In Lane	1.00		0.13	1.00		1.00	1.00		1.00	1.00		0.34
Lane Grp Cap(c), veh/h	196	217	223	838	476	598	493	993	831	221	633	627
V/C Ratio(X)	0.55	0.39	0.39	0.58	0.27	0.26	0.02	0.27	0.43	0.84	0.30	0.30
Avail Cap(c_a), veh/h	372	990	1019	1637	1543	1502	598	2012	1285	221	1037	1029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.3	22.3	22.4	18.3	16.4	11.6	9.9	15.4	7.9	23.8	12.7	12.9
Incr Delay (d2), s/veh	0.9	0.4	0.4	0.2	0.1	0.1	0.0	0.1	0.1	23.4	0.1	0.1
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	1.3	1.0	1.0	2.5	1.2	1.1	0.1	1.2	2.0	3.6	1.4	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.2	22.7	22.8	18.6	16.5	11.7	9.9	15.5	8.0	47.2	12.8	13.0
LnGrp LOS	C	C	C	B	B	B	A	B	A	D	B	B
Approach Vol, veh/h		279			763			639			564	
Approach Delay, s/veh		23.3			16.8			11.2			24.2	
Approach LOS		C			B			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.7	23.1	16.8	10.0	10.0	18.8	9.3	17.5				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	4.0	31.0	25.0	30.0	5.0	30.0	10.0	45.0				
Max Q Clear Time (g_c+I1), s	2.2	6.4	9.0	4.5	7.8	9.7	5.3	5.7				
Green Ext Time (p_c), s	0.0	1.9	2.9	0.9	0.0	4.1	0.0	0.6				

Intersection Summary

HCM 6th Ctrl Delay 17.9

HCM 6th LOS B

Notes

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

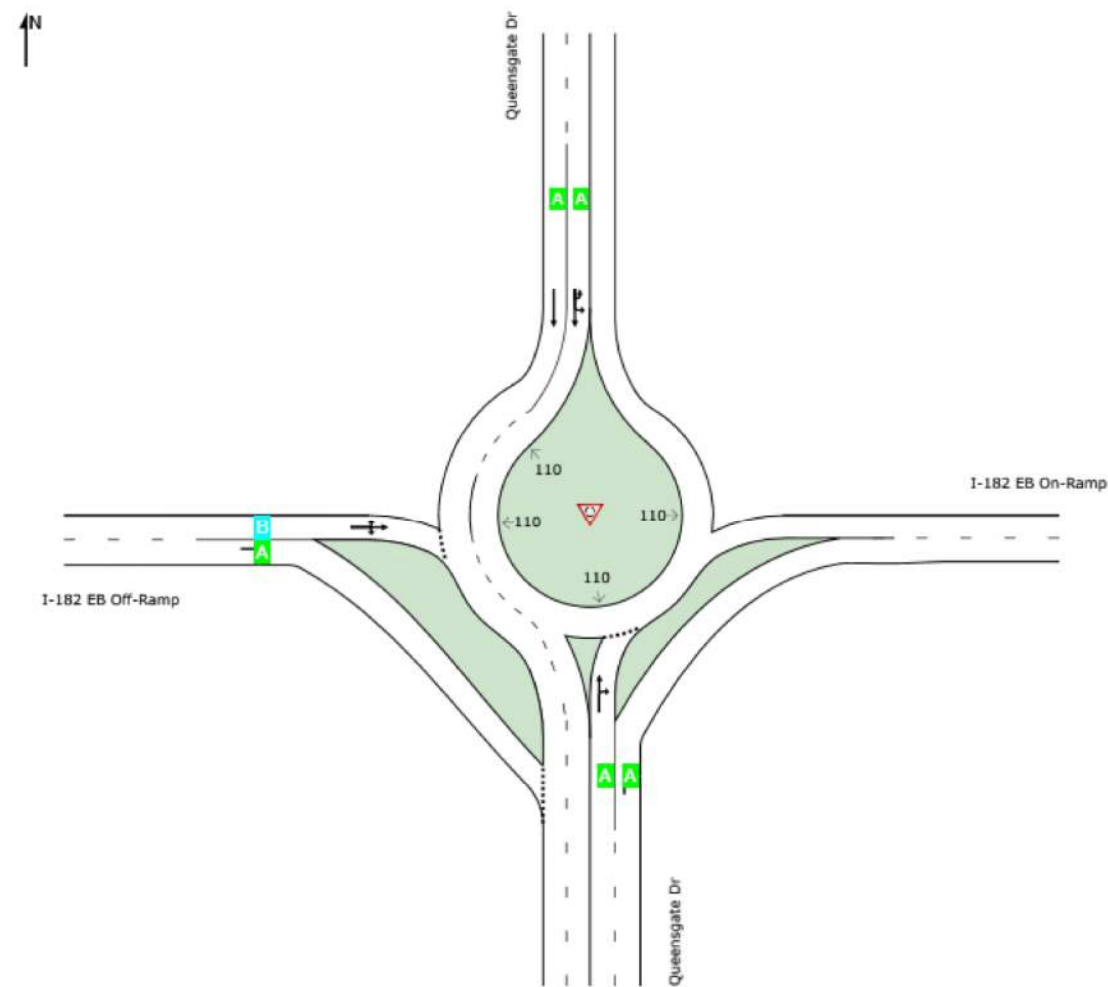
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2021 Existing - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used).
Delay Model: SIDRA Standard (Geometric Delay is included).

MOVEMENT SUMMARY

 **Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2021 Existing - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] ft				
South: Queensgate Dr														
8	T1	156	2.0	175	2.0	0.448	6.2	LOS A	3.0	77.3	0.68	0.69	0.68	36.7
18	R2	985	2.0	1107	2.0	0.448	4.5	LOS A	3.0	77.3	0.23	0.51	0.23	36.7
Approach		1141	2.0	1282	2.0	0.448	4.7	LOS A	3.0	77.3	0.29	0.53	0.29	36.7
North: Queensgate Dr														
7u	U	5	25.0	6	25.0	0.353	12.7	LOS B	0.0	0.0	0.00	0.66	0.00	35.4
7	L2	457	3.0	513	3.0	0.353	9.9	LOS A	0.0	0.0	0.00	0.66	0.00	35.1
4	T1	492	5.0	553	5.0	0.340	4.1	LOS A	0.0	0.0	0.00	0.38	0.00	38.1
Approach		954	4.1	1072	4.1	0.353	6.9	LOS A	0.0	0.0	0.00	0.52	0.00	36.6
West: I-182 EB Off-Ramp														
5	L2	57	4.0	64	4.0	0.069	11.9	LOS B	0.2	5.7	0.47	0.77	0.47	34.1
2	T1	3	50.0	3	50.0	0.069	7.8	LOS A	0.2	5.7	0.47	0.77	0.47	33.3
12	R2	43	0.0	48	0.0	0.044	5.7	LOS A	0.2	4.5	0.45	0.57	0.45	35.8
Approach		103	3.7	116	3.7	0.069	9.2	LOS A	0.2	5.7	0.46	0.68	0.46	34.8
All Vehicles		2198	3.0	2470	3.0	0.448	5.9	LOS A	3.0	77.3	0.17	0.53	0.17	36.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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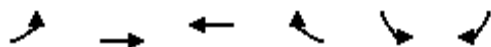
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Lanes, Volumes, Timings

14: Keene Rd & Queensgate Dr

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	396	383	278	534	329	82
Future Volume (vph)	396	383	278	534	329	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350			175	0	200
Storage Lanes	1			1	2	1
Taper Length (ft)	25				25	
Right Turn on Red				Yes		Yes
Link Speed (mph)		45	45		35	
Link Distance (ft)		4647	3045		1355	
Travel Time (s)		70.4	46.1		26.4	
Confl. Peds. (#/hr)	1			1		1
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	4%	4%	3%	3%	7%	7%
Shared Lane Traffic (%)						
Turn Type	D.P+P	NA	NA	Perm	Prot	pm+ov
Protected Phases	7	4	8		5	7
Permitted Phases	8			8		5
Detector Phase	7	4	8	8	5	7
Switch Phase						
Minimum Initial (s)	4.0	8.0	8.0	8.0	4.0	4.0
Minimum Split (s)	8.0	22.0	30.0	30.0	21.0	8.0
Total Split (s)	24.0	69.0	45.0	45.0	21.0	24.0
Total Split (%)	26.7%	76.7%	50.0%	50.0%	23.3%	26.7%
Yellow Time (s)	3.5	5.0	5.0	5.0	3.5	3.5
All-Red Time (s)	0.5	1.0	1.0	1.0	0.5	0.5
Lost Time Adjust (s)	0.0	-2.0	-2.0	-2.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead	Lead		Lag
Lead-Lag Optimize?						
Recall Mode	None	C-Max	C-Max	C-Max	None	None

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 4:EBT and 8:EBWB, Start of Green, Master Intersection

Natural Cycle: 60

Control Type: Actuated-Coordinated

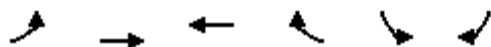
Splits and Phases: 14: Keene Rd & Queensgate Dr



HCM 6th Signalized Intersection Summary

14: Keene Rd & Queensgate Dr

05/12/2021



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations							
Traffic Volume (veh/h)	396	383	278	534	329	82	
Future Volume (veh/h)	396	383	278	534	329	82	
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	1841	1841	1856	1856	1796	1796	
Adj Flow Rate, veh/h	445	430	312	0	370	92	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	
Percent Heavy Veh, %	4	4	3	3	7	7	
Cap, veh/h	864	2645	1606		514	592	
Arrive On Green	0.23	0.76	0.15	0.00	0.15	0.15	
Sat Flow, veh/h	1753	3589	3618	1572	3319	1522	
Grp Volume(v), veh/h	445	430	312	0	370	92	
Grp Sat Flow(s),veh/h/ln	1753	1749	1763	1572	1659	1522	
Q Serve(g_s), s	0.0	3.1	7.0	0.0	9.5	0.0	
Cycle Q Clear(g_c), s	0.0	3.1	7.0	0.0	9.5	0.0	
Prop In Lane	1.00			1.00	1.00	1.00	
Lane Grp Cap(c), veh/h	864	2645	1606		514	592	
V/C Ratio(X)	0.52	0.16	0.19		0.72	0.16	
Avail Cap(c_a), veh/h	864	2645	1606		627	644	
HCM Platoon Ratio	1.00	1.00	0.33	0.33	1.00	1.00	
Upstream Filter(I)	0.96	0.96	0.96	0.00	1.00	1.00	
Uniform Delay (d), s/veh	13.1	3.1	23.8	0.0	36.2	17.9	
Incr Delay (d2), s/veh	0.2	0.1	0.3	0.0	3.1	0.1	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	5.2	0.7	2.9	0.0	4.0	2.3	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	13.4	3.2	24.0	0.0	39.3	18.0	
LnGrp LOS	B	A	C		D	B	
Approach Vol, veh/h		875	312	A	462		
Approach Delay, s/veh		8.4	24.0		35.1		
Approach LOS		A	C		D		
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		17.9		72.1		27.1	45.0
Change Period (Y+Rc), s		4.0		6.0		6.0	* 6
Max Green Setting (Gmax), s		17.0		63.0		20.0	* 39
Max Q Clear Time (g_c+I1), s		11.5		5.1		2.0	9.0
Green Ext Time (p_c), s		2.4		4.9		0.3	3.1

Intersection Summary

HCM 6th Ctrl Delay	18.8
HCM 6th LOS	B

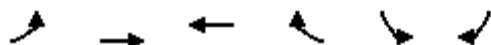
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

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

Lanes, Volumes, Timings
16: Gage Blvd & Keene Rd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø6
Lane Configurations							
Traffic Volume (vph)	37	156	140	434	448	22	
Future Volume (vph)	37	156	140	434	448	22	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Grade (%)		-3%	3%		0%		
Storage Length (ft)	200			0	0	100	
Storage Lanes	1			1	2	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1832	3557	1872	1591	3467	1615	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1832	3557	1872	1591	3467	1615	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				457		23	
Link Speed (mph)		40	40		45		
Link Distance (ft)		246	874		1238		
Travel Time (s)		4.2	14.9		18.8		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	39	164	147	457	472	23	
Turn Type	Prot	NA	NA	pt+ov	Prot	Prot	
Protected Phases	7	4	8	8 5	5	5	6
Permitted Phases							
Detector Phase	7	4	8	8 5	5	5	
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0	27.0		20.0	20.0	27.0
Total Split (s)	10.0	37.0	27.0		26.0	26.0	27.0
Total Split (%)	11.1%	41.1%	30.0%		28.9%	28.9%	30%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0	4.0
All-Red Time (s)	0.0	0.0	0.0		0.0	0.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0	
Lead/Lag	Lag		Lead		Lag	Lag	Lead
Lead-Lag Optimize?							
Recall Mode	None	None	None		C-Max	C-Max	None
Act Effect Green (s)	6.2	17.7	11.1	75.6	58.9	58.9	
Actuated g/C Ratio	0.07	0.20	0.12	0.84	0.65	0.65	
v/c Ratio	0.31	0.23	0.64	0.32	0.21	0.02	
Control Delay	45.8	28.8	48.4	2.1	7.5	4.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	45.8	28.8	48.4	2.1	7.5	4.8	
LOS	D	C	D	A	A	A	
Approach Delay		32.1	13.3		7.4		
Approach LOS		C	B		A		

Intersection Summary

Area Type: Other

Cycle Length: 90

Lanes, Volumes, Timings

16: Gage Blvd & Keene Rd

05/12/2021

Actuated Cycle Length: 90

Offset: 70 (78%), Referenced to phase 5:SBL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 14.0

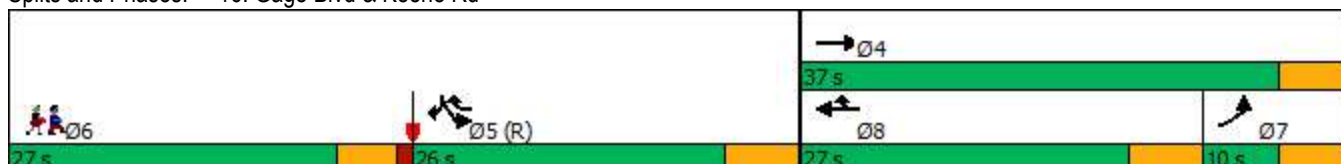
Intersection LOS: B

Intersection Capacity Utilization 36.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 16: Gage Blvd & Keene Rd



Lanes, Volumes, Timings
17: Leslie Rd & Gage Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	436	132	46	316	65	256	225	121	86	186	99
Future Volume (vph)	61	436	132	46	316	65	256	225	121	86	186	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	350		0	200		275	200		200
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		874			3504			345			536	
Travel Time (s)		14.9			59.7			6.7			10.4	
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
Heavy Vehicles (%)	2%	1%	3%	3%	3%	4%	2%	1%	1%	2%	6%	5%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6		6	2		2
Detector Phase	7	4		3	8		1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0		9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	11.0	35.0		9.0	33.0		24.0	35.0	35.0	11.0	22.0	22.0
Total Split (%)	12.2%	38.9%		10.0%	36.7%		26.7%	38.9%	38.9%	12.2%	24.4%	24.4%
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 90

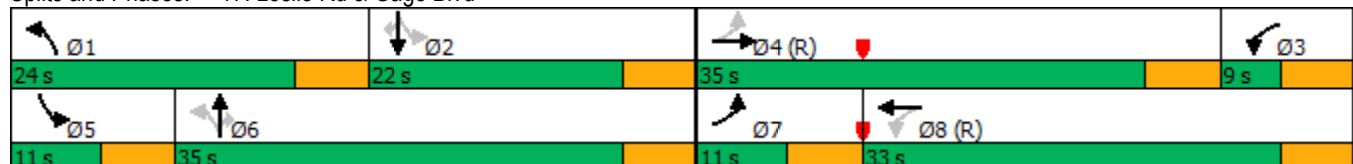
Actuated Cycle Length: 90

Offset: 73 (81%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 17: Leslie Rd & Gage Blvd



HCM 6th Signalized Intersection Summary

17: Leslie Rd & Gage Blvd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	61	436	132	46	316	65	256	225	121	86	186	99
Future Volume (veh/h)	61	436	132	46	316	65	256	225	121	86	186	99
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1885	1856	1856	1856	1841	1870	1885	1885	1870	1811	1826
Adj Flow Rate, veh/h	65	464	140	49	336	69	272	239	129	91	198	105
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	3	3	4	2	1	1	2	6	5
Cap, veh/h	346	936	280	521	1388	282	396	429	364	320	254	200
Arrive On Green	0.02	0.11	0.11	0.18	0.48	0.46	0.16	0.23	0.23	0.07	0.14	0.13
Sat Flow, veh/h	1781	2716	813	1767	2919	592	1781	1885	1598	1781	1811	1547
Grp Volume(v), veh/h	65	305	299	49	201	204	272	239	129	91	198	105
Grp Sat Flow(s),veh/h/ln	1781	1791	1739	1767	1763	1749	1781	1885	1598	1781	1811	1547
Q Serve(g_s), s	2.3	14.4	14.6	0.0	6.1	6.3	11.0	10.1	6.1	3.8	9.5	3.9
Cycle Q Clear(g_c), s	2.3	14.4	14.6	0.0	6.1	6.3	11.0	10.1	6.1	3.8	9.5	3.9
Prop In Lane	1.00		0.47	1.00		0.34	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	346	617	599	521	838	832	396	429	364	320	254	200
V/C Ratio(X)	0.19	0.49	0.50	0.09	0.24	0.24	0.69	0.56	0.35	0.28	0.78	0.52
Avail Cap(c_a), veh/h	396	617	599	521	838	832	513	649	550	336	362	292
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.81	0.81	0.81	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.6	32.5	32.7	21.5	14.0	14.1	25.6	30.7	29.2	29.7	37.3	16.8
Incr Delay (d2), s/veh	0.1	2.8	2.9	0.0	0.5	0.6	1.3	0.4	0.2	0.2	4.0	0.8
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	1.0	7.3	7.2	0.7	2.3	2.4	4.6	4.5	2.3	1.6	4.4	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.7	35.3	35.6	21.5	14.5	14.7	26.9	31.2	29.4	29.8	41.3	17.6
LnGrp LOS	C	D	D	C	B	B	C	C	C	C	D	B
Approach Vol, veh/h	669			454			640			394		
Approach Delay, s/veh	34.2			15.3			29.0			32.3		
Approach LOS	C			B			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.1	16.6	20.3	35.0	10.2	24.5	8.5	46.8				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	19.0	17.0	4.0	30.0	6.0	30.0	6.0	28.0				
Max Q Clear Time (g_c+I1), s	13.0	11.5	2.0	16.6	5.8	12.1	4.3	8.3				
Green Ext Time (p_c), s	0.0	0.1	0.0	0.7	0.0	0.3	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay	28.4											
HCM 6th LOS	C											

Lanes, Volumes, Timings
18: Leslie Rd & Reata Rd

05/12/2021

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	113	158	109	259	334	90
Future Volume (vph)	113	158	109	259	334	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	0			285
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Link Speed (mph)	40			40	40	
Link Distance (ft)	5360			1600	7773	
Travel Time (s)	91.4			27.3	132.5	
Confl. Peds. (#/hr)		1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	3%	7%	1%	2%	4%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

Intersection

Int Delay, s/veh 4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	113	158	109	259	334	90
Future Vol, veh/h	113	158	109	259	334	90
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	0	-	-	285
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	3	7	1	2	4
Mvmt Flow	123	172	118	282	363	98

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	881	364	461
Stage 1	363	-	-
Stage 2	518	-	-
Critical Hdwy	6.41	6.23	4.17
Critical Hdwy Stg 1	5.41	-	-
Critical Hdwy Stg 2	5.41	-	-
Follow-up Hdwy	3.509	3.327	2.263
Pot Cap-1 Maneuver	318	679	1074
Stage 1	706	-	-
Stage 2	600	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	283	678	1074
Mov Cap-2 Maneuver	409	-	-
Stage 1	628	-	-
Stage 2	600	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.4	2.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1074	-	409	678	-	-
HCM Lane V/C Ratio	0.11	-	0.3	0.253	-	-
HCM Control Delay (s)	8.8	-	17.5	12.1	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.4	-	1.2	1	-	-

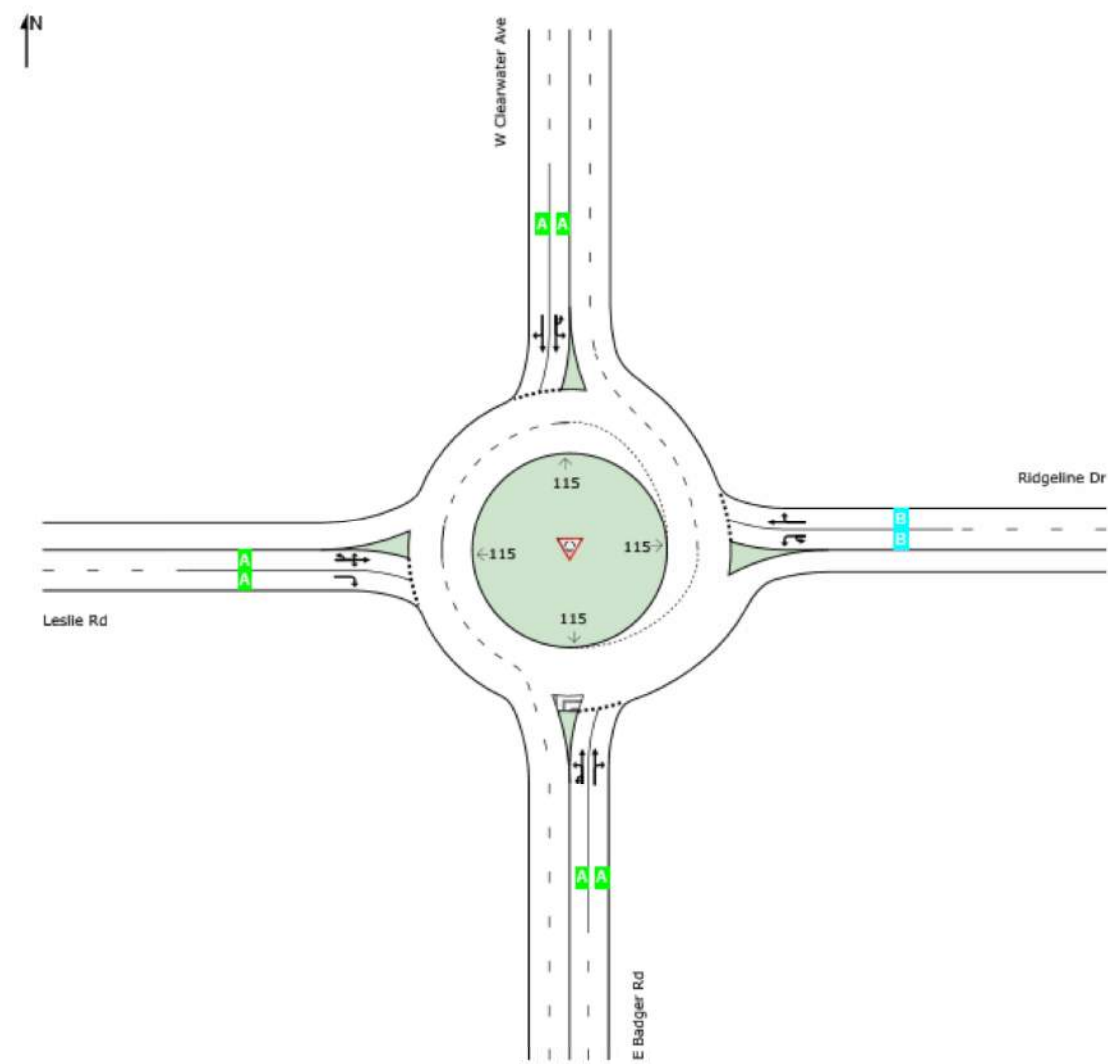
LANE LEVEL OF SERVICE

Lane Level of Service

 Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2021 Existing - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2021 Existing - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: E Badger Rd														
3u	U	6	0.0	7	0.0	0.404	8.2	LOS A	2.0	50.9	0.58	0.52	0.58	34.1
3	L2	116	2.0	130	2.0	0.404	8.3	LOS A	2.0	50.9	0.58	0.52	0.58	33.2
8	T1	505	2.0	567	2.0	0.404	8.3	LOS A	2.0	50.9	0.58	0.52	0.58	33.6
18	R2	57	11.0	64	11.0	0.404	8.7	LOS A	2.0	50.5	0.58	0.52	0.58	32.7
Approach		684	2.7	769	2.7	0.404	8.3	LOS A	2.0	50.9	0.58	0.52	0.58	33.4
East: Ridgeline Dr														
1u	U	1	0.0	1	0.0	0.297	11.3	LOS B	1.0	28.4	0.67	0.70	0.76	30.7
1	L2	127	12.0	143	12.0	0.297	12.1	LOS B	1.0	28.4	0.67	0.70	0.76	29.7
6	T1	90	0.0	101	0.0	0.308	10.1	LOS B	1.2	30.6	0.67	0.69	0.75	32.9
16	R2	75	3.0	84	3.0	0.308	10.3	LOS B	1.2	30.6	0.67	0.69	0.75	31.8
Approach		293	6.0	329	6.0	0.308	11.0	LOS B	1.2	30.6	0.67	0.69	0.75	31.1
North: W Clearwater Ave														
7u	U	4	0.0	4	0.0	0.244	6.4	LOS A	1.0	25.5	0.49	0.43	0.49	35.5
7	L2	24	11.0	27	11.0	0.244	6.8	LOS A	1.0	25.5	0.49	0.43	0.49	34.2
4	T1	242	4.0	272	4.0	0.244	6.4	LOS A	1.0	25.5	0.49	0.42	0.49	34.4
14	R2	130	6.0	146	6.0	0.244	6.2	LOS A	1.0	25.1	0.47	0.40	0.47	33.5
Approach		400	5.0	449	5.0	0.244	6.4	LOS A	1.0	25.5	0.48	0.42	0.48	34.1
West: Leslie Rd														
5u	U	1	0.0	1	0.0	0.398	8.4	LOS A	2.0	49.4	0.58	0.58	0.63	33.0
5	L2	238	1.0	267	1.0	0.398	8.4	LOS A	2.0	49.4	0.58	0.58	0.63	32.2
2	T1	91	1.0	102	1.0	0.398	8.4	LOS A	2.0	49.4	0.58	0.58	0.63	32.0
12	R2	186	3.0	209	3.0	0.249	7.0	LOS A	1.0	25.8	0.53	0.50	0.53	33.3
Approach		516	1.7	580	1.7	0.398	7.9	LOS A	2.0	49.4	0.57	0.55	0.59	32.5
All Vehicles		1893	3.4	2127	3.4	0.404	8.2	LOS A	2.0	50.9	0.57	0.53	0.59	32.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings
20: E Badger Rd & I-82 WB Ramps

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	40	175	512	20	138	421
Future Volume (vph)	40	175	512	20	138	421
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%		-3%			3%
Storage Length (ft)	0	0		0	95	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	405		758			508
Travel Time (s)	9.2		10.3			6.9
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	3%	3%	3%	13%	8%	4%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
20: E Badger Rd & I-82 WB Ramps

05/12/2021

Intersection

Int Delay, s/veh 5.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	175	512	20	138	421
Future Vol, veh/h	40	175	512	20	138	421
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	-	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-3	-	-3	-	-	3
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	3	3	3	13	8	4
Mvmt Flow	46	201	589	23	159	484

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1161	601	0
Stage 1	601	-	-
Stage 2	560	-	-
Critical Hdwy	6.045	5.945	-
Critical Hdwy Stg 1	4.845	-	-
Critical Hdwy Stg 2	5.245	-	-
Follow-up Hdwy	3.5285	3.3285	-
Pot Cap-1 Maneuver	243	523	-
Stage 1	601	-	-
Stage 2	586	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	201	523	-
Mov Cap-2 Maneuver	201	-	-
Stage 1	601	-	-
Stage 2	486	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.1	0	2.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	403	931
HCM Lane V/C Ratio	-	-	0.613	0.17
HCM Control Delay (s)	-	-	27.1	9.7
HCM Lane LOS	-	-	D	A
HCM 95th %tile Q(veh)	-	-	4	0.6

Lanes, Volumes, Timings
21: E Badger Rd & I-82 EB Ramps

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	22	186	345	61	218	244
Future Volume (vph)	22	186	345	61	218	244
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%		3%			-3%
Storage Length (ft)	0	0		0	250	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	410		360			758
Travel Time (s)	9.3		4.9			10.3
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	3%	3%	6%	5%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
21: E Badger Rd & I-82 EB Ramps

05/12/2021

Intersection

Int Delay, s/veh 5.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	22	186	345	61	218	244
Future Vol, veh/h	22	186	345	61	218	244
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	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-5	-	3	-	-	-3
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	3	3	6	5	3
Mvmt Flow	25	211	392	69	248	277

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1200	427	0
Stage 1	427	-	-
Stage 2	773	-	-
Critical Hdwy	5.4	5.73	-
Critical Hdwy Stg 1	4.4	-	-
Critical Hdwy Stg 2	4.4	-	-
Follow-up Hdwy	3.5	3.327	-
Pot Cap-1 Maneuver	288	664	-
Stage 1	746	-	-
Stage 2	569	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	222	664	-
Mov Cap-2 Maneuver	222	-	-
Stage 1	746	-	-
Stage 2	439	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.5	0	4.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	548	1084
HCM Lane V/C Ratio	-	-	0.431	0.229
HCM Control Delay (s)	-	-	16.5	9.3
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	2.2	0.9

Lanes, Volumes, Timings
22: Bermuda Rd & Reata Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	67	3	30	67	16	5	1	39	38	5	15
Future Volume (vph)	9	67	3	30	67	16	5	1	39	38	5	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		685			5360			569			542	
Travel Time (s)		11.7			91.4			11.1			10.6	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	14%	2%	0%	13%	2%	8%	25%	0%	3%	0%	25%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
22: Bermuda Rd & Reata Rd

05/12/2021

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	67	3	30	67	16	5	1	39	38	5	15
Future Vol, veh/h	9	67	3	30	67	16	5	1	39	38	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	14	2	0	13	2	8	25	0	3	0	25	0
Mvmt Flow	10	75	3	34	75	18	6	1	44	43	6	17
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	93	0	0	78	0	0	261	258	77	271	250	84
Stage 1	-	-	-	-	-	-	97	97	-	152	152	-
Stage 2	-	-	-	-	-	-	164	161	-	119	98	-
Critical Hdwy	4.24	-	-	4.23	-	-	7.35	6.5	6.23	7.1	6.75	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	5.5	-	6.1	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	5.5	-	6.1	5.75	-
Follow-up Hdwy	2.326	-	-	2.317	-	-	3.725	4	3.327	3.5	4.225	3.3
Pot Cap-1 Maneuver	1429	-	-	1454	-	-	647	650	981	686	615	981
Stage 1	-	-	-	-	-	-	856	819	-	855	730	-
Stage 2	-	-	-	-	-	-	787	769	-	890	771	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1429	-	-	1454	-	-	616	629	981	639	595	981
Mov Cap-2 Maneuver	-	-	-	-	-	-	616	629	-	639	595	-
Stage 1	-	-	-	-	-	-	850	813	-	849	712	-
Stage 2	-	-	-	-	-	-	748	750	-	843	766	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			2			9.2			10.7		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	910	1429	-	-	1454	-	-	697				
HCM Lane V/C Ratio	0.056	0.007	-	-	0.023	-	-	0.093				
HCM Control Delay (s)	9.2	7.5	0	-	7.5	0	-	10.7				
HCM Lane LOS	A	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.3				

2021 Existing PM Peak Hour

Lanes, Volumes, Timings
1: Dallas Rd & I-82 EB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	136	0	203	0	0	0	0	203	31	140	182	0
Future Volume (vph)	136	0	203	0	0	0	0	203	31	140	182	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			-3%			5%			-11%	
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		106			198			377			305	
Travel Time (s)		2.4			4.5			5.1			4.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	0%	0%	0%	0%	2%	0%	1%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Free			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
1: Dallas Rd & I-82 EB Ramps

05/12/2021

Intersection												
Int Delay, s/veh	16.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↕			↕	
Traffic Vol, veh/h	136	0	203	0	0	0	0	203	31	140	182	0
Future Vol, veh/h	136	0	203	0	0	0	0	203	31	140	182	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	3	-	-	-3	-	-	5	-	-	-11	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	0	1	0	0	0	0	2	0	1	0	0
Mvmt Flow	155	0	231	0	0	0	0	231	35	159	207	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	774	791	207	-	0	0	266	0	0
Stage 1	525	525	-	-	-	-	-	-	-
Stage 2	249	266	-	-	-	-	-	-	-
Critical Hdwy	7.01	7.1	6.51	-	-	-	4.11	-	-
Critical Hdwy Stg 1	6.01	6.1	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.01	6.1	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4	3.309	-	-	-	2.209	-	-
Pot Cap-1 Maneuver	324	284	822	0	-	-	1304	-	0
Stage 1	546	488	-	0	-	-	-	-	0
Stage 2	762	662	-	0	-	-	-	-	0
Platoon blocked, %				-	-	-	-	-	-
Mov Cap-1 Maneuver	279	0	822	-	-	-	1304	-	-
Mov Cap-2 Maneuver	279	0	-	-	-	-	-	-	-
Stage 1	546	0	-	-	-	-	-	-	-
Stage 2	657	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	41.1	0	3.5
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	462	1304	-
HCM Lane V/C Ratio	-	-	0.834	0.122	-
HCM Control Delay (s)	-	-	41.1	8.1	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	8.1	0.4	-

Lanes, Volumes, Timings

2: Dallas Rd & I-82 WB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	43	1	235	98	242	0	0	282	94
Future Volume (vph)	0	0	0	43	1	235	98	242	0	0	282	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-5%			0%			0%	
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		233			450			305			1186	
Travel Time (s)		5.3			10.2			4.2			16.2	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	4%	1%	0%	0%	0%	4%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
2: Dallas Rd & I-82 WB Ramps

05/12/2021

Intersection												
Int Delay, s/veh	5.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕			↕			↕	
Traffic Vol, veh/h	0	0	0	43	1	235	98	242	0	0	282	94
Future Vol, veh/h	0	0	0	43	1	235	98	242	0	0	282	94
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-3	-	-	-5	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	0	0	0	0	0	0	4	1	0	0	0	4
Mvmt Flow	0	0	0	53	1	290	121	299	0	0	348	116
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				947	1005	299	464	0	-	-	-	0
Stage 1				541	541	-	-	-	-	-	-	-
Stage 2				406	464	-	-	-	-	-	-	-
Critical Hdwy				5.4	5.5	5.7	4.14	-	-	-	-	-
Critical Hdwy Stg 1				4.4	4.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2				4.4	4.5	-	-	-	-	-	-	-
Follow-up Hdwy				3.5	4	3.3	2.236	-	-	-	-	-
Pot Cap-1 Maneuver				380	322	777	1087	-	0	0	-	-
Stage 1				683	609	-	-	-	0	0	-	-
Stage 2				758	645	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				329	0	777	1087	-	-	-	-	-
Mov Cap-2 Maneuver				329	0	-	-	-	-	-	-	-
Stage 1				592	0	-	-	-	-	-	-	-
Stage 2				758	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				16.9		2.5		0				
HCM LOS				C								
Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR							
Capacity (veh/h)	1087	-	642	-	-							
HCM Lane V/C Ratio	0.111	-	0.537	-	-							
HCM Control Delay (s)	8.7	0	16.9	-	-							
HCM Lane LOS	A	A	C	-	-							
HCM 95th %tile Q(veh)	0.4	-	3.2	-	-							

Lanes, Volumes, Timings

3: Dallas Rd & Trowbridge Blvd

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	93	64	303	171	85	276
Future Volume (vph)	93	64	303	171	85	276
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		330	180	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Link Speed (mph)	25		50			50
Link Distance (ft)	317		1186			1047
Travel Time (s)	8.6		16.2			14.3
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	1%	0%	1%	0%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
3: Dallas Rd & Trowbridge Blvd

05/12/2021

Intersection						
Int Delay, s/veh	4.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔		↑	↔	↔	↑
Traffic Vol, veh/h	93	64	303	171	85	276
Future Vol, veh/h	93	64	303	171	85	276
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	-	-	330	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	1	0	1	0	0	1
Mvmt Flow	107	74	348	197	98	317
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	861	348	0	0	545	0
Stage 1	348	-	-	-	-	-
Stage 2	513	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	327	700	-	-	1034	-
Stage 1	717	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	296	700	-	-	1034	-
Mov Cap-2 Maneuver	296	-	-	-	-	-
Stage 1	717	-	-	-	-	-
Stage 2	546	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	22.2	0	2.1			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	387	1034	-	
HCM Lane V/C Ratio	-	-	0.466	0.094	-	
HCM Control Delay (s)	-	-	22.2	8.8	-	
HCM Lane LOS	-	-	C	A	-	
HCM 95th %tile Q(veh)	-	-	2.4	0.3	-	

Lanes, Volumes, Timings 4: Dallas Rd & Ava Way

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	43	29	296	69	26	315
Future Volume (vph)	43	29	296	69	26	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	25		50			50
Link Distance (ft)	380		1047			11825
Travel Time (s)	10.4		14.3			161.3
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	1%	0%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
4: Dallas Rd & Ava Way

05/12/2021

Intersection						
Int Delay, s/veh	1.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	43	29	296	69	26	315
Future Vol, veh/h	43	29	296	69	26	315
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	0	0	1	0	0	1
Mvmt Flow	51	34	348	81	31	371
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	822	389	0	0	429	0
Stage 1	389	-	-	-	-	-
Stage 2	433	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	346	664	-	-	1141	-
Stage 1	689	-	-	-	-	-
Stage 2	658	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	334	664	-	-	1141	-
Mov Cap-2 Maneuver	334	-	-	-	-	-
Stage 1	689	-	-	-	-	-
Stage 2	636	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	15.8	0		0.6		
HCM LOS	C					
Minor Lane/Major Mvmt		NBT	NBRWBLn1	SBL	SBT	
Capacity (veh/h)		-	-	418	1141	-
HCM Lane V/C Ratio		-	-	0.203	0.027	-
HCM Control Delay (s)		-	-	15.8	8.2	0
HCM Lane LOS		-	-	C	A	A
HCM 95th %tile Q(veh)		-	-	0.7	0.1	-

Lanes, Volumes, Timings
5: Dallas Rd & Arena Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	5	2	138	5	24	1	301	114	14	282	12
Future Volume (vph)	1	5	2	138	5	24	1	301	114	14	282	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			4%			-5%			4%	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		259			1543			11825			569	
Travel Time (s)		7.1			42.1			230.4			11.1	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
5: Dallas Rd & Arena Rd

05/12/2021

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	1	5	2	138	5	24	1	301	114	14	282	12
Future Vol, veh/h	1	5	2	138	5	24	1	301	114	14	282	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	4	-	-	-5	-	-	4	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	0
Mvmt Flow	1	6	2	159	6	28	1	346	131	16	324	14
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	794	842	331	781	784	412	338	0	0	477	0	0
Stage 1	363	363	-	414	414	-	-	-	-	-	-	-
Stage 2	431	479	-	367	370	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.9	7.3	6.6	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.9	6.3	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.9	6.3	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	308	303	715	264	275	615	1232	-	-	1096	-	-
Stage 1	660	628	-	565	544	-	-	-	-	-	-	-
Stage 2	607	558	-	605	574	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	285	297	715	256	270	615	1232	-	-	1096	-	-
Mov Cap-2 Maneuver	285	297	-	256	270	-	-	-	-	-	-	-
Stage 1	659	617	-	564	543	-	-	-	-	-	-	-
Stage 2	573	557	-	587	564	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	15.7		41.8		0		0.4					
HCM LOS	C		E									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1232	-	-	346	280	1096	-	-				
HCM Lane V/C Ratio	0.001	-	-	0.027	0.686	0.015	-	-				
HCM Control Delay (s)	7.9	0	-	15.7	41.8	8.3	0	-				
HCM Lane LOS	A	A	-	C	E	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	4.6	0	-	-				

Lanes, Volumes, Timings

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	114	36	92	161	42	47	211	84	54	212	37
Future Volume (vph)	21	114	36	92	161	42	47	211	84	54	212	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		896			1478			569			1455	
Travel Time (s)		15.3			25.2			11.1			28.3	
Confl. Peds. (#/hr)	1		4	4		1						
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
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	2%	0%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th AWSC
6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

Intersection	
Intersection Delay, s/veh	15.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	114	36	92	161	42	47	211	84	54	212	37
Future Vol, veh/h	21	114	36	92	161	42	47	211	84	54	212	37
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
Heavy Vehicles, %	0	0	0	0	1	0	0	1	1	2	0	3
Mvmt Flow	23	125	40	101	177	46	52	232	92	59	233	41
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	13.5	14.5	18.3	16
HCM LOS	B	B	C	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	72%	0%	76%	0%	79%	0%	85%
Vol Right, %	0%	28%	0%	24%	0%	21%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	47	295	21	150	92	203	54	249
LT Vol	47	0	21	0	92	0	54	0
Through Vol	0	211	0	114	0	161	0	212
RT Vol	0	84	0	36	0	42	0	37
Lane Flow Rate	52	324	23	165	101	223	59	274
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.107	0.607	0.051	0.336	0.217	0.438	0.124	0.524
Departure Headway (Hd)	7.436	6.739	8.019	7.332	7.713	7.07	7.55	6.897
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	482	535	446	490	465	509	475	523
Service Time	5.183	4.486	5.774	5.087	5.463	4.82	5.299	4.646
HCM Lane V/C Ratio	0.108	0.606	0.052	0.337	0.217	0.438	0.124	0.524
HCM Control Delay	11.1	19.4	11.2	13.8	12.6	15.3	11.4	17
HCM Lane LOS	B	C	B	B	B	C	B	C
HCM 95th-tile Q	0.4	4	0.2	1.5	0.8	2.2	0.4	3

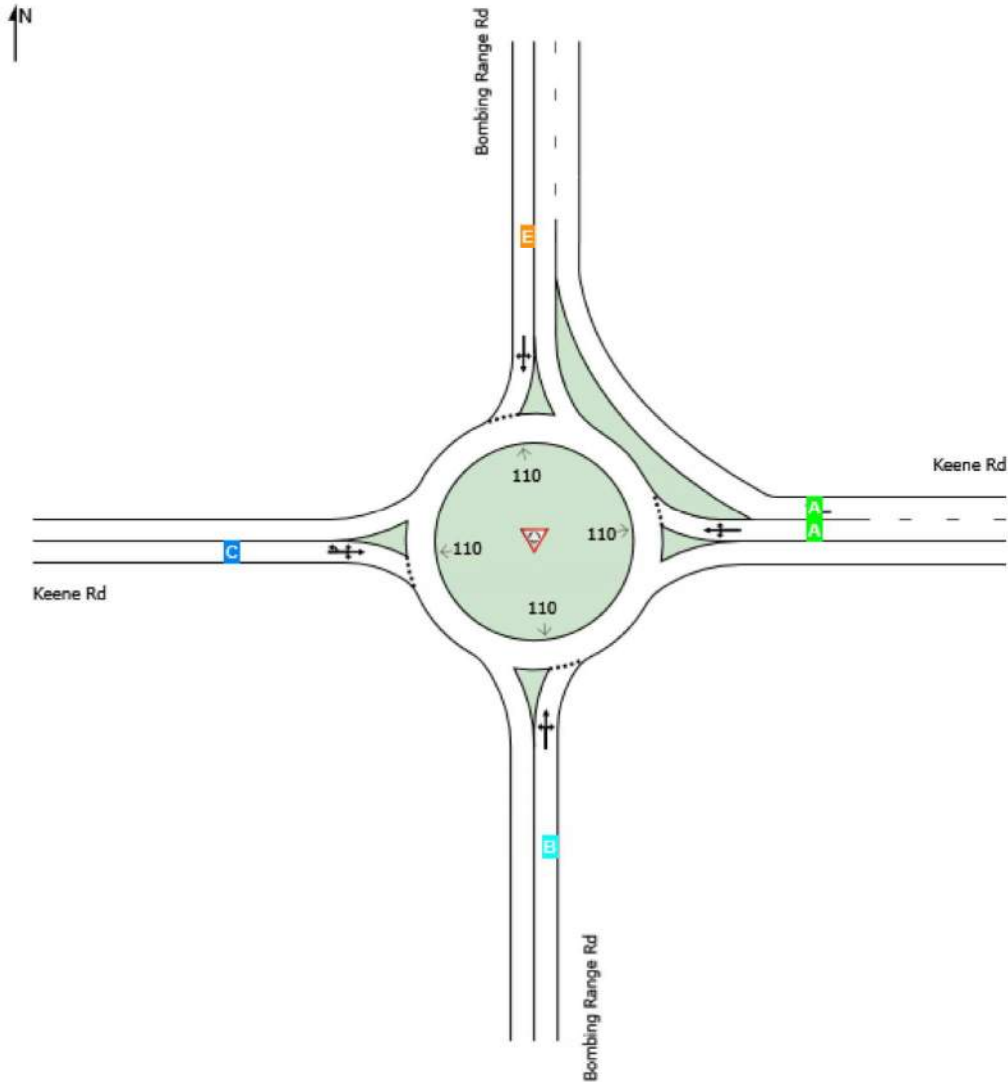
LANE LEVEL OF SERVICE

Lane Level of Service

 Site: 7 [Keene Rd / Bombing Range Rd (Site Folder: 2021 Existing - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	A	E	C	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 7 [Keene Rd / Bombing Range Rd (Site Folder: 2021 Existing - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] ft				mph
South: Bombing Range Rd														
3	L2	85	0.0	89	0.0	0.481	13.9	LOS B	2.8	70.3	0.76	0.90	1.11	25.8
8	T1	178	1.0	185	1.0	0.481	14.0	LOS B	2.8	70.3	0.76	0.90	1.11	25.4
18	R2	10	0.0	10	0.0	0.481	13.9	LOS B	2.8	70.3	0.76	0.90	1.11	24.8
Approach		273	0.7	284	0.7	0.481	14.0	LOS B	2.8	70.3	0.76	0.90	1.11	25.5
East: Keene Rd														
1	L2	38	0.0	40	0.0	0.491	8.9	LOS A	2.9	72.6	0.57	0.46	0.57	35.7
6	T1	469	1.0	489	1.0	0.491	9.0	LOS A	2.9	72.6	0.57	0.46	0.57	35.6
16	R2	506	0.0	527	0.0	0.315	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.6
Approach		1013	0.5	1055	0.5	0.491	4.5	LOS A	2.9	72.6	0.28	0.23	0.28	37.9
North: Bombing Range Rd														
7	L2	417	1.0	434	1.0	0.927	41.7	LOS E	20.4	513.6	1.00	1.98	3.25	19.4
4	T1	208	1.0	217	1.0	0.927	41.7	LOS E	20.4	513.6	1.00	1.98	3.25	19.2
14	R2	19	0.0	20	0.0	0.927	41.6	LOS E	20.4	513.6	1.00	1.98	3.25	18.8
Approach		644	1.0	671	1.0	0.927	41.7	LOS E	20.4	513.6	1.00	1.98	3.25	19.3
West: Keene Rd														
5u	U	1	0.0	1	0.0	0.645	17.7	LOS C	5.6	139.7	0.83	1.10	1.48	25.7
5	L2	14	0.0	15	0.0	0.645	17.7	LOS C	5.6	139.7	0.83	1.10	1.48	25.1
2	T1	351	1.0	366	1.0	0.645	17.8	LOS C	5.6	139.7	0.83	1.10	1.48	24.7
12	R2	50	0.0	52	0.0	0.645	17.7	LOS C	5.6	139.7	0.83	1.10	1.48	24.1
Approach		416	0.8	433	0.8	0.645	17.8	LOS C	5.6	139.7	0.83	1.10	1.48	24.7
All Vehicles		2346	0.7	2444	0.7	0.927	18.2	LOS C	20.4	513.6	0.63	0.94	1.41	26.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - Roundabout Analysis.sip9

Lanes, Volumes, Timings

8: Arena Rd/E Mountain Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	244	2	249	291	2	3	0	197	1	0	1
Future Volume (vph)	3	244	2	249	291	2	3	0	197	1	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1478			1363			1543			354	
Travel Time (s)		25.2			23.2			42.1			9.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
8: Arena Rd/E Mountain Rd & Kennedy Rd

05/12/2021

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	244	2	249	291	2	3	0	197	1	0	1
Future Vol, veh/h	3	244	2	249	291	2	3	0	197	1	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	1	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	254	2	259	303	2	3	0	205	1	0	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	305	0	0	256	0	0	1084	1084	255	1186	1084	304
Stage 1	-	-	-	-	-	-	261	261	-	822	822	-
Stage 2	-	-	-	-	-	-	823	823	-	364	262	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1267	-	-	1321	-	-	196	219	789	167	219	740
Stage 1	-	-	-	-	-	-	748	696	-	371	391	-
Stage 2	-	-	-	-	-	-	371	391	-	659	695	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1267	-	-	1321	-	-	160	167	789	101	167	740
Mov Cap-2 Maneuver	-	-	-	-	-	-	160	167	-	101	167	-
Stage 1	-	-	-	-	-	-	746	694	-	370	299	-
Stage 2	-	-	-	-	-	-	283	299	-	486	693	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			3.9			11.7			25.5		
HCM LOS							B			D		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	745	1267	-	-	1321	-	-	178				
HCM Lane V/C Ratio	0.28	0.002	-	-	0.196	-	-	0.012				
HCM Control Delay (s)	11.7	7.8	0	-	8.4	0	-	25.5				
HCM Lane LOS	B	A	A	-	A	A	-	D				
HCM 95th %tile Q(veh)	1.1	0	-	-	0.7	-	-	0				

Lanes, Volumes, Timings

9: Kennedy Rd & Keene Rd

05/12/2021

	↖	→	↗	↖	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗			↖	↖		↖↗	↖
Traffic Volume (vph)	114	668	12	379	726	35	7	93	353	15	148	258
Future Volume (vph)	114	668	12	379	726	35	7	93	353	15	148	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	260		0	375		0	160		0	0		330
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			40			40	
Link Distance (ft)		3063			2930			1363			832	
Travel Time (s)		46.4			44.4			23.2			14.2	
Confl. Peds. (#/hr)			1			10	1		7	7		1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			6			2	
Permitted Phases							6		6	2		2
Detector Phase	7	4		3	8		6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	12.0	37.0		26.0	51.0		27.0	27.0	27.0	27.0	27.0	27.0
Total Split (%)	13.3%	41.1%		28.9%	56.7%		30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	5.0	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.0	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	-1.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?		Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 90

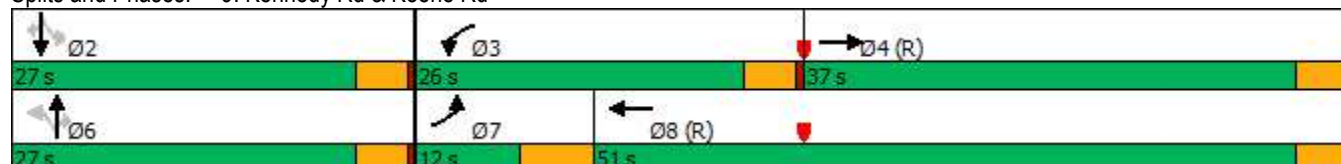
Actuated Cycle Length: 90

Offset: 4 (4%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 9: Kennedy Rd & Keene Rd



HCM 6th Signalized Intersection Summary

9: Kennedy Rd & Keene Rd

05/12/2021

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	114	668	12	379	726	35	7	93	353	15	148	258	
Future Volume (veh/h)	114	668	12	379	726	35	7	93	353	15	148	258	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		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	1900	1885	1900	1900	1900	1900	1900	1900	1885	1900	1900	1900	
Adj Flow Rate, veh/h	115	675	12	383	733	35	7	94	357	15	149	261	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	0	1	0	0	0	0	0	0	1	0	0	0	
Cap, veh/h	161	1425	25	409	1868	89	53	446	388	61	431	391	
Arrive On Green	0.09	0.40	0.40	0.45	1.00	1.00	0.24	0.24	0.24	0.24	0.24	0.24	
Sat Flow, veh/h	1810	3600	64	1810	3506	167	41	1821	1584	71	1759	1596	
Grp Volume(v), veh/h	115	336	351	383	377	391	101	0	357	164	0	261	
Grp Sat Flow(s),veh/h/ln	1810	1791	1874	1810	1805	1868	1862	0	1584	1829	0	1596	
Q Serve(g_s), s	5.6	12.5	12.6	18.1	0.0	0.0	0.0	0.0	19.8	0.0	0.0	13.3	
Cycle Q Clear(g_c), s	5.6	12.5	12.6	18.1	0.0	0.0	3.8	0.0	19.8	6.4	0.0	13.3	
Prop In Lane	1.00		0.03	1.00		0.09	0.07		1.00	0.09		1.00	
Lane Grp Cap(c), veh/h	161	709	741	409	962	996	499	0	388	492	0	391	
V/C Ratio(X)	0.71	0.47	0.47	0.94	0.39	0.39	0.20	0.00	0.92	0.33	0.00	0.67	
Avail Cap(c_a), veh/h	161	709	741	442	962	996	518	0	405	510	0	408	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	0.85	0.85	0.85	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/veh	39.9	20.2	20.2	24.0	0.0	0.0	27.1	0.0	33.1	28.1	0.0	30.7	
Incr Delay (d2), s/veh	12.2	2.3	2.2	23.7	1.0	1.0	0.2	0.0	25.6	0.4	0.0	3.9	
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	2.9	5.2	5.4	7.7	0.3	0.3	1.7	0.0	9.8	2.8	0.0	5.2	
Unsig. Movement Delay, s/veh													
LnGrp Delay(d),s/veh	52.1	22.5	22.4	47.8	1.0	1.0	27.3	0.0	58.7	28.5	0.0	34.6	
LnGrp LOS	D	C	C	D	A	A	C	A	E	C	A	C	
Approach Vol, veh/h	802			1151				458				425	
Approach Delay, s/veh	26.7			16.6				51.8				32.2	
Approach LOS	C			B				D				C	
Timer - Assigned Phs	2		3	4		6		7	8				
Phs Duration (G+Y+Rc), s	26.0		24.3	39.6		26.0		12.0	52.0				
Change Period (Y+Rc), s	4.0		4.0	4.0		4.0		5.0	4.0				
Max Green Setting (Gmax), s	23.0		22.0	33.0		23.0		7.0	47.0				
Max Q Clear Time (g_c+l1), s	15.3		20.1	14.6		21.8		7.6	2.0				
Green Ext Time (p_c), s	1.1		0.3	3.6		0.3		0.0	4.8				
Intersection Summary													
HCM 6th Ctrl Delay	27.5												
HCM 6th LOS	C												

Lanes, Volumes, Timings

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	374	708	9	30	655	145	12	34	34	242	76	465
Future Volume (vph)	374	708	9	30	655	145	12	34	34	242	76	465
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	300		300	65		0	250		0
Storage Lanes	2		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			25			35	
Link Distance (ft)		2930			4647			563			1514	
Travel Time (s)		44.4			70.4			15.4			29.5	
Confl. Peds. (#/hr)						1	1					1
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov
Protected Phases	7	4		3	8	5	1	6		5	2	7
Permitted Phases				4		8	2			6		2
Detector Phase	7	4		3	8	5	1	6		5	2	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0	9.0	9.0	20.0		9.0	20.0	9.0
Total Split (s)	25.0	44.0		9.0	28.0	17.0	12.0	20.0		17.0	25.0	25.0
Total Split (%)	27.8%	48.9%		10.0%	31.1%	18.9%	13.3%	22.2%		18.9%	27.8%	27.8%
Yellow Time (s)	5.0	3.5		5.0	3.5	5.0	5.0	3.5		5.0	3.5	5.0
All-Red Time (s)	0.0	0.5		0.0	0.5	0.0	0.0	0.5		0.0	0.5	0.0
Lost Time Adjust (s)	-1.0	0.0		-1.0	0.0	0.0	0.0	0.0		-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0	5.0	5.0	4.0		4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?		Yes			Yes			Yes			Yes	
Recall Mode	None	C-Max		None	C-Max	None	None	None		None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 90

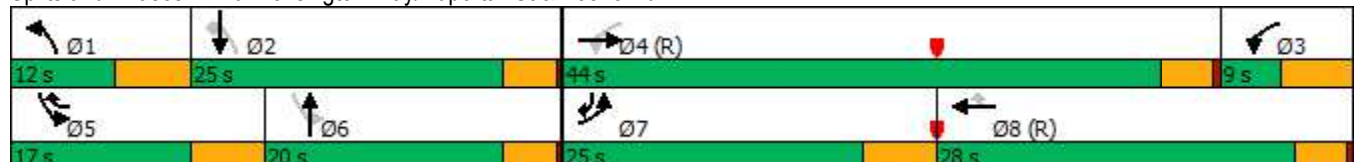
Actuated Cycle Length: 90

Offset: 60 (67%), Referenced to phase 4:EBWB and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 10: Kensington Way/Duportail St & Keene Rd



HCM 6th Signalized Intersection Summary

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	374	708	9	30	655	145	12	34	34	242	76	465
Future Volume (veh/h)	374	708	9	30	655	145	12	34	34	242	76	465
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1885	1885	1885	1870	1870	1870
Adj Flow Rate, veh/h	398	753	10	32	697	154	13	36	36	257	81	495
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	2	2	1	1	1	1	1	1	2	2	2
Cap, veh/h	503	1596	21	516	1464	865	270	97	97	450	436	582
Arrive On Green	0.15	0.44	0.44	0.12	0.41	0.41	0.01	0.11	0.11	0.14	0.23	0.23
Sat Flow, veh/h	3456	3591	48	1795	3582	1596	1795	864	864	1781	1870	1583
Grp Volume(v), veh/h	398	373	390	32	697	154	13	0	72	257	81	495
Grp Sat Flow(s),veh/h/ln	1728	1777	1862	1795	1791	1596	1795	0	1727	1781	1870	1583
Q Serve(g_s), s	10.0	13.3	13.3	0.0	12.9	4.4	0.5	0.0	3.5	11.1	3.1	21.0
Cycle Q Clear(g_c), s	10.0	13.3	13.3	0.0	12.9	4.4	0.5	0.0	3.5	11.1	3.1	21.0
Prop In Lane	1.00		0.03	1.00		1.00	1.00		0.50	1.00		1.00
Lane Grp Cap(c), veh/h	503	790	827	516	1464	865	270	0	194	450	436	582
V/C Ratio(X)	0.79	0.47	0.47	0.06	0.48	0.18	0.05	0.00	0.37	0.57	0.19	0.85
Avail Cap(c_a), veh/h	806	790	827	516	1464	865	387	0	307	450	436	582
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)	0.85	0.85	0.85	0.90	0.90	0.90	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.1	17.6	17.6	15.4	19.5	10.4	25.8	0.0	37.0	28.3	27.6	26.2
Incr Delay (d2), s/veh	0.9	1.7	1.6	0.0	1.0	0.4	0.0	0.0	1.2	1.1	0.2	11.4
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	4.1	5.2	5.5	0.4	5.1	1.4	0.2	0.0	1.5	4.7	1.4	10.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.0	19.3	19.2	15.4	20.5	10.8	25.9	0.0	38.2	29.4	27.9	37.6
LnGrp LOS	D	B	B	B	C	B	C	A	D	C	C	D
Approach Vol, veh/h	1161				883				85			
Approach Delay, s/veh	25.7				18.7				36.3			
Approach LOS	C				B				D			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.1	25.0	14.9	44.0	17.0	14.1	17.1	41.8				
Change Period (Y+Rc), s	5.0	4.0	5.0	4.0	5.0	4.0	5.0	* 5				
Max Green Setting (Gmax), s	7.0	21.0	4.0	40.0	12.0	16.0	20.0	* 24				
Max Q Clear Time (g_c+I1), s	2.5	23.0	2.0	15.3	13.1	5.5	12.0	14.9				
Green Ext Time (p_c), s	0.0	0.0	0.0	4.4	0.0	0.2	0.1	3.3				
Intersection Summary												
HCM 6th Ctrl Delay	26.3											
HCM 6th LOS	C											
Notes												

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings

11: Duportail St & Queensgate Dr

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	264	15	721	311	182	34	373	516	333	587	107
Future Volume (vph)	135	264	15	721	311	182	34	373	516	333	587	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	200		125	200		250	200		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			35	
Link Distance (ft)		1398			1249			1078			1088	
Travel Time (s)		31.8			28.4			24.5			21.2	
Confl. Peds. (#/hr)			2				3					3
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	D.P+P	NA	pt+ov	Prot	NA	
Protected Phases	7	4		3	8	8 5	1	6	6 3	5	2	
Permitted Phases							2					
Detector Phase	7	4		3	8	8 5	1	6	6 3	5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	35.0		30.0	30.0		9.0	35.0		9.0	35.0	
Total Split (s)	17.0	35.0		31.0	49.0		13.0	20.0		24.0	31.0	
Total Split (%)	15.5%	31.8%		28.2%	44.5%		11.8%	18.2%		21.8%	28.2%	
Yellow Time (s)	5.0	4.0		4.0	4.0		5.0	4.0		5.0	4.0	
All-Red Time (s)	0.0	1.0		1.0	1.0		0.0	1.0		0.0	1.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	None		None	None	

Intersection Summary

Area Type: Other

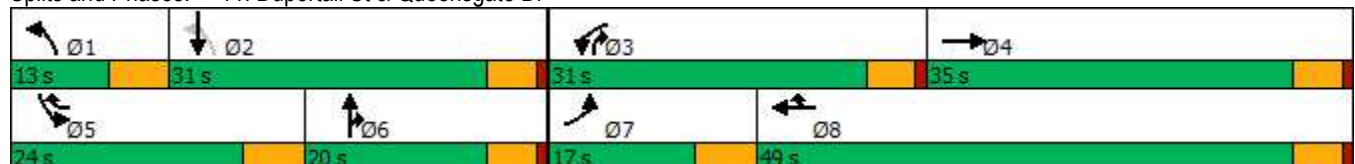
Cycle Length: 110

Actuated Cycle Length: 93.5

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Splits and Phases: 11: Duportail St & Queensgate Dr



HCM 6th Signalized Intersection Summary

11: Duportail St & Queensgate Dr

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	264	15	721	311	182	34	373	516	333	587	107
Future Volume (veh/h)	135	264	15	721	311	182	34	373	516	333	587	107
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1870	1870	1870	1885	1885	1885	1900	1900	1900
Adj Flow Rate, veh/h	142	278	16	759	327	192	36	393	543	351	618	113
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	2	2	2	1	1	1	0	0	0
Cap, veh/h	216	504	29	974	576	857	338	714	767	421	1163	212
Arrive On Green	0.12	0.15	0.13	0.28	0.31	0.31	0.05	0.20	0.20	0.23	0.38	0.37
Sat Flow, veh/h	1810	3469	199	3456	1870	1585	1795	3582	1586	1810	3047	556
Grp Volume(v), veh/h	142	144	150	759	327	192	36	393	543	351	366	365
Grp Sat Flow(s),veh/h/ln	1810	1805	1863	1728	1870	1585	1795	1791	1586	1810	1805	1798
Q Serve(g_s), s	6.4	6.3	6.4	17.2	12.5	5.4	1.0	8.4	17.0	15.7	13.4	13.5
Cycle Q Clear(g_c), s	6.4	6.3	6.4	17.2	12.5	5.4	1.0	8.4	17.0	15.7	13.4	13.5
Prop In Lane	1.00		0.11	1.00		1.00	1.00		1.00	1.00		0.31
Lane Grp Cap(c), veh/h	216	262	271	974	576	857	338	714	767	421	689	686
V/C Ratio(X)	0.66	0.55	0.55	0.78	0.57	0.22	0.11	0.55	0.71	0.83	0.53	0.53
Avail Cap(c_a), veh/h	297	678	699	1135	1009	1224	458	714	767	446	689	686
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.9	33.8	33.9	28.2	24.7	10.2	15.2	30.7	17.4	31.1	20.4	20.6
Incr Delay (d2), s/veh	1.3	0.7	0.7	2.5	0.3	0.0	0.1	0.5	2.6	11.4	0.4	0.4
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	2.8	2.8	2.9	7.2	5.4	1.8	0.4	3.6	8.3	7.9	5.4	5.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.2	34.5	34.6	30.6	25.1	10.3	15.2	31.2	20.0	42.5	20.8	21.0
LnGrp LOS	D	C	C	C	C	B	B	C	C	D	C	C
Approach Vol, veh/h		436			1278			972			1082	
Approach Delay, s/veh		35.4			26.2			24.4			27.9	
Approach LOS		D			C			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.3	35.5	27.0	15.4	22.8	20.0	13.2	29.3				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	8.0	26.0	26.0	30.0	19.0	15.0	12.0	44.0				
Max Q Clear Time (g_c+I1), s	3.0	15.5	19.2	8.4	17.7	19.0	8.4	14.5				
Green Ext Time (p_c), s	0.0	3.0	2.8	1.5	0.1	0.0	0.1	1.8				
Intersection Summary												
HCM 6th Ctrl Delay				27.3								
HCM 6th LOS				C								
Notes												
User approved pedestrian interval to be less than phase max green.												

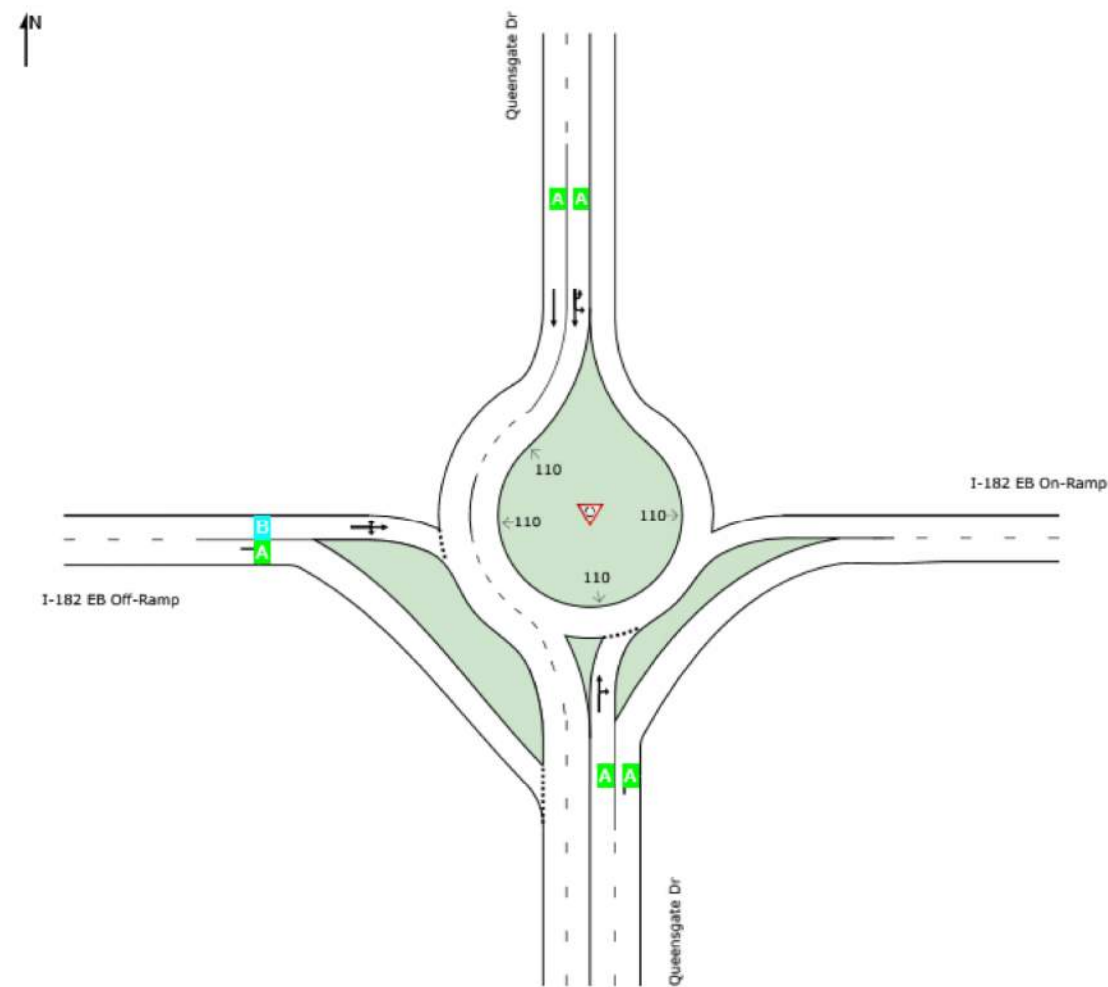
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2021 Existing - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	North	West	
LOS	A	A	B	A



Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used).
Delay Model: SIDRA Standard (Geometric Delay is included).

MOVEMENT SUMMARY

 **Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2021 Existing - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] ft				mph
South: Queensgate Dr														
8	T1	268	1.0	273	1.0	0.371	8.2	LOS A	2.7	67.0	0.79	0.77	0.79	35.9
18	R2	709	1.0	723	1.0	0.371	4.2	LOS A	2.7	67.0	0.12	0.47	0.12	37.0
Approach		977	1.0	997	1.0	0.371	5.3	LOS A	2.7	67.0	0.30	0.56	0.30	36.7
North: Queensgate Dr														
7u	U	9	0.0	9	0.0	0.574	12.4	LOS B	0.0	0.0	0.00	0.65	0.00	36.5
7	L2	751	1.0	766	1.0	0.574	9.9	LOS A	0.0	0.0	0.00	0.65	0.00	35.5
4	T1	1044	0.0	1065	0.0	0.574	4.1	LOS A	0.0	0.0	0.00	0.40	0.00	38.0
Approach		1804	0.4	1841	0.4	0.574	6.5	LOS A	0.0	0.0	0.00	0.51	0.00	36.9
West: I-182 EB Off-Ramp														
5	L2	86	4.0	88	4.0	0.106	14.0	LOS B	0.4	10.9	0.63	0.87	0.63	33.3
2	T1	1	0.0	1	0.0	0.106	7.6	LOS A	0.4	10.9	0.63	0.87	0.63	33.2
12	R2	97	1.0	99	1.0	0.106	7.5	LOS A	0.5	12.2	0.60	0.72	0.60	34.9
Approach		184	2.4	188	2.4	0.106	10.5	LOS B	0.5	12.2	0.62	0.79	0.62	34.1
All Vehicles		2965	0.7	3026	0.7	0.574	6.4	LOS A	2.7	67.0	0.14	0.54	0.14	36.6

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

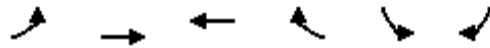
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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - Roundabout Analysis.sip9

Lanes, Volumes, Timings 14: Keene Rd & Queensgate Dr

05/12/2021

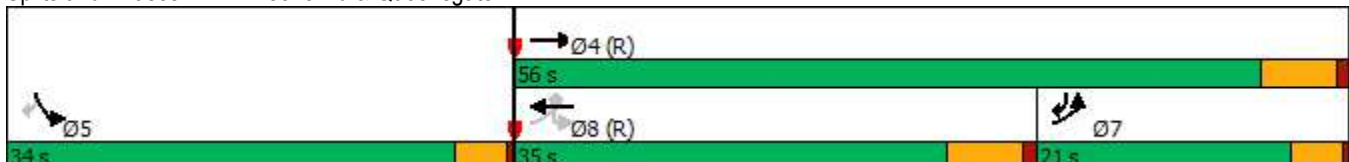


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	341	665	641	499	712	208
Future Volume (vph)	341	665	641	499	712	208
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350			175	0	200
Storage Lanes	1			1	2	1
Taper Length (ft)	25				25	
Right Turn on Red				Yes		Yes
Link Speed (mph)		45	45		35	
Link Distance (ft)		4647	3045		1355	
Travel Time (s)		70.4	46.1		26.4	
Confl. Peds. (#/hr)	3			3		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	1%	1%	0%	0%
Shared Lane Traffic (%)						
Turn Type	D.P+P	NA	NA	Perm	Prot	pm+ov
Protected Phases	7	4	8		5	7
Permitted Phases	8			8		5
Detector Phase	7	4	8	8	5	7
Switch Phase						
Minimum Initial (s)	4.0	8.0	8.0	8.0	4.0	4.0
Minimum Split (s)	8.0	22.0	30.0	30.0	21.0	8.0
Total Split (s)	21.0	56.0	35.0	35.0	34.0	21.0
Total Split (%)	23.3%	62.2%	38.9%	38.9%	37.8%	23.3%
Yellow Time (s)	3.5	5.0	5.0	5.0	3.5	3.5
All-Red Time (s)	0.5	1.0	1.0	1.0	0.5	0.5
Lost Time Adjust (s)	0.0	-2.0	-2.0	-2.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead	Lead		Lag
Lead-Lag Optimize?						
Recall Mode	None	C-Max	C-Max	C-Max	None	None

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:EBT and 8:EBWB, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated

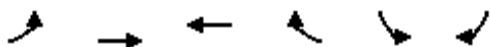
Splits and Phases: 14: Keene Rd & Queensgate Dr



HCM 6th Signalized Intersection Summary

14: Keene Rd & Queensgate Dr

05/12/2021



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations							
Traffic Volume (veh/h)	341	665	641	499	712	208	
Future Volume (veh/h)	341	665	641	499	712	208	
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	1885	1885	1900	1900	
Adj Flow Rate, veh/h	363	707	682	0	757	221	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	
Percent Heavy Veh, %	2	2	1	1	0	0	
Cap, veh/h	544	2172	1234		1053	805	
Arrive On Green	0.20	0.61	0.11	0.00	0.30	0.30	
Sat Flow, veh/h	1781	3647	3676	1598	3510	1610	
Grp Volume(v), veh/h	363	707	682	0	757	221	
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1755	1610	
Q Serve(g_s), s	6.5	8.7	16.2	0.0	17.3	0.0	
Cycle Q Clear(g_c), s	6.5	8.7	16.2	0.0	17.3	0.0	
Prop In Lane	1.00			1.00	1.00	1.00	
Lane Grp Cap(c), veh/h	544	2172	1234		1053	805	
V/C Ratio(X)	0.67	0.33	0.55		0.72	0.27	
Avail Cap(c_a), veh/h	544	2172	1234		1170	859	
HCM Platoon Ratio	1.00	1.00	0.33	0.33	1.00	1.00	
Upstream Filter(I)	0.89	0.89	0.96	0.00	1.00	1.00	
Uniform Delay (d), s/veh	27.8	8.5	33.3	0.0	28.1	13.0	
Incr Delay (d2), s/veh	2.3	0.4	1.7	0.0	1.9	0.2	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	6.6	2.8	7.9	0.0	7.2	5.6	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	30.1	8.9	35.0	0.0	30.0	13.2	
LnGrp LOS	C	A	D		C	B	
Approach Vol, veh/h		1070	682	A	978		
Approach Delay, s/veh		16.1	35.0		26.2		
Approach LOS		B	D		C		
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		31.0		59.0		24.0	35.0
Change Period (Y+Rc), s		4.0		6.0		6.0	* 6
Max Green Setting (Gmax), s		30.0		50.0		17.0	* 29
Max Q Clear Time (g_c+I1), s		19.3		10.7		8.5	18.2
Green Ext Time (p_c), s		7.7		8.6		0.2	4.5

Intersection Summary

HCM 6th Ctrl Delay	24.4
HCM 6th LOS	C

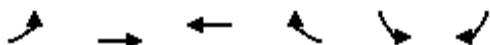
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

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

Lanes, Volumes, Timings
16: Gage Blvd & Keene Rd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø6
Lane Configurations							
Traffic Volume (vph)	44	175	272	754	696	52	
Future Volume (vph)	44	175	272	754	696	52	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Grade (%)		-3%	3%		0%		
Storage Length (ft)	200			0	0	100	
Storage Lanes	1			1	2	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1832	3557	1872	1591	3467	1615	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1832	3557	1872	1591	3467	1615	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				794		39	
Link Speed (mph)		40	40		45		
Link Distance (ft)		246	874		1238		
Travel Time (s)		4.2	14.9		18.8		
Confl. Peds. (#/hr)				2			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	46	184	286	794	733	55	
Turn Type	Prot	NA	NA	pt+ov	Prot	Prot	
Protected Phases	7	4	8	8 5	5	5	6
Permitted Phases							
Detector Phase	7	4	8	8 5	5	5	
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0	27.0		20.0	20.0	27.0
Total Split (s)	9.0	36.0	27.0		27.0	27.0	27.0
Total Split (%)	10.0%	40.0%	30.0%		30.0%	30.0%	30%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0	4.0
All-Red Time (s)	0.0	0.0	0.0		0.0	0.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0	
Lead/Lag	Lag		Lead		Lag	Lag	Lead
Lead-Lag Optimize?							
Recall Mode	None	None	None		C-Max	C-Max	None
Act Effct Green (s)	5.6	23.7	17.7	76.2	52.9	52.9	
Actuated g/C Ratio	0.06	0.26	0.20	0.85	0.59	0.59	
v/c Ratio	0.40	0.20	0.78	0.54	0.36	0.06	
Control Delay	51.4	24.2	35.1	4.6	11.9	6.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	51.4	24.2	35.1	4.6	11.9	6.4	
LOS	D	C	D	A	B	A	
Approach Delay		29.6	12.7		11.5		
Approach LOS		C	B		B		

Intersection Summary

Area Type: Other

Lanes, Volumes, Timings

16: Gage Blvd & Keene Rd

05/12/2021

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 70 (78%), Referenced to phase 5:SBL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 14.1

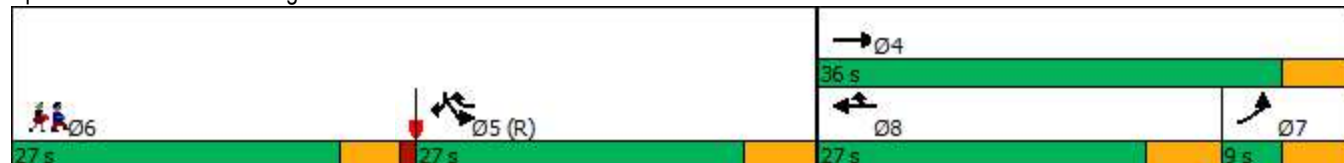
Intersection LOS: B

Intersection Capacity Utilization 56.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 16: Gage Blvd & Keene Rd



Lanes, Volumes, Timings

17: Leslie Rd & Gage Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	542	269	159	788	100	258	220	144	136	489	140
Future Volume (vph)	74	542	269	159	788	100	258	220	144	136	489	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	350		0	200		275	200		200
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		874			3504			345			536	
Travel Time (s)		14.9			59.7			6.7			10.4	
Confl. Peds. (#/hr)	2		1	1		2	5		1	1		5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	0%	2%	0%	0%	0%	0%	0%	2%	0%	0%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6		6	2		2
Detector Phase	7	4		3	8		1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0		9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	10.0	33.0		15.0	38.0		18.0	25.0	25.0	17.0	24.0	24.0
Total Split (%)	11.1%	36.7%		16.7%	42.2%		20.0%	27.8%	27.8%	18.9%	26.7%	26.7%
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 90

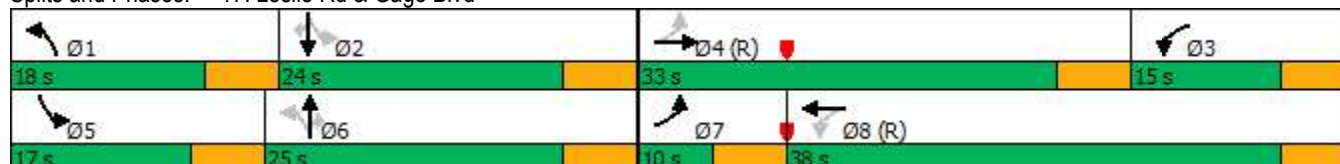
Actuated Cycle Length: 90

Offset: 73 (81%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Splits and Phases: 17: Leslie Rd & Gage Blvd



HCM 6th Signalized Intersection Summary

17: Leslie Rd & Gage Blvd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	542	269	159	788	100	258	220	144	136	489	140
Future Volume (veh/h)	74	542	269	159	788	100	258	220	144	136	489	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1870	1900	1870	1900	1900	1900	1900	1900	1870	1900	1900
Adj Flow Rate, veh/h	80	589	292	173	857	109	280	239	157	148	532	152
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	0	2	0	0	0	0	0	2	0	0
Cap, veh/h	185	741	367	341	1275	162	343	520	439	413	422	338
Arrive On Green	0.02	0.11	0.10	0.13	0.40	0.38	0.15	0.27	0.27	0.09	0.22	0.21
Sat Flow, veh/h	1781	2300	1139	1781	3221	410	1810	1900	1601	1781	1900	1599
Grp Volume(v), veh/h	80	455	426	173	480	486	280	239	157	148	532	152
Grp Sat Flow(s),veh/h/ln	1781	1777	1663	1781	1805	1826	1810	1900	1601	1781	1900	1599
Q Serve(g_s), s	3.0	22.5	22.5	2.6	19.7	19.7	10.1	9.4	7.1	5.6	20.0	5.3
Cycle Q Clear(g_c), s	3.0	22.5	22.5	2.6	19.7	19.7	10.1	9.4	7.1	5.6	20.0	5.3
Prop In Lane	1.00		0.69	1.00		0.22	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	185	573	536	341	714	723	343	520	439	413	422	338
V/C Ratio(X)	0.43	0.79	0.80	0.51	0.67	0.67	0.82	0.46	0.36	0.36	1.26	0.45
Avail Cap(c_a), veh/h	199	573	536	341	714	723	361	520	439	504	422	338
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	0.95	0.81	0.81	0.81	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.8	37.3	37.4	33.9	22.4	22.5	22.5	27.1	26.3	23.1	35.0	15.4
Incr Delay (d2), s/veh	0.6	10.4	11.1	0.4	4.1	4.0	12.0	0.2	0.2	0.2	134.9	0.3
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	1.3	12.2	11.6	3.3	8.5	8.6	5.2	4.1	2.6	2.3	24.7	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.4	47.7	48.5	34.4	26.5	26.5	34.5	27.4	26.5	23.3	169.9	15.7
LnGrp LOS	C	D	D	C	C	C	C	C	C	C	F	B
Approach Vol, veh/h		961			1139			676			832	
Approach Delay, s/veh		46.4			27.7			30.1			115.7	
Approach LOS		D			C			C			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.1	24.0	15.9	33.0	12.4	28.6	9.3	39.6				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	13.0	19.0	10.0	28.0	12.0	20.0	5.0	33.0				
Max Q Clear Time (g_c+I1), s	12.1	22.0	4.6	24.5	7.6	11.4	5.0	21.7				
Green Ext Time (p_c), s	0.0	0.0	0.0	0.6	0.0	0.2	0.0	1.1				
Intersection Summary												
HCM 6th Ctrl Delay			53.4									
HCM 6th LOS			D									

Lanes, Volumes, Timings
18: Leslie Rd & Reata Rd

05/12/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	109	115	192	393	329	164
Future Volume (vph)	109	115	192	393	329	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	0			285
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Link Speed (mph)	40			40	40	
Link Distance (ft)	5360			1600	7773	
Travel Time (s)	91.4			27.3	132.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	1%	2%	0%	2%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection

Int Delay, s/veh 4.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	109	115	192	393	329	164
Future Vol, veh/h	109	115	192	393	329	164
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	0	-	-	285
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	1	2	0	2	0
Mvmt Flow	117	124	206	423	354	176

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	1189	354	530
Stage 1	354	-	-
Stage 2	835	-	-
Critical Hdwy	6.4	6.21	4.12
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.309	2.218
Pot Cap-1 Maneuver	210	692	1037
Stage 1	715	-	-
Stage 2	429	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	168	692	1037
Mov Cap-2 Maneuver	298	-	-
Stage 1	573	-	-
Stage 2	429	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.8	3.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1037	-	298	692	-	-
HCM Lane V/C Ratio	0.199	-	0.393	0.179	-	-
HCM Control Delay (s)	9.3	-	24.7	11.3	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.7	-	1.8	0.6	-	-

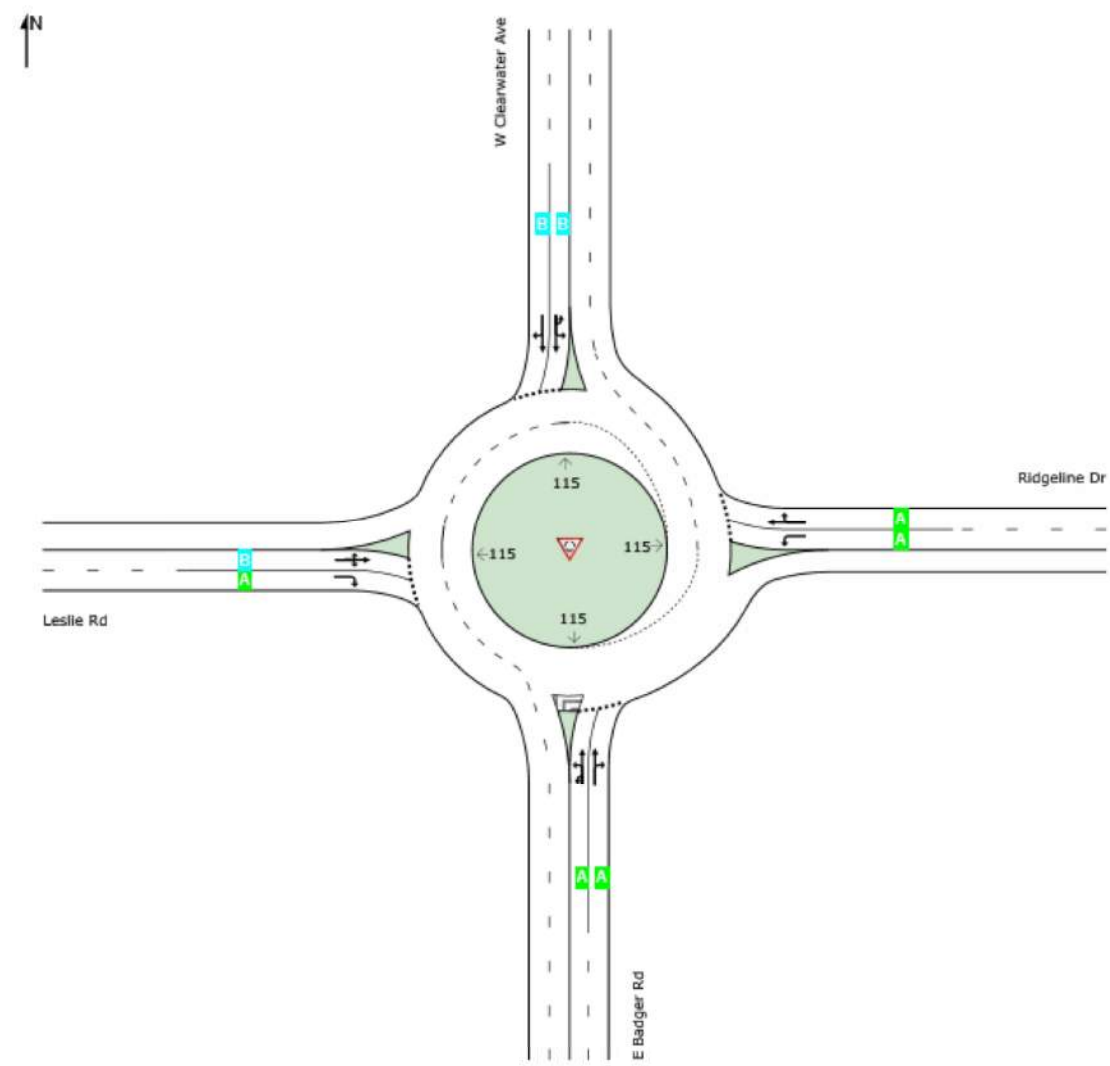
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2021 Existing - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	B	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2021 Existing - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] ft				mph
South: E Badger Rd														
3u	U	7	17.0	8	17.0	0.409	8.7	LOS A	2.1	52.9	0.56	0.50	0.56	33.0
3	L2	212	1.0	228	1.0	0.409	8.1	LOS A	2.1	52.9	0.56	0.50	0.56	32.6
8	T1	436	1.0	469	1.0	0.409	8.1	LOS A	2.1	53.0	0.57	0.50	0.57	33.5
18	R2	106	0.0	114	0.0	0.409	8.1	LOS A	2.1	53.0	0.57	0.50	0.57	33.0
Approach		761	1.0	818	1.0	0.409	8.1	LOS A	2.1	53.0	0.57	0.50	0.57	33.2
East: Ridgeline Dr														
1	L2	142	1.0	153	1.0	0.250	9.1	LOS A	0.9	23.8	0.64	0.64	0.64	31.1
6	T1	143	0.0	154	0.0	0.313	9.2	LOS A	1.3	32.0	0.65	0.66	0.70	33.3
16	R2	56	2.0	60	2.0	0.313	9.3	LOS A	1.3	32.0	0.65	0.66	0.70	32.3
Approach		341	0.7	367	0.7	0.313	9.2	LOS A	1.3	32.0	0.64	0.65	0.68	32.2
North: W Clearwater Ave														
7u	U	1	0.0	1	0.0	0.500	11.3	LOS B	3.3	84.1	0.68	0.79	0.97	33.1
7	L2	58	0.0	62	0.0	0.500	11.3	LOS B	3.3	84.1	0.68	0.79	0.97	32.2
4	T1	485	1.0	522	1.0	0.500	11.1	LOS B	3.3	84.3	0.67	0.78	0.96	32.2
14	R2	243	1.0	261	1.0	0.500	10.6	LOS B	3.3	84.3	0.66	0.76	0.94	31.5
Approach		787	0.9	846	0.9	0.500	10.9	LOS B	3.3	84.3	0.67	0.77	0.95	32.0
West: Leslie Rd														
5	L2	126	3.0	135	3.0	0.414	10.5	LOS B	2.1	52.6	0.66	0.73	0.88	32.0
2	T1	155	2.0	167	2.0	0.414	10.4	LOS B	2.1	52.6	0.66	0.73	0.88	31.8
12	R2	162	1.0	174	1.0	0.261	8.6	LOS A	1.0	25.5	0.62	0.62	0.62	32.5
Approach		443	1.9	476	1.9	0.414	9.8	LOS A	2.1	52.6	0.65	0.69	0.78	32.1
All Vehicles		2332	1.1	2508	1.1	0.500	9.5	LOS A	3.3	84.3	0.63	0.65	0.75	32.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings
20: E Badger Rd & I-82 WB Ramps

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	62	355	385	36	214	606
Future Volume (vph)	62	355	385	36	214	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%		-3%			3%
Storage Length (ft)	0	0		0	95	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	405		758			508
Travel Time (s)	9.2		10.3			6.9
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	1%	1%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
20: E Badger Rd & I-82 WB Ramps

05/12/2021

Intersection

Int Delay, s/veh 15.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	62	355	385	36	214	606
Future Vol, veh/h	62	355	385	36	214	606
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	-	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-3	-	-3	-	-	3
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	1	1	0	0	0
Mvmt Flow	66	378	410	38	228	645

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1208	429	0
Stage 1	429	-	-
Stage 2	779	-	-
Critical Hdwy	6.03	5.915	-
Critical Hdwy Stg 1	4.83	-	-
Critical Hdwy Stg 2	5.23	-	-
Follow-up Hdwy	3.519	3.3095	-
Pot Cap-1 Maneuver	230	650	-
Stage 1	704	-	-
Stage 2	471	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	183	650	-
Mov Cap-2 Maneuver	183	-	-
Stage 1	704	-	-
Stage 2	375	-	-

Approach	WB	NB	SB
HCM Control Delay, s	58	0	2.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	471	1123
HCM Lane V/C Ratio	-	-	0.942	0.203
HCM Control Delay (s)	-	-	58	9
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	11.3	0.8

Lanes, Volumes, Timings
21: E Badger Rd & I-82 EB Ramps

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	26	156	290	51	204	459
Future Volume (vph)	26	156	290	51	204	459
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%		3%			-3%
Storage Length (ft)	0	0		0	250	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	410		360			758
Travel Time (s)	9.3		4.9			10.3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	5%	2%	0%	0%	2%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
21: E Badger Rd & I-82 EB Ramps

05/12/2021

Intersection						
Int Delay, s/veh	3.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	26	156	290	51	204	459
Future Vol, veh/h	26	156	290	51	204	459
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	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-5	-	3	-	-	-3
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	5	2	0	0	2	1
Mvmt Flow	28	166	309	54	217	488
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1258	336	0	0	363	0
Stage 1	336	-	-	-	-	-
Stage 2	922	-	-	-	-	-
Critical Hdwy	5.45	5.72	-	-	4.12	-
Critical Hdwy Stg 1	4.45	-	-	-	-	-
Critical Hdwy Stg 2	4.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	264	740	-	-	1196	-
Stage 1	787	-	-	-	-	-
Stage 2	494	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	216	740	-	-	1196	-
Mov Cap-2 Maneuver	216	-	-	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	405	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	15.1	0		2.7		
HCM LOS	C					
Minor Lane/Major Mvmt		NBT	NBRWBLn1	SBL	SBT	
Capacity (veh/h)		-	-	550	1196	-
HCM Lane V/C Ratio		-	-	0.352	0.181	-
HCM Control Delay (s)		-	-	15.1	8.7	-
HCM Lane LOS		-	-	C	A	-
HCM 95th %tile Q(veh)		-	-	1.6	0.7	-

Lanes, Volumes, Timings
22: Bermuda Rd & Reata Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	80	8	45	109	47	5	6	38	26	3	10
Future Volume (vph)	16	80	8	45	109	47	5	6	38	26	3	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		685			5360			569			542	
Travel Time (s)		11.7			91.4			11.1			10.6	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	80	8	45	109	47	5	6	38	26	3	10
Future Vol, veh/h	16	80	8	45	109	47	5	6	38	26	3	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	0	0	3	0	0	0
Mvmt Flow	19	94	9	53	128	55	6	7	45	31	4	12
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	183	0	0	103	0	0	407	426	99	425	403	156
Stage 1	-	-	-	-	-	-	137	137	-	262	262	-
Stage 2	-	-	-	-	-	-	270	289	-	163	141	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.23	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.327	3.5	4	3.3
Pot Cap-1 Maneuver	1404	-	-	1502	-	-	558	524	954	543	539	895
Stage 1	-	-	-	-	-	-	871	787	-	747	695	-
Stage 2	-	-	-	-	-	-	740	677	-	844	784	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1404	-	-	1502	-	-	526	496	954	491	510	895
Mov Cap-2 Maneuver	-	-	-	-	-	-	526	496	-	491	510	-
Stage 1	-	-	-	-	-	-	859	776	-	737	667	-
Stage 2	-	-	-	-	-	-	697	650	-	786	773	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.2			1.7			9.9			12		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	798	1404	-	-	1502	-	-	557				
HCM Lane V/C Ratio	0.072	0.013	-	-	0.035	-	-	0.082				
HCM Control Delay (s)	9.9	7.6	0	-	7.5	0	-	12				
HCM Lane LOS	A	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.3				

2040 With BMS Full Buildout AM Peak Hour

Lanes, Volumes, Timings
1: Dallas Rd & I-82 EB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	315	1	95	0	0	0	0	376	100	571	139	0
Future Volume (vph)	315	1	95	0	0	0	0	376	100	571	139	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			-3%			5%			-11%	
Storage Length (ft)	0		0	0		0	0		0	150		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		106			198			377			305	
Travel Time (s)		2.4			4.5			5.1			4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Free			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
1: Dallas Rd & I-82 EB Ramps

05/12/2021

Intersection												
Int Delay, s/veh	1620.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↗		↖	↗	
Traffic Vol, veh/h	315	1	95	0	0	0	0	376	100	571	139	0
Future Vol, veh/h	315	1	95	0	0	0	0	376	100	571	139	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	3	-	-	-3	-	-	5	-	-	-11	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	342	1	103	0	0	0	0	409	109	621	151	0
Major/Minor	Minor2						Major1		Major2			
Conflicting Flow All	1857	1911	151				-	0	0	518	0	0
Stage 1	1393	1393	-				-	-	-	-	-	-
Stage 2	464	518	-				-	-	-	-	-	-
Critical Hdwy	7.03	7.13	6.53				-	-	-	4.13	-	-
Critical Hdwy Stg 1	6.03	6.13	-				-	-	-	-	-	-
Critical Hdwy Stg 2	6.03	6.13	-				-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327				-	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 59	49	882				0	-	-	1043	-	0
Stage 1	~ 181	165	-				0	-	-	-	-	0
Stage 2	584	488	-				0	-	-	-	-	0
Platoon blocked, %									-	-	-	
Mov Cap-1 Maneuver	~ 24	0	882				-	-	-	1043	-	-
Mov Cap-2 Maneuver	~ 24	0	-				-	-	-	-	-	-
Stage 1	~ 181	0	-				-	-	-	-	-	-
Stage 2	~ 237	0	-				-	-	-	-	-	-
Approach	EB						NB		SB			
HCM Control Delay, \$	6278.4						0		10.8			
HCM LOS	F											
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT							
Capacity (veh/h)	-	-	31	1043	-							
HCM Lane V/C Ratio	-	-	14.411	0.595	-							
HCM Control Delay (s)	-	-	\$ 6278.4	13.4	-							
HCM Lane LOS	-	-	F	B	-							
HCM 95th %tile Q(veh)	-	-	55	4.1	-							
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon						

Lanes, Volumes, Timings

2: Dallas Rd & I-82 WB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	38	1	318	265	418	0	0	674	630
Future Volume (vph)	0	0	0	38	1	318	265	418	0	0	674	630
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-5%			0%			0%	
Storage Length (ft)	0		0	0		200	100		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		233			450			305			1186	
Travel Time (s)		5.3			10.2			4.2			16.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC

2: Dallas Rd & I-82 WB Ramps

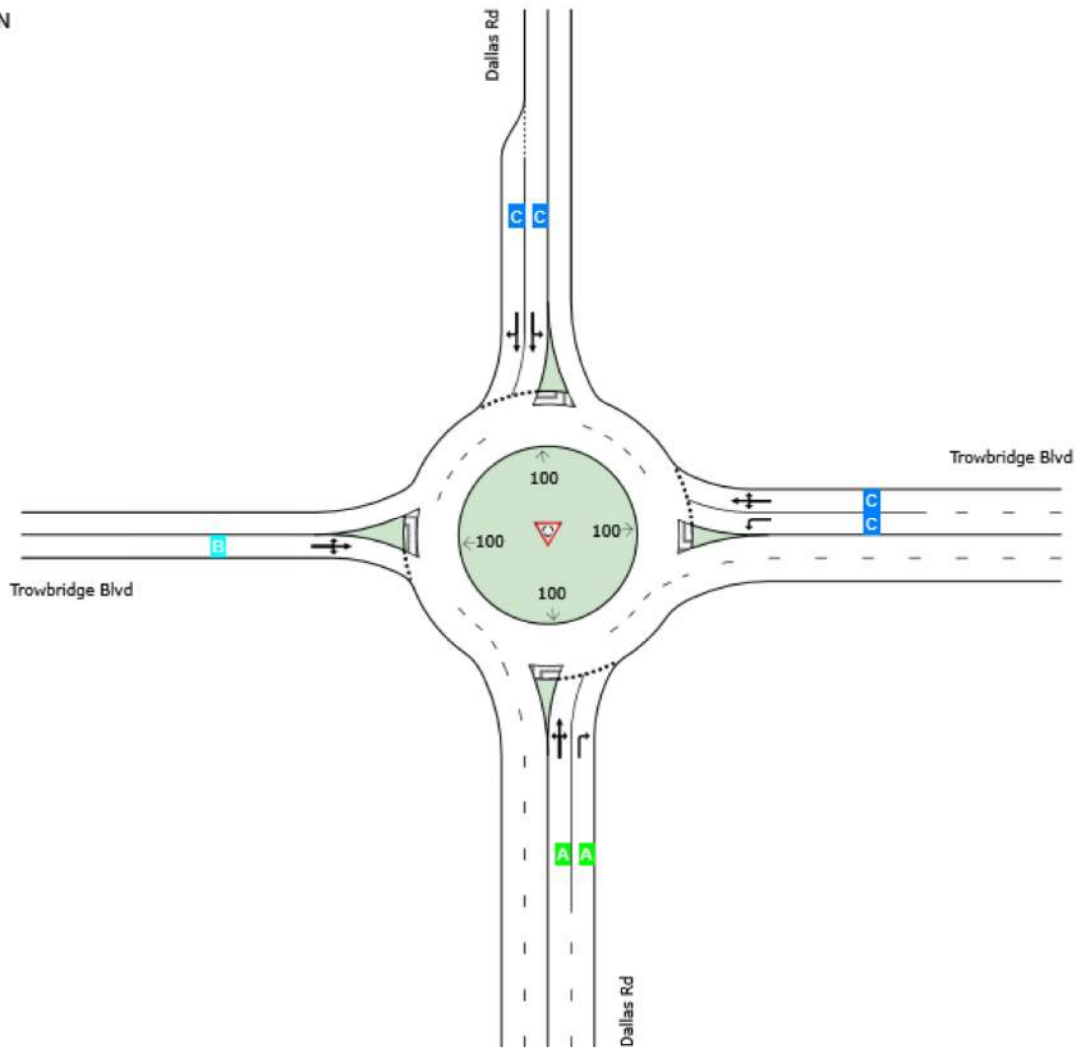
05/12/2021

Intersection												
Int Delay, s/veh	10.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	38	1	318	265	418	0	0	674	630
Future Vol, veh/h	0	0	0	38	1	318	265	418	0	0	674	630
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	200	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-3	-	-	-5	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	41	1	346	288	454	0	0	733	685
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				2106	2448	454	1418	0	-	-	-	0
Stage 1				1030	1030	-	-	-	-	-	-	-
Stage 2				1076	1418	-	-	-	-	-	-	-
Critical Hdwy				5.43	5.53	5.73	4.13	-	-	-	-	-
Critical Hdwy Stg 1				4.43	4.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2				4.43	4.53	-	-	-	-	-	-	-
Follow-up Hdwy				3.527	4.027	3.327	2.227	-	-	-	-	-
Pot Cap-1 Maneuver				101	61	643	477	-	0	0	-	-
Stage 1				456	412	-	-	-	0	0	-	-
Stage 2				439	299	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				~ 40	0	643	477	-	-	-	-	-
Mov Cap-2 Maneuver				~ 40	0	-	-	-	-	-	-	-
Stage 1				181	0	-	-	-	-	-	-	-
Stage 2				439	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				49.6		9.1		0				
HCM LOS				E								
Minor Lane/Major Mvmt		NBL	NBTWBLn1WBLn2		SBT	SBR						
Capacity (veh/h)		477	-	40	643	-	-					
HCM Lane V/C Ratio		0.604	-	1.06	0.538	-	-					
HCM Control Delay (s)		23.4	-\$	316.1	16.9	-	-					
HCM Lane LOS		C	-	F	C	-	-					
HCM 95th %tile Q(veh)		3.9	-	4.1	3.2	-	-					
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon						

Lane Level of Service

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	C	C	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Sign Control.
 Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
 LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
 Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 3 [Dallas Rd / Trowbridge Blvd (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Dallas Rd														
3	L2	48	3.0	52	3.0	0.342	6.3	LOS A	1.8	45.0	0.35	0.21	0.35	34.3
8	T1	321	3.0	349	3.0	0.342	6.3	LOS A	1.8	45.0	0.35	0.21	0.35	34.2
18	R2	385	3.0	418	3.0	0.342	6.3	LOS A	1.8	45.0	0.35	0.21	0.35	33.3
Approach		754	3.0	820	3.0	0.342	6.3	LOS A	1.8	45.0	0.35	0.21	0.35	33.7
East: Trowbridge Blvd														
1	L2	936	3.0	1017	3.0	0.699	15.7	LOS C	9.1	234.1	0.79	1.03	1.46	28.5
6	T1	33	3.0	36	3.0	0.699	15.7	LOS C	9.1	234.1	0.79	1.03	1.46	29.0
16	R2	238	3.0	259	3.0	0.699	15.7	LOS C	9.1	234.1	0.79	1.03	1.46	28.2
Approach		1207	3.0	1312	3.0	0.699	15.7	LOS C	9.1	234.1	0.79	1.03	1.46	28.5
North: Dallas Rd														
7	L2	118	3.0	128	3.0	0.454	15.6	LOS C	2.1	54.8	0.76	0.87	1.13	29.1
4	T1	289	3.0	314	3.0	0.454	15.6	LOS C	2.1	54.8	0.76	0.87	1.13	29.9
14	R2	2	3.0	2	3.0	0.454	15.6	LOS C	2.1	54.8	0.76	0.87	1.13	29.4
Approach		409	3.0	445	3.0	0.454	15.6	LOS C	2.1	54.8	0.76	0.87	1.13	29.7
West: Trowbridge Blvd														
5	L2	5	3.0	5	3.0	0.117	14.7	LOS B	0.4	9.8	0.80	0.80	0.80	30.2
2	T1	8	3.0	9	3.0	0.117	14.7	LOS B	0.4	9.8	0.80	0.80	0.80	30.2
12	R2	18	3.0	20	3.0	0.117	14.7	LOS B	0.4	9.8	0.80	0.80	0.80	29.4
Approach		31	3.0	34	3.0	0.117	14.7	LOS B	0.4	9.8	0.80	0.80	0.80	29.7
All Vehicles		2401	3.0	2610	3.0	0.699	12.7	LOS B	9.1	234.1	0.65	0.74	1.05	30.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings

4: Dallas Rd & Ava Way

05/13/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	12	33	67	18	115	72	380	72	70	301	34
Future Volume (vph)	43	12	33	67	18	115	72	380	72	70	301	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		25			25			50			50	
Link Distance (ft)		233			2528			1047			11825	
Travel Time (s)		6.4			68.9			14.3			161.3	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
4: Dallas Rd & Ava Way

05/13/2021

Intersection												
Int Delay, s/veh	8.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	43	12	33	67	18	115	72	380	72	70	301	34
Future Vol, veh/h	43	12	33	67	18	115	72	380	72	70	301	34
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	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, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	47	13	36	73	20	125	78	413	78	76	327	37
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1189	1155	356	1140	1134	462	369	0	0	496	0	0
Stage 1	503	503	-	613	613	-	-	-	-	-	-	-
Stage 2	686	652	-	527	521	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	164	196	686	177	202	598	1184	-	-	1063	-	-
Stage 1	549	540	-	478	482	-	-	-	-	-	-	-
Stage 2	436	463	-	533	530	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	106	169	680	141	174	593	1179	-	-	1059	-	-
Mov Cap-2 Maneuver	106	169	-	141	174	-	-	-	-	-	-	-
Stage 1	511	499	-	445	448	-	-	-	-	-	-	-
Stage 2	306	431	-	454	490	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	39.2			29.7			1.1			1.5		
HCM LOS	E			D								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1179	-	-	106	376	141	447	1059	-	-		
HCM Lane V/C Ratio	0.066	-	-	0.441	0.13	0.516	0.323	0.072	-	-		
HCM Control Delay (s)	8.3	-	-	63.4	16	55	16.9	8.7	-	-		
HCM Lane LOS	A	-	-	F	C	F	C	A	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	1.9	0.4	2.5	1.4	0.2	-	-		

Lanes, Volumes, Timings

5: Dallas Rd & Arena Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	16	0	120	1	10	1	471	139	11	303	4
Future Volume (vph)	6	16	0	120	1	10	1	471	139	11	303	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			4%			-5%			4%	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		259			1543			11825			569	
Travel Time (s)		7.1			42.1			230.4			11.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
5: Dallas Rd & Arena Rd

05/12/2021

Intersection												
Int Delay, s/veh	8.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	6	16	0	120	1	10	1	471	139	11	303	4
Future Vol, veh/h	6	16	0	120	1	10	1	471	139	11	303	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	4	-	-	-5	-	-	4	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	7	17	0	130	1	11	1	512	151	12	329	4

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	951	1020	331	954	947	588	333	0	0	663	0	0
Stage 1	355	355	-	590	590	-	-	-	-	-	-	-
Stage 2	596	665	-	364	357	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.93	7.33	6.63	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.93	6.33	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.93	6.33	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	239	236	708	192	211	475	1221	-	-	921	-	-
Stage 1	660	628	-	432	433	-	-	-	-	-	-	-
Stage 2	488	456	-	602	579	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	230	232	708	179	207	475	1221	-	-	921	-	-
Mov Cap-2 Maneuver	230	232	-	179	207	-	-	-	-	-	-	-
Stage 1	659	618	-	432	433	-	-	-	-	-	-	-
Stage 2	475	456	-	576	570	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	22.4		67.1		0		0.3	
HCM LOS	C		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1221	-	-	231	188	921	-
HCM Lane V/C Ratio	0.001	-	-	0.104	0.757	0.013	-
HCM Control Delay (s)	8	0	-	22.4	67.1	9	0
HCM Lane LOS	A	A	-	C	F	A	A
HCM 95th %tile Q(veh)	0	-	-	0.3	5	0	-

Lanes, Volumes, Timings

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	122	24	93	71	28	25	190	251	31	192	28
Future Volume (vph)	20	122	24	93	71	28	25	190	251	31	192	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		896			1478			569			1455	
Travel Time (s)		15.3			25.2			11.1			28.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th AWSC
6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

Intersection	
Intersection Delay, s/veh	16.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	122	24	93	71	28	25	190	251	31	192	28
Future Vol, veh/h	20	122	24	93	71	28	25	190	251	31	192	28
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	21	126	25	96	73	29	26	196	259	32	198	29
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	12.6	11.8	22.5	13.4
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	43%	0%	84%	0%	72%	0%	87%
Vol Right, %	0%	57%	0%	16%	0%	28%	0%	13%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	25	441	20	146	93	99	31	220
LT Vol	25	0	20	0	93	0	31	0
Through Vol	0	190	0	122	0	71	0	192
RT Vol	0	251	0	24	0	28	0	28
Lane Flow Rate	26	455	21	151	96	102	32	227
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.048	0.734	0.044	0.296	0.204	0.197	0.063	0.413
Departure Headway (Hd)	6.831	5.919	7.712	7.082	7.655	6.941	7.15	6.549
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	527	614	466	509	471	518	504	553
Service Time	4.531	3.619	5.432	4.802	5.373	4.659	4.85	4.249
HCM Lane V/C Ratio	0.049	0.741	0.045	0.297	0.204	0.197	0.063	0.41
HCM Control Delay	9.9	23.2	10.8	12.8	12.3	11.4	10.3	13.8
HCM Lane LOS	A	C	B	B	B	B	B	B
HCM 95th-tile Q	0.2	6.3	0.1	1.2	0.8	0.7	0.2	2

Lanes, Volumes, Timings

7: Bombing Range Rd & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	469	79	16	271	240	71	150	24	438	181	16
Future Volume (vph)	19	469	79	16	271	240	71	150	24	438	181	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	175		225	100		0	175		0
Storage Lanes	1		1	1		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			45			30			30	
Link Distance (ft)		538			3222			1455			437	
Travel Time (s)		12.2			48.8			33.1			9.9	
Confl. Peds. (#/hr)						1						
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
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases	7	4	1	3	8	5	1	6		5	2	
Permitted Phases			4			8						
Detector Phase	7	4	1	3	8	5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	20.0	9.0	9.0	20.0	9.0	9.0	20.0		9.0	20.0	
Total Split (s)	9.0	20.0	15.0	9.0	20.0	71.0	15.0	20.0		71.0	76.0	
Total Split (%)	7.5%	16.7%	12.5%	7.5%	16.7%	59.2%	12.5%	16.7%		59.2%	63.3%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	None	None	C-Max	None	None	Max		None	Max	

Intersection Summary

Area Type: Other

Cycle Length: 120

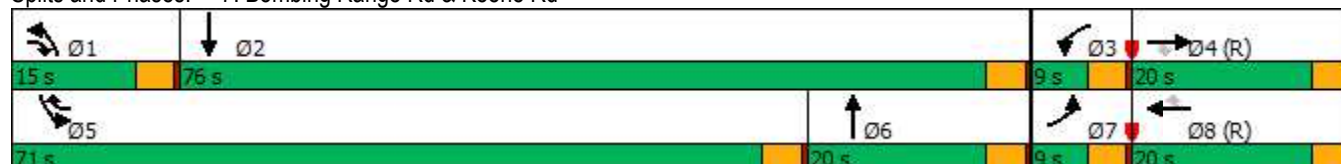
Actuated Cycle Length: 120

Offset: 71 (59%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 7: Bombing Range Rd & Keene Rd



HCM 6th Signalized Intersection Summary

7: Bombing Range Rd & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	469	79	16	271	240	71	150	24	438	181	16
Future Volume (veh/h)	19	469	79	16	271	240	71	150	24	438	181	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	20	499	84	17	288	255	76	160	26	466	193	17
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	29	696	397	25	690	563	97	765	124	559	1009	89
Arrive On Green	0.02	0.20	0.20	0.01	0.20	0.20	0.05	0.49	0.49	0.16	0.60	0.60
Sat Flow, veh/h	1767	3526	1572	1767	3526	1568	1767	1557	253	3428	1681	148
Grp Volume(v), veh/h	20	499	84	17	288	255	76	0	186	466	0	210
Grp Sat Flow(s),veh/h/ln	1767	1763	1572	1767	1763	1568	1767	0	1810	1714	0	1829
Q Serve(g_s), s	1.4	15.9	5.1	1.1	8.6	14.9	5.1	0.0	7.0	15.8	0.0	6.2
Cycle Q Clear(g_c), s	1.4	15.9	5.1	1.1	8.6	14.9	5.1	0.0	7.0	15.8	0.0	6.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.14	1.00		0.08
Lane Grp Cap(c), veh/h	29	696	397	25	690	563	97	0	890	559	0	1097
V/C Ratio(X)	0.70	0.72	0.21	0.67	0.42	0.45	0.78	0.00	0.21	0.83	0.00	0.19
Avail Cap(c_a), veh/h	74	696	397	74	690	563	162	0	890	1914	0	1097
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.98	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	58.7	45.0	35.4	58.8	42.3	29.5	56.0	0.0	17.3	48.6	0.0	10.8
Incr Delay (d2), s/veh	26.3	6.2	1.2	25.6	1.8	2.6	12.9	0.0	0.5	3.3	0.0	0.4
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	0.8	7.5	2.0	0.7	3.8	5.8	2.6	0.0	3.1	7.0	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.0	51.3	36.7	84.4	44.1	32.0	68.9	0.0	17.8	52.0	0.0	11.2
LnGrp LOS	F	D	D	F	D	C	E	A	B	D	A	B
Approach Vol, veh/h		603			560			262			676	
Approach Delay, s/veh		50.3			39.8			32.6			39.3	
Approach LOS		D			D			C			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.6	76.0	5.7	27.7	23.6	63.0	5.9	27.5				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	11.0	72.0	5.0	16.0	67.0	16.0	5.0	16.0				
Max Q Clear Time (g_c+I1), s	7.1	8.2	3.1	17.9	17.8	9.0	3.4	16.9				
Green Ext Time (p_c), s	0.0	1.4	0.0	0.0	1.8	0.5	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			41.8									
HCM 6th LOS			D									

Lanes, Volumes, Timings

8: Arena Rd/E Mountain Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	412	1	173	232	1	0	0	199	6	0	5
Future Volume (vph)	1	412	1	173	232	1	0	0	199	6	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1478			1363			1543			354	
Travel Time (s)		25.2			23.2			42.1			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
8: Arena Rd/E Mountain Rd & Kennedy Rd

05/12/2021

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	412	1	173	232	1	0	0	199	6	0	5
Future Vol, veh/h	1	412	1	173	232	1	0	0	199	6	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	1	448	1	188	252	1	0	0	216	7	0	5
Major/Minor	Major1		Major2			Minor1			Minor2			
Conflicting Flow All	253	0	0	449	0	0	1082	1080	449	1188	1080	253
Stage 1	-	-	-	-	-	-	451	451	-	629	629	-
Stage 2	-	-	-	-	-	-	631	629	-	559	451	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	1306	-	-	1106	-	-	194	217	608	164	217	783
Stage 1	-	-	-	-	-	-	586	569	-	469	474	-
Stage 2	-	-	-	-	-	-	467	474	-	512	569	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1306	-	-	1106	-	-	163	174	608	90	174	783
Mov Cap-2 Maneuver	-	-	-	-	-	-	163	174	-	90	174	-
Stage 1	-	-	-	-	-	-	585	568	-	469	380	-
Stage 2	-	-	-	-	-	-	372	380	-	330	568	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	0		3.8			14.2			30.9			
HCM LOS						B			D			
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	608	1306	-	-	1106	-	-	151				
HCM Lane V/C Ratio	0.356	0.001	-	-	0.17	-	-	0.079				
HCM Control Delay (s)	14.2	7.8	0	-	8.9	0	-	30.9				
HCM Lane LOS	B	A	A	-	A	A	-	D				
HCM 95th %tile Q(veh)	1.6	0	-	-	0.6	-	-	0.3				

Lanes, Volumes, Timings

9: Kennedy Rd & Keene Rd

05/12/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	669	40	269	426	14	28	194	406	10	138	135
Future Volume (vph)	77	669	40	269	426	14	28	194	406	10	138	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	260		0	375		0	160		0	0		330
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			40			40	
Link Distance (ft)		3222			2930			1363			832	
Travel Time (s)		48.8			44.4			23.2			14.2	
Confl. Peds. (#/hr)			1			2	2		7	7		2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			6			2	
Permitted Phases							6		6	2		2
Detector Phase	7	4		3	8		6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	16.0	44.0		36.0	64.0		40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	13.3%	36.7%		30.0%	53.3%		33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	5.0	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.0	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	-1.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	4.0
Lead/Lag	Lead	Lead		Lag	Lag							
Lead-Lag Optimize?		Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

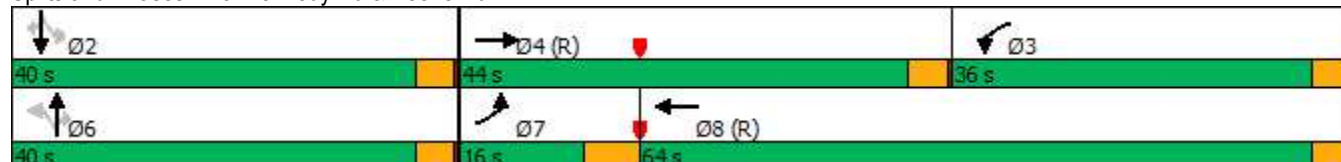
Actuated Cycle Length: 120

Offset: 8 (7%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 9: Kennedy Rd & Keene Rd



HCM 6th Signalized Intersection Summary

9: Kennedy Rd & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	669	40	269	426	14	28	194	406	10	138	135
Future Volume (veh/h)	77	669	40	269	426	14	28	194	406	10	138	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	81	704	42	283	448	15	29	204	427	11	145	142
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	116	1127	67	490	1896	63	73	470	452	48	500	452
Arrive On Green	0.07	0.33	0.33	0.55	1.00	1.00	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1767	3380	202	1767	3481	116	135	1624	1561	54	1728	1561
Grp Volume(v), veh/h	81	367	379	283	227	236	233	0	427	156	0	142
Grp Sat Flow(s),veh/h/ln	1767	1763	1819	1767	1763	1834	1759	0	1561	1782	0	1561
Q Serve(g_s), s	5.4	21.0	21.1	12.6	0.0	0.0	0.0	0.0	32.1	0.0	0.0	8.5
Cycle Q Clear(g_c), s	5.4	21.0	21.1	12.6	0.0	0.0	12.2	0.0	32.1	7.8	0.0	8.5
Prop In Lane	1.00		0.11	1.00		0.06	0.12		1.00	0.07		1.00
Lane Grp Cap(c), veh/h	116	588	606	490	960	999	543	0	452	548	0	452
V/C Ratio(X)	0.70	0.62	0.63	0.58	0.24	0.24	0.43	0.00	0.95	0.28	0.00	0.31
Avail Cap(c_a), veh/h	177	588	606	490	960	999	561	0	468	566	0	468
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.57	0.57	0.57	0.94	0.94	0.94	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.9	33.7	33.7	22.1	0.0	0.0	34.6	0.0	41.7	33.1	0.0	33.3
Incr Delay (d2), s/veh	1.6	2.9	2.8	1.6	0.5	0.5	0.5	0.0	27.8	0.3	0.0	0.4
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	9.1	9.4	4.2	0.1	0.1	5.5	0.0	15.3	3.5	0.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.5	36.5	36.5	23.7	0.5	0.5	35.2	0.0	69.5	33.4	0.0	33.7
LnGrp LOS	E	D	D	C	A	A	D	A	E	C	A	C
Approach Vol, veh/h	827			746			660			298		
Approach Delay, s/veh	38.5			9.3			57.4			33.5		
Approach LOS	D			A			E			C		
Timer - Assigned Phs	2		3	4		6		7	8			
Phs Duration (G+Y+Rc), s	38.7		37.3	44.0		38.7		11.9	69.4			
Change Period (Y+Rc), s	4.0		4.0	4.0		4.0		5.0	4.0			
Max Green Setting (Gmax), s	36.0		32.0	40.0		36.0		11.0	60.0			
Max Q Clear Time (g_c+I1), s	10.5		14.6	23.1		34.1		7.4	2.0			
Green Ext Time (p_c), s	1.3		0.7	3.9		0.6		0.0	2.6			
Intersection Summary												
HCM 6th Ctrl Delay	34.2											
HCM 6th LOS	C											

Lanes, Volumes, Timings

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	424	831	9	28	367	77	8	55	38	97	36	377
Future Volume (vph)	424	831	9	28	367	77	8	55	38	97	36	377
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	300		300	65		0	250		0
Storage Lanes	2		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			25			35	
Link Distance (ft)		2930			4647			563			1514	
Travel Time (s)		44.4			70.4			15.4			29.5	
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov
Protected Phases	7	4		3	8	5	1	6		5	2	7
Permitted Phases				4		8	2			6		2
Detector Phase	7	4		3	8	5	1	6		5	2	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0	9.0	9.0	20.0		9.0	20.0	9.0
Total Split (s)	41.0	67.0		11.0	37.0	17.0	11.0	25.0		17.0	31.0	41.0
Total Split (%)	34.2%	55.8%		9.2%	30.8%	14.2%	9.2%	20.8%		14.2%	25.8%	34.2%
Yellow Time (s)	5.0	3.5		5.0	3.5	5.0	5.0	3.5		5.0	3.5	5.0
All-Red Time (s)	0.0	0.5		0.0	0.5	0.0	0.0	0.5		0.0	0.5	0.0
Lost Time Adjust (s)	-1.0	0.0		-1.0	0.0	0.0	0.0	0.0		-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0	5.0	5.0	4.0		4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?		Yes			Yes			Yes			Yes	
Recall Mode	None	C-Max		None	C-Max	None	None	None		None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

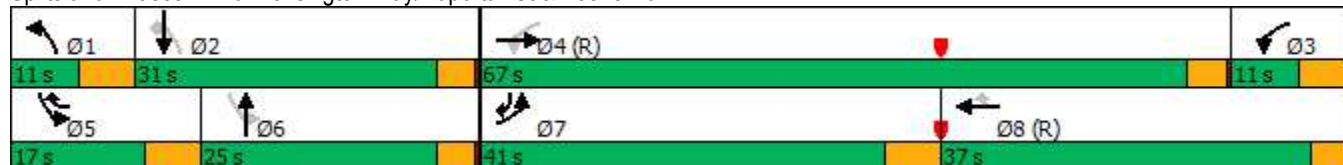
Actuated Cycle Length: 120

Offset: 82 (68%), Referenced to phase 4:EBWB and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 10: Kensington Way/Duportail St & Keene Rd



HCM 6th Signalized Intersection Summary

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 						 	
Traffic Volume (veh/h)	424	831	9	28	367	77	8	55	38	97	36	377
Future Volume (veh/h)	424	831	9	28	367	77	8	55	38	97	36	377
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	461	903	10	30	399	84	9	60	41	105	39	410
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	526	1875	21	560	1632	826	270	176	120	349	417	582
Arrive On Green	0.31	1.00	1.00	0.10	0.46	0.46	0.01	0.17	0.17	0.07	0.23	0.23
Sat Flow, veh/h	3428	3572	40	1767	3526	1572	1767	1026	701	1767	1856	1570
Grp Volume(v), veh/h	461	446	467	30	399	84	9	0	101	105	39	410
Grp Sat Flow(s),veh/h/ln	1714	1763	1848	1767	1763	1572	1767	0	1728	1767	1856	1570
Q Serve(g_s), s	15.3	0.0	0.0	0.0	8.2	3.2	0.5	0.0	6.2	5.7	2.0	26.7
Cycle Q Clear(g_c), s	15.3	0.0	0.0	0.0	8.2	3.2	0.5	0.0	6.2	5.7	2.0	26.7
Prop In Lane	1.00		0.02	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	526	925	970	560	1632	826	270	0	296	349	417	582
V/C Ratio(X)	0.88	0.48	0.48	0.05	0.24	0.10	0.03	0.00	0.34	0.30	0.09	0.70
Avail Cap(c_a), veh/h	1057	925	970	560	1632	826	343	0	302	416	417	582
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	0.82	0.95	0.95	0.95	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.5	0.0	0.0	8.5	19.5	14.3	35.4	0.0	43.7	36.0	36.8	32.2
Incr Delay (d2), s/veh	1.5	1.5	1.4	0.0	0.3	0.2	0.0	0.0	0.7	0.2	0.1	3.9
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	0.4	0.4	0.3	3.3	1.1	0.2	0.0	2.7	2.5	0.9	10.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.0	1.5	1.4	8.5	19.9	14.5	35.5	0.0	44.4	36.2	36.9	36.1
LnGrp LOS	D	A	A	A	B	B	D	A	D	D	D	D
Approach Vol, veh/h		1374			513			110			554	
Approach Delay, s/veh		15.1			18.3			43.7			36.2	
Approach LOS		B			B			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.0	31.0	16.0	67.0	12.5	24.6	22.4	60.5				
Change Period (Y+Rc), s	5.0	4.0	5.0	4.0	5.0	4.0	5.0	* 5				
Max Green Setting (Gmax), s	6.0	27.0	6.0	63.0	12.0	21.0	36.0	* 33				
Max Q Clear Time (g_c+I1), s	2.5	28.7	2.0	2.0	7.7	8.2	17.3	10.2				
Green Ext Time (p_c), s	0.0	0.0	0.0	6.1	0.0	0.4	0.1	2.6				

Intersection Summary

HCM 6th Ctrl Delay	21.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings

11: Duportail St & Queensgate Dr

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	167	11	490	133	223	13	388	365	214	387	68
Future Volume (vph)	113	167	11	490	133	223	13	388	365	214	387	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	200		125	200		250	200		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			35	
Link Distance (ft)		1398			1249			1078			1088	
Travel Time (s)		31.8			28.4			24.5			21.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	D.P+P	NA	pt+ov	Prot	NA	
Protected Phases	7	4		3	8	8 5	1	6	6 3	5	2	
Permitted Phases							2					
Detector Phase	7	4		3	8	8 5	1	6	6 3	5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	35.0		30.0	30.0		9.0	35.0		9.0	35.0	
Total Split (s)	19.0	35.0		30.0	46.0		9.0	35.0		20.0	46.0	
Total Split (%)	15.8%	29.2%		25.0%	38.3%		7.5%	29.2%		16.7%	38.3%	
Yellow Time (s)	5.0	4.0		4.0	4.0		5.0	4.0		5.0	4.0	
All-Red Time (s)	0.0	1.0		1.0	1.0		0.0	1.0		0.0	1.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	None		None	None	

Intersection Summary

Area Type: Other

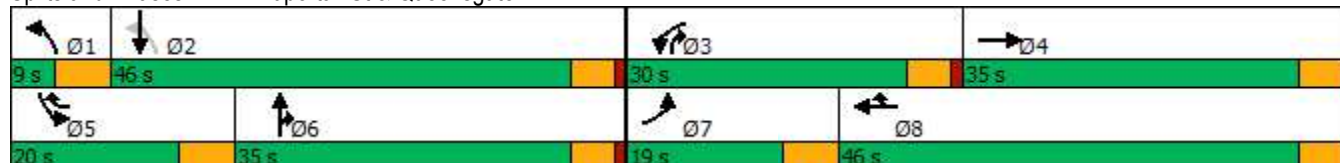
Cycle Length: 120

Actuated Cycle Length: 76.6

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Splits and Phases: 11: Duportail St & Queensgate Dr



HCM 6th Signalized Intersection Summary

11: Duportail St & Queensgate Dr

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	167	11	490	133	223	13	388	365	214	387	68
Future Volume (veh/h)	113	167	11	490	133	223	13	388	365	214	387	68
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	123	182	12	533	145	242	14	422	397	233	421	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	204	403	26	818	451	668	476	1017	829	321	1284	224
Arrive On Green	0.12	0.12	0.11	0.24	0.24	0.24	0.04	0.29	0.29	0.18	0.43	0.41
Sat Flow, veh/h	1767	3359	220	3428	1856	1572	1767	3526	1572	1767	3000	524
Grp Volume(v), veh/h	123	95	99	533	145	242	14	422	397	233	246	249
Grp Sat Flow(s),veh/h/ln	1767	1763	1816	1714	1856	1572	1767	1763	1572	1767	1763	1761
Q Serve(g_s), s	4.6	3.5	3.6	9.8	4.5	7.3	0.3	6.8	11.2	8.7	6.5	6.6
Cycle Q Clear(g_c), s	4.6	3.5	3.6	9.8	4.5	7.3	0.3	6.8	11.2	8.7	6.5	6.6
Prop In Lane	1.00		0.12	1.00		1.00	1.00		1.00	1.00		0.30
Lane Grp Cap(c), veh/h	204	211	218	818	451	668	476	1017	829	321	755	754
V/C Ratio(X)	0.60	0.45	0.46	0.65	0.32	0.36	0.03	0.41	0.48	0.73	0.33	0.33
Avail Cap(c_a), veh/h	403	805	829	1320	1138	1250	552	1609	1093	429	1081	1080
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.5	28.7	28.8	24.1	21.8	13.7	10.2	20.2	10.5	27.0	13.3	13.5
Incr Delay (d2), s/veh	1.1	0.6	0.6	0.3	0.2	0.1	0.0	0.1	0.2	2.3	0.1	0.1
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	1.5	1.5	3.8	1.9	2.4	0.1	2.6	3.4	3.7	2.3	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.5	29.2	29.3	24.4	21.9	13.8	10.2	20.3	10.6	29.4	13.4	13.6
LnGrp LOS	C	C	C	C	C	B	B	C	B	C	B	B
Approach Vol, veh/h		317			920			833			728	
Approach Delay, s/veh		29.8			21.2			15.5			18.6	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.0	33.0	19.7	11.4	15.7	23.2	11.1	20.0				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	4.0	41.0	25.0	30.0	15.0	30.0	14.0	41.0				
Max Q Clear Time (g_c+I1), s	2.3	8.6	11.8	5.6	10.7	13.2	6.6	9.3				
Green Ext Time (p_c), s	0.0	2.7	2.9	1.0	0.1	5.0	0.1	0.7				

Intersection Summary

HCM 6th Ctrl Delay 19.8

HCM 6th LOS B

Notes

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

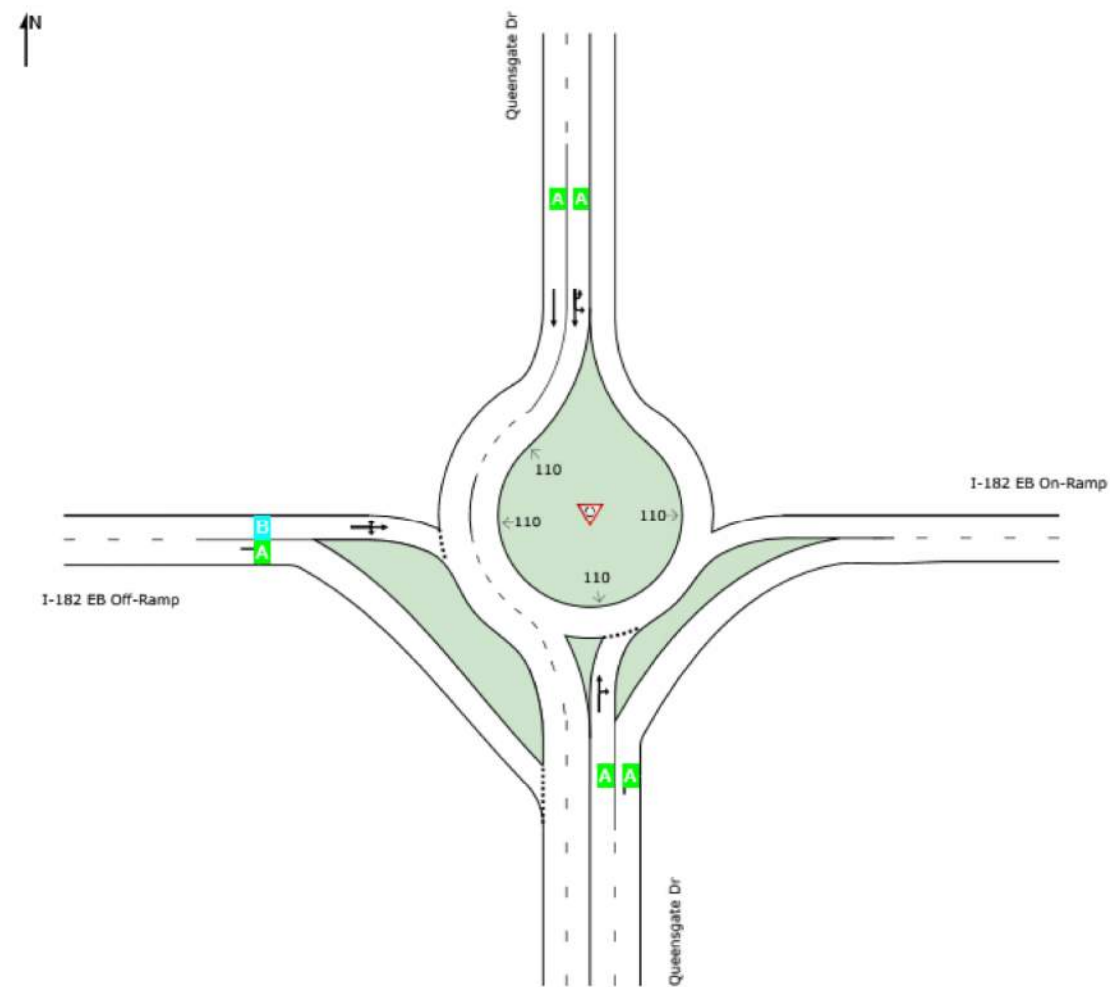
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	North	West	
LOS	A	A	B	A



Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used).
Delay Model: SIDRA Standard (Geometric Delay is included).

MOVEMENT SUMMARY

 **Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Queensgate Dr														
8	T1	260	3.0	283	3.0	0.596	9.7	LOS A	6.0	153.4	0.83	0.91	1.05	35.1
18	R2	1236	3.0	1343	3.0	0.596	5.4	LOS A	6.0	153.4	0.23	0.56	0.29	36.2
Approach		1496	3.0	1626	3.0	0.596	6.1	LOS A	6.0	153.4	0.33	0.62	0.42	36.0
North: Queensgate Dr														
7u	U	6	3.0	7	3.0	0.428	12.5	LOS B	0.0	0.0	0.00	0.66	0.00	36.1
7	L2	573	3.0	623	3.0	0.428	9.9	LOS A	0.0	0.0	0.00	0.66	0.00	35.1
4	T1	648	3.0	704	3.0	0.425	4.1	LOS A	0.0	0.0	0.00	0.38	0.00	38.2
Approach		1227	3.0	1334	3.0	0.428	6.8	LOS A	0.0	0.0	0.00	0.52	0.00	36.7
West: I-182 EB Off-Ramp														
5	L2	81	3.0	88	3.0	0.095	12.5	LOS B	0.3	8.3	0.53	0.81	0.53	34.1
2	T1	4	3.0	4	3.0	0.095	6.3	LOS A	0.3	8.3	0.53	0.81	0.53	33.9
12	R2	54	3.0	59	3.0	0.060	6.6	LOS A	0.3	6.9	0.53	0.62	0.53	35.4
Approach		139	3.0	151	3.0	0.095	10.0	LOS B	0.3	8.3	0.53	0.74	0.53	34.5
All Vehicles		2862	3.0	3111	3.0	0.596	6.6	LOS A	6.0	153.4	0.20	0.58	0.25	36.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - Roundabout Analysis.sip9

Lanes, Volumes, Timings
14: Queensgate Dr & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	497	405	85	10	199	545	125	214	22	338	106	103
Future Volume (vph)	497	405	85	10	199	545	125	214	22	338	106	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350		250	150		175	100		0	200		200
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	1819	0	3400	1845	1568
Flt Permitted	0.544			0.450			0.950			0.950		
Satd. Flow (perm)	1002	3505	1568	830	3505	1568	1752	1819	0	3400	1845	1546
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			92			494		4				112
Link Speed (mph)		45			45			30			35	
Link Distance (ft)		4647			3045			8170			1355	
Travel Time (s)		70.4			46.1			185.7			26.4	
Confl. Peds. (#/hr)	1					1						1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	540	440	92	11	216	592	136	257	0	367	115	112
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA	custom	Prot	NA		Prot	NA	pm+ov
Protected Phases	7!	4	1	3	8	2 6 14!	1	6!		5	2	7
Permitted Phases	8		4	4								2
Detector Phase	7	4	1	3	8	2 6 14	1	6		5	2	7
Switch Phase												
Minimum Initial (s)	4.0	8.0	4.0	4.0	8.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.5	22.0	19.0	9.0	30.0		19.0	20.0		8.5	20.0	8.5
Total Split (s)	38.0	61.0	19.0	9.0	32.0		19.0	28.0		22.0	31.0	38.0
Total Split (%)	31.7%	50.8%	15.8%	7.5%	26.7%		15.8%	23.3%		18.3%	25.8%	31.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	0.5
Lost Time Adjust (s)	0.0	-2.0	0.0	0.0	-2.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	2.0	4.0	4.0	2.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?		Yes								Yes		
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	None
Act Effect Green (s)	65.6	69.8	84.3	71.8	38.2	90.7	13.3	21.7		16.7	25.1	54.6
Actuated g/C Ratio	0.55	0.58	0.70	0.60	0.32	0.76	0.11	0.18		0.14	0.21	0.46
v/c Ratio	0.74	0.22	0.08	0.02	0.19	0.45	0.70	0.77		0.78	0.30	0.15
Control Delay	33.4	10.5	2.4	11.5	29.1	2.6	70.8	61.9		61.7	41.5	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	33.4	10.5	2.4	11.5	29.1	2.6	70.8	61.9		61.7	41.5	1.9
LOS	C	B	A	B	C	A	E	E		E	D	A
Approach Delay		21.3			9.7			65.0			46.5	
Approach LOS		C			A			E			D	

Intersection Summary

Area Type: Other

Cycle Length: 120

Lanes, Volumes, Timings
14: Queensgate Dr & Keene Rd

05/12/2021

Lane Group	Ø14	Ø15
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	14	15
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	22.0	48.0
Total Split (%)	18%	40%
Yellow Time (s)	5.0	5.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?		
Recall Mode	Ped	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Intersection Summary		

Lanes, Volumes, Timings

14: Queensgate Dr & Keene Rd

05/12/2021

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 4:EBWB and 8:EBWB, Start of Green, Master Intersection

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 29.2

Intersection LOS: C

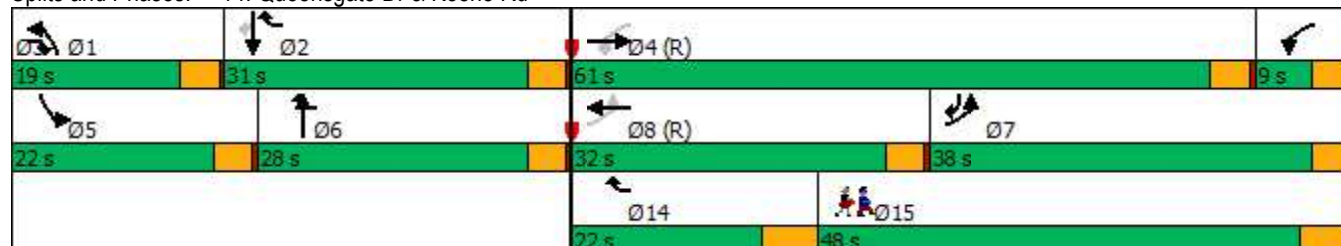
Intersection Capacity Utilization 84.0%

ICU Level of Service E

Analysis Period (min) 15

! Phase conflict between lane groups.

Splits and Phases: 14: Queensgate Dr & Keene Rd



Lanes, Volumes, Timings

15: N Bermuda Rd/Queensgate Dr & Gage Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	157	294	10	25	147	25	10	125	25	10	75	109
Future Volume (vph)	157	294	10	25	147	25	10	125	25	10	75	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)	30			40			30			30		
Link Distance (ft)	2592			6334			551			8170		
Travel Time (s)	58.9			108.0			12.5			185.7		
Peak Hour Factor	0.90	0.90	0.90	0.92	0.90	0.92	0.90	0.92	0.92	0.92	0.92	0.90
Heavy Vehicles (%)	2%	2%	2%	3%	2%	3%	2%	3%	3%	3%	3%	2%
Shared Lane Traffic (%)												
Sign Control	Stop			Stop			Stop			Stop		

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th AWSC
15: N Bermuda Rd/Queensgate Dr & Gage Blvd

05/12/2021

Intersection

Intersection Delay, s/veh	14
Intersection LOS	B

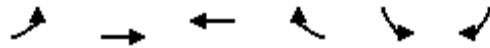
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	157	294	10	25	147	25	10	125	25	10	75	109
Future Vol, veh/h	157	294	10	25	147	25	10	125	25	10	75	109
Peak Hour Factor	0.90	0.90	0.90	0.92	0.90	0.92	0.90	0.92	0.92	0.92	0.92	0.90
Heavy Vehicles, %	2	2	2	3	2	3	2	3	3	3	3	2
Mvmt Flow	174	327	11	27	163	27	11	136	27	11	82	121
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	15.6	12.5	12.7	13
HCM LOS	C	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	83%	0%	97%	0%	85%	0%	41%
Vol Right, %	0%	17%	0%	3%	0%	15%	0%	59%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	10	150	157	304	25	172	10	184
LT Vol	10	0	157	0	25	0	10	0
Through Vol	0	125	0	294	0	147	0	75
RT Vol	0	25	0	10	0	25	0	109
Lane Flow Rate	11	163	174	338	27	191	11	203
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.023	0.313	0.324	0.578	0.054	0.346	0.023	0.368
Departure Headway (Hd)	7.522	6.91	6.695	6.165	7.163	6.533	7.471	6.538
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	473	517	534	581	497	547	477	547
Service Time	5.312	4.699	4.467	3.937	4.95	4.319	5.258	4.324
HCM Lane V/C Ratio	0.023	0.315	0.326	0.582	0.054	0.349	0.023	0.371
HCM Control Delay	10.5	12.9	12.7	17.1	10.4	12.8	10.4	13.1
HCM Lane LOS	B	B	B	C	B	B	B	B
HCM 95th-tile Q	0.1	1.3	1.4	3.7	0.2	1.5	0.1	1.7

Lanes, Volumes, Timings
16: Gage Blvd & Keene Rd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø6
Lane Configurations							
Traffic Volume (vph)	46	348	247	519	537	28	
Future Volume (vph)	46	348	247	519	537	28	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Grade (%)		-3%	3%		0%		
Storage Length (ft)	200			0	0	100	
Storage Lanes	1			1	2	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1779	3557	1817	1544	3400	1568	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1779	3557	1817	1544	3400	1568	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				564		22	
Link Speed (mph)		40	40		45		
Link Distance (ft)		805	874		1238		
Travel Time (s)		13.7	14.9		18.8		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	50	378	268	564	584	30	
Turn Type	Prot	NA	NA	pt+ov	Prot	Prot	
Protected Phases	7	4	8	8 5	5	5	6
Permitted Phases							
Detector Phase	7	4	8	8 5	5	5	
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0	27.0		20.0	20.0	27.0
Total Split (s)	14.0	52.0	38.0		41.0	41.0	27.0
Total Split (%)	11.7%	43.3%	31.7%		34.2%	34.2%	23%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0	4.0
All-Red Time (s)	0.0	0.0	0.0		0.0	0.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0	
Lead/Lag	Lag		Lead		Lag	Lag	Lead
Lead-Lag Optimize?							
Recall Mode	None	None	None		C-Max	C-Max	None
Act Effect Green (s)	7.5	31.7	21.9	101.7	74.9	74.9	
Actuated g/C Ratio	0.06	0.26	0.18	0.85	0.62	0.62	
v/c Ratio	0.45	0.40	0.81	0.40	0.28	0.03	
Control Delay	66.2	36.1	57.8	3.2	12.9	7.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	66.2	36.1	57.8	3.2	12.9	7.9	
LOS	E	D	E	A	B	A	
Approach Delay		39.7	20.8		12.7		
Approach LOS		D	C		B		

Intersection Summary

Area Type: Other
Cycle Length: 120

Lanes, Volumes, Timings

16: Gage Blvd & Keene Rd

05/12/2021

Actuated Cycle Length: 120

Offset: 79 (66%), Referenced to phase 5:SBL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 22.4

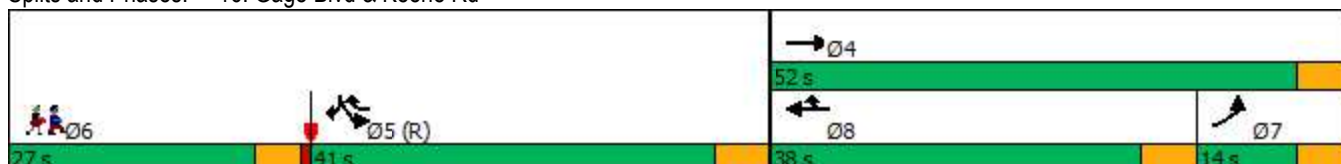
Intersection LOS: C

Intersection Capacity Utilization 42.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 16: Gage Blvd & Keene Rd



Lanes, Volumes, Timings

17: Leslie Rd & Gage Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	655	141	58	457	82	296	282	152	108	233	134
Future Volume (vph)	121	655	141	58	457	82	296	282	152	108	233	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	350		0	200		275	200		200
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		874			3504			345			536	
Travel Time (s)		14.9			59.7			6.7			10.4	
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
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6		6	2		2
Detector Phase	7	4		3	8		1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0		9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	16.0	50.0		10.0	44.0		29.0	50.0	50.0	10.0	31.0	31.0
Total Split (%)	13.3%	41.7%		8.3%	36.7%		24.2%	41.7%	41.7%	8.3%	25.8%	25.8%
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

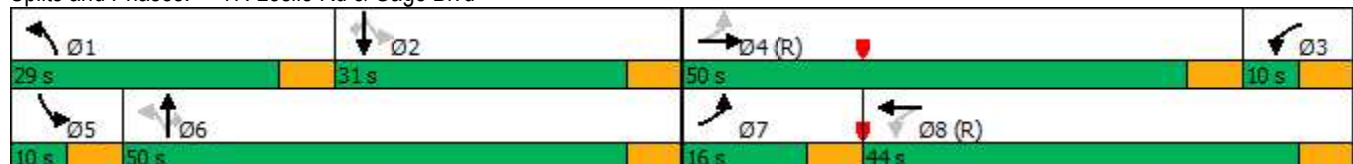
Actuated Cycle Length: 120

Offset: 118 (98%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 17: Leslie Rd & Gage Blvd



HCM 6th Signalized Intersection Summary

17: Leslie Rd & Gage Blvd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	655	141	58	457	82	296	282	152	108	233	134
Future Volume (veh/h)	121	655	141	58	457	82	296	282	152	108	233	134
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	129	697	150	62	486	87	315	300	162	115	248	143
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	334	1106	238	499	1398	249	384	511	433	273	291	234
Arrive On Green	0.15	0.77	0.75	0.16	0.47	0.46	0.17	0.28	0.28	0.05	0.16	0.15
Sat Flow, veh/h	1767	2886	621	1767	2990	532	1767	1856	1572	1767	1856	1572
Grp Volume(v), veh/h	129	426	421	62	285	288	315	300	162	115	248	143
Grp Sat Flow(s),veh/h/ln	1767	1763	1744	1767	1763	1760	1767	1856	1572	1767	1856	1572
Q Serve(g_s), s	6.0	13.1	13.3	0.0	12.3	12.5	17.1	16.8	10.0	6.0	15.6	7.4
Cycle Q Clear(g_c), s	6.0	13.1	13.3	0.0	12.3	12.5	17.1	16.8	10.0	6.0	15.6	7.4
Prop In Lane	1.00		0.36	1.00		0.30	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	334	676	668	499	824	823	384	511	433	273	291	234
V/C Ratio(X)	0.39	0.63	0.63	0.12	0.35	0.35	0.82	0.59	0.37	0.42	0.85	0.61
Avail Cap(c_a), veh/h	380	676	668	499	824	823	455	711	603	273	417	341
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.96	0.82	0.82	0.82	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.8	10.2	10.4	23.5	20.3	20.4	33.3	37.6	35.1	40.6	49.2	25.2
Incr Delay (d2), s/veh	0.3	4.2	4.3	0.0	0.9	1.0	8.5	0.4	0.2	0.4	8.0	1.0
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	2.3	3.8	3.9	1.1	5.1	5.2	8.1	7.6	3.8	2.9	7.8	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.1	14.4	14.7	23.5	21.2	21.4	41.8	38.0	35.3	41.0	57.2	26.2
LnGrp LOS	C	B	B	C	C	C	D	D	D	D	E	C
Approach Vol, veh/h		976			635			777			506	
Approach Delay, s/veh		16.0			21.5			39.0			44.8	
Approach LOS		B			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	24.2	22.8	23.0	50.0	10.0	37.0	12.9	60.1				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	24.0	26.0	5.0	45.0	5.0	45.0	11.0	39.0				
Max Q Clear Time (g_c+I1), s	19.1	17.6	2.0	15.3	8.0	18.8	8.0	14.5				
Green Ext Time (p_c), s	0.0	0.2	0.0	1.0	0.0	0.4	0.0	0.6				
Intersection Summary												
HCM 6th Ctrl Delay				28.4								
HCM 6th LOS				C								

Lanes, Volumes, Timings
18: Leslie Rd & Reata Rd

05/12/2021

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	206	517	375	300	394	123
Future Volume (vph)	206	517	375	300	394	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	0			285
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Link Speed (mph)	40			40	40	
Link Distance (ft)	5360			1600	7773	
Travel Time (s)	91.4			27.3	132.5	
Confl. Peds. (#/hr)		1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
18: Leslie Rd & Reata Rd

05/12/2021

Intersection

Int Delay, s/veh 32.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	206	517	375	300	394	123
Future Vol, veh/h	206	517	375	300	394	123
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	0	-	-	285
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	224	562	408	326	428	134

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1570	429	562	0	-	0
Stage 1	428	-	-	-	-	-
Stage 2	1142	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	~ 121	624	1004	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	303	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 72	623	1004	-	-	-
Mov Cap-2 Maneuver	~ 188	-	-	-	-	-
Stage 1	389	-	-	-	-	-
Stage 2	303	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	80.5	6.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1004	-	188	623	-	-
HCM Lane V/C Ratio	0.406	-	1.191	0.902	-	-
HCM Control Delay (s)	11	-	177.2	41.9	-	-
HCM Lane LOS	B	-	F	E	-	-
HCM 95th %tile Q(veh)	2	-	11.7	11.2	-	-

Notes

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

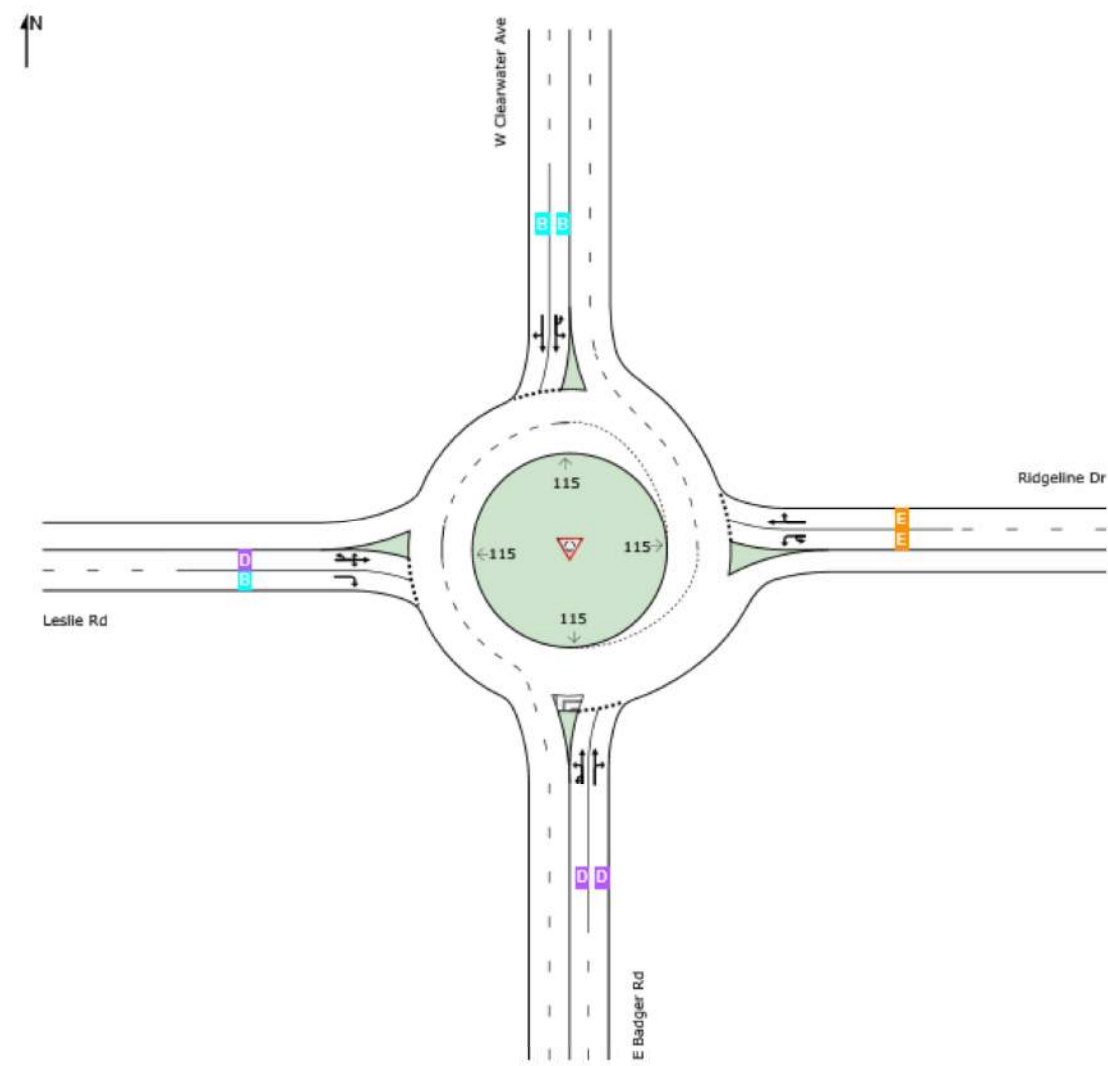
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	E	B	C	D



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: E Badger Rd														
3u	U	8	3.0	9	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.6
3	L2	257	3.0	289	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.2
8	T1	751	3.0	844	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.5
18	R2	93	3.0	104	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.1
Approach		1109	3.0	1246	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.4
East: Ridgeline Dr														
1u	U	1	3.0	1	3.0	0.699	42.4	LOS E	3.4	87.8	0.92	1.15	1.85	22.0
1	L2	169	3.0	190	3.0	0.699	42.4	LOS E	3.4	87.8	0.92	1.15	1.85	21.6
6	T1	123	3.0	138	3.0	0.753	42.1	LOS E	4.2	107.5	0.92	1.21	2.05	22.4
16	R2	94	3.0	106	3.0	0.753	42.1	LOS E	4.2	107.5	0.92	1.21	2.05	22.0
Approach		387	3.0	435	3.0	0.753	42.3	LOS E	4.2	107.5	0.92	1.19	1.96	21.9
North: W Clearwater Ave														
7u	U	5	3.0	6	3.0	0.486	12.0	LOS B	2.9	74.6	0.69	0.80	1.01	32.8
7	L2	30	3.0	34	3.0	0.486	12.0	LOS B	2.9	74.6	0.69	0.80	1.01	31.9
4	T1	367	3.0	412	3.0	0.486	11.8	LOS B	2.9	75.0	0.69	0.79	1.00	31.9
14	R2	254	3.0	285	3.0	0.486	11.2	LOS B	2.9	75.0	0.67	0.78	0.98	31.2
Approach		656	3.0	737	3.0	0.486	11.6	LOS B	2.9	75.0	0.68	0.79	0.99	31.6
West: Leslie Rd														
5u	U	1	3.0	1	3.0	0.848	28.8	LOS D	13.2	339.0	0.93	1.47	2.52	25.5
5	L2	451	3.0	507	3.0	0.848	28.8	LOS D	13.2	339.0	0.93	1.47	2.52	25.1
2	T1	136	3.0	153	3.0	0.848	28.8	LOS D	13.2	339.0	0.93	1.47	2.52	24.9
12	R2	354	3.0	398	3.0	0.563	14.3	LOS B	3.9	100.4	0.74	0.90	1.21	30.0
Approach		942	3.0	1058	3.0	0.848	23.4	LOS C	13.2	339.0	0.86	1.26	2.03	26.6
All Vehicles		3094	3.0	3476	3.0	0.872	26.9	LOS D	13.9	355.9	0.87	1.26	2.06	25.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings
20: E Badger Rd & I-82 WB Ramps

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	50	261	862	25	256	649
Future Volume (vph)	50	261	862	25	256	649
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%		-3%			3%
Storage Length (ft)	0	0		0	95	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	405		216			508
Travel Time (s)	9.2		2.9			6.9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
20: E Badger Rd & I-82 WB Ramps

05/12/2021

Intersection						
Int Delay, s/veh	61.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	50	261	862	25	256	649
Future Vol, veh/h	50	261	862	25	256	649
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	-	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-3	-	-3	-	-	3
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	54	284	937	27	278	705
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1860	951	0	0	964	0
Stage 1	951	-	-	-	-	-
Stage 2	909	-	-	-	-	-
Critical Hdwy	6.045	5.945	-	-	4.145	-
Critical Hdwy Stg 1	4.845	-	-	-	-	-
Critical Hdwy Stg 2	5.245	-	-	-	-	-
Follow-up Hdwy	3.5285	3.3285	-	-	2.2285	-
Pot Cap-1 Maneuver	98	338	-	-	707	-
Stage 1	436	-	-	-	-	-
Stage 2	410	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	59	338	-	-	707	-
Mov Cap-2 Maneuver	59	-	-	-	-	-
Stage 1	436	-	-	-	-	-
Stage 2	249	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	\$ 405		0		3.8	
HCM LOS	F					
Minor Lane/Major Mvmt			NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)			-	-	192	707
HCM Lane V/C Ratio			-	-	1.761	0.394
HCM Control Delay (s)			-	-	\$ 405	13.4
HCM Lane LOS			-	-	F	B
HCM 95th %tile Q(veh)			-	-	23.6	1.9
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Lanes, Volumes, Timings
21: E Badger Rd & I-82 EB Ramps

05/12/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	28	373	513	77	359	341
Future Volume (vph)	28	373	513	77	359	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%		3%			-3%
Storage Length (ft)	0	0		0	250	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	410		360			542
Travel Time (s)	9.3		4.9			7.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
21: E Badger Rd & I-82 EB Ramps

05/12/2021

Intersection						
Int Delay, s/veh	27					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	373	513	77	359	341
Future Vol, veh/h	28	373	513	77	359	341
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	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-5	-	3	-	-	-3
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	30	405	558	84	390	371
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1751	600	0	0	642	0
Stage 1	600	-	-	-	-	-
Stage 2	1151	-	-	-	-	-
Critical Hdwy	5.43	5.73	-	-	4.13	-
Critical Hdwy Stg 1	4.43	-	-	-	-	-
Critical Hdwy Stg 2	4.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	152	542	-	-	938	-
Stage 1	645	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	89	542	-	-	938	-
Mov Cap-2 Maneuver	89	-	-	-	-	-
Stage 1	645	-	-	-	-	-
Stage 2	241	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	103.6	0	5.9			
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	400	938	-	
HCM Lane V/C Ratio	-	-	1.09	0.416	-	
HCM Control Delay (s)	-	-	103.6	11.5	-	
HCM Lane LOS	-	-	F	B	-	
HCM 95th %tile Q(veh)	-	-	15.2	2.1	-	

Lanes, Volumes, Timings
22: Bermuda Rd & Reata Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	562	46	38	480	45	93	1	49	73	6	29
Future Volume (vph)	21	562	46	38	480	45	93	1	49	73	6	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		6954			5360			569			542	
Travel Time (s)		118.5			91.4			11.1			10.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

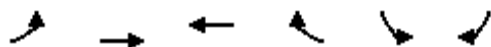
HCM 6th TWSC
22: Bermuda Rd & Reata Rd

05/12/2021

Intersection												
Int Delay, s/veh	22.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	562	46	38	480	45	93	1	49	73	6	29
Future Vol, veh/h	21	562	46	38	480	45	93	1	49	73	6	29
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	23	611	50	41	522	49	101	1	53	79	7	32
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	571	0	0	661	0	0	1330	1335	636	1338	1336	547
Stage 1	-	-	-	-	-	-	682	682	-	629	629	-
Stage 2	-	-	-	-	-	-	648	653	-	709	707	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	997	-	-	923	-	-	131	153	476	129	153	535
Stage 1	-	-	-	-	-	-	438	448	-	469	474	-
Stage 2	-	-	-	-	-	-	457	462	-	423	437	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	997	-	-	923	-	-	110	138	476	105	138	535
Mov Cap-2 Maneuver	-	-	-	-	-	-	110	138	-	105	138	-
Stage 1	-	-	-	-	-	-	422	431	-	452	443	-
Stage 2	-	-	-	-	-	-	396	432	-	361	421	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0.6			143.3			106.7		
HCM LOS							F			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	150	997	-	-	923	-	-	136				
HCM Lane V/C Ratio	1.036	0.023	-	-	0.045	-	-	0.863				
HCM Control Delay (s)	143.3	8.7	0	-	9.1	0	-	106.7				
HCM Lane LOS	F	A	A	-	A	A	-	F				
HCM 95th %tile Q(veh)	8	0.1	-	-	0.1	-	-	5.6				

Lanes, Volumes, Timings
23: Reata Rd & Gage Blvd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Traffic Volume (vph)	19	271	412	103	251	58
Future Volume (vph)	19	271	412	103	251	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	0			0	1	1
Taper Length (ft)	25				25	
Link Speed (mph)		40	40		30	
Link Distance (ft)		1666	6954		1188	
Travel Time (s)		28.4	118.5		27.0	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection

Int Delay, s/veh 13.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	19	271	412	103	251	58
Future Vol, veh/h	19	271	412	103	251	58
Conflicting Peds, #/hr	5	0	0	5	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	21	295	448	112	273	63

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	565	0	0 846 509
Stage 1	-	-	- 509 -
Stage 2	-	-	- 337 -
Critical Hdwy	4.13	-	- 6.43 6.23
Critical Hdwy Stg 1	-	-	- 5.43 -
Critical Hdwy Stg 2	-	-	- 5.43 -
Follow-up Hdwy	2.227	-	- 3.527 3.327
Pot Cap-1 Maneuver	1002	-	- 331 562
Stage 1	-	-	- 602 -
Stage 2	-	-	- 721 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	998	-	- 320 560
Mov Cap-2 Maneuver	-	-	- 320 -
Stage 1	-	-	- 585 -
Stage 2	-	-	- 718 -

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	48.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	998	-	-	-	320	560
HCM Lane V/C Ratio	0.021	-	-	-	0.853	0.113
HCM Control Delay (s)	8.7	0	-	-	56.7	12.2
HCM Lane LOS	A	A	-	-	F	B
HCM 95th %tile Q(veh)	0.1	-	-	-	7.6	0.4

Lanes, Volumes, Timings
24: Reata Rd & Unnamed Rd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	29	45	113	357	245	47
Future Volume (vph)	29	45	113	357	245	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	0			0	1	1
Taper Length (ft)	25				25	
Link Speed (mph)		30	40		30	
Link Distance (ft)		275	1666		1350	
Travel Time (s)		6.3	28.4		30.7	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC
24: Reata Rd & Unnamed Rd

05/12/2021

Intersection						
Int Delay, s/veh	6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	29	45	113	357	245	47
Future Vol, veh/h	29	45	113	357	245	47
Conflicting Peds, #/hr	5	0	0	5	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	32	49	123	388	266	51
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	516	0	-	0	435	322
Stage 1	-	-	-	-	322	-
Stage 2	-	-	-	-	113	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1045	-	-	-	576	717
Stage 1	-	-	-	-	732	-
Stage 2	-	-	-	-	909	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1041	-	-	-	553	714
Mov Cap-2 Maneuver	-	-	-	-	553	-
Stage 1	-	-	-	-	706	-
Stage 2	-	-	-	-	905	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.4	0		16.3		
HCM LOS				C		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1041	-	-	-	553	714
HCM Lane V/C Ratio	0.03	-	-	-	0.482	0.072
HCM Control Delay (s)	8.6	0	-	-	17.4	10.4
HCM Lane LOS	A	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	2.6	0.2

2040 With BMS Full Buildout PM Peak Hour

Lanes, Volumes, Timings
1: Dallas Rd & I-82 EB Ramps

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	676	0	311	0	0	0	0	353	67	467	332	0
Future Volume (vph)	676	0	311	0	0	0	0	353	67	467	332	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			-3%			5%			-11%	
Storage Length (ft)	0		0	0		0	0		0	150		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		106			198			377			305	
Travel Time (s)		2.4			4.5			5.1			4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Free			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
1: Dallas Rd & I-82 EB Ramps

05/11/2021

Intersection												
Int Delay, s/veh	4189											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↕		↕	↕	
Traffic Vol, veh/h	676	0	311	0	0	0	0	353	67	467	332	0
Future Vol, veh/h	676	0	311	0	0	0	0	353	67	467	332	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	3	-	-	-3	-	-	5	-	-	-11	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	735	0	338	0	0	0	0	384	73	508	361	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1798	1834	361	-	0	0	457	0	0
Stage 1	1377	1377	-	-	-	-	-	-	-
Stage 2	421	457	-	-	-	-	-	-	-
Critical Hdwy	7.03	7.13	6.53	-	-	-	4.13	-	-
Critical Hdwy Stg 1	6.03	6.13	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.03	6.13	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	-	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 65	56	661	0	-	-	1099	-	0
Stage 1	~ 185	168	-	0	-	-	-	-	0
Stage 2	~ 615	524	-	0	-	-	-	-	0
Platoon blocked, %				-	-	-	-	-	-
Mov Cap-1 Maneuver	~ 35	0	661	-	-	-	1099	-	-
Mov Cap-2 Maneuver	~ 35	0	-	-	-	-	-	-	-
Stage 1	~ 185	0	-	-	-	-	-	-	-
Stage 2	~ 331	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, \$ 9357.3		0	6.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	50	1099	-
HCM Lane V/C Ratio	-	-	21.457	0.462	-
HCM Control Delay (s)	-	-	\$ 9357.3	11.1	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	130.9	2.5	-

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

Lanes, Volumes, Timings

2: Dallas Rd & I-82 WB Ramps

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	103	1	732	162	868	0	0	701	559
Future Volume (vph)	0	0	0	103	1	732	162	868	0	0	701	559
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-5%			0%			0%	
Storage Length (ft)	0		0	0		200	100		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		233			450			305			1186	
Travel Time (s)		5.3			10.2			4.2			16.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC

2: Dallas Rd & I-82 WB Ramps

05/11/2021

Intersection												
Int Delay, s/veh	162											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	103	1	732	162	868	0	0	701	559
Future Vol, veh/h	0	0	0	103	1	732	162	868	0	0	701	559
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	200	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-3	-	-	-5	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	112	1	796	176	943	0	0	762	608

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2361	2665	943	1370	0	-
Stage 1	1295	1295	-	-	-	-
Stage 2	1066	1370	-	-	-	-
Critical Hdwy	5.43	5.53	5.73	4.13	-	-
Critical Hdwy Stg 1	4.43	4.53	-	-	-	-
Critical Hdwy Stg 2	4.43	4.53	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	2.227	-	-
Pot Cap-1 Maneuver	~ 74	47	~ 361	498	-	0
Stage 1	366	332	-	-	-	0
Stage 2	443	312	-	-	-	0
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	~ 48	0	~ 361	498	-	-
Mov Cap-2 Maneuver	~ 48	0	-	-	-	-
Stage 1	237	0	-	-	-	-
Stage 2	443	0	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	\$ 602.6	2.5	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBTWBLn1WBLn2	SBT	SBR
Capacity (veh/h)	498	- 48 361	-	-
HCM Lane V/C Ratio	0.354	- 2.355 2.204	-	-
HCM Control Delay (s)	16.1	-\$ 800.2\$ 574.5	-	-
HCM Lane LOS	C	- F F	-	-
HCM 95th %tile Q(veh)	1.6	- 11.7 59.4	-	-

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

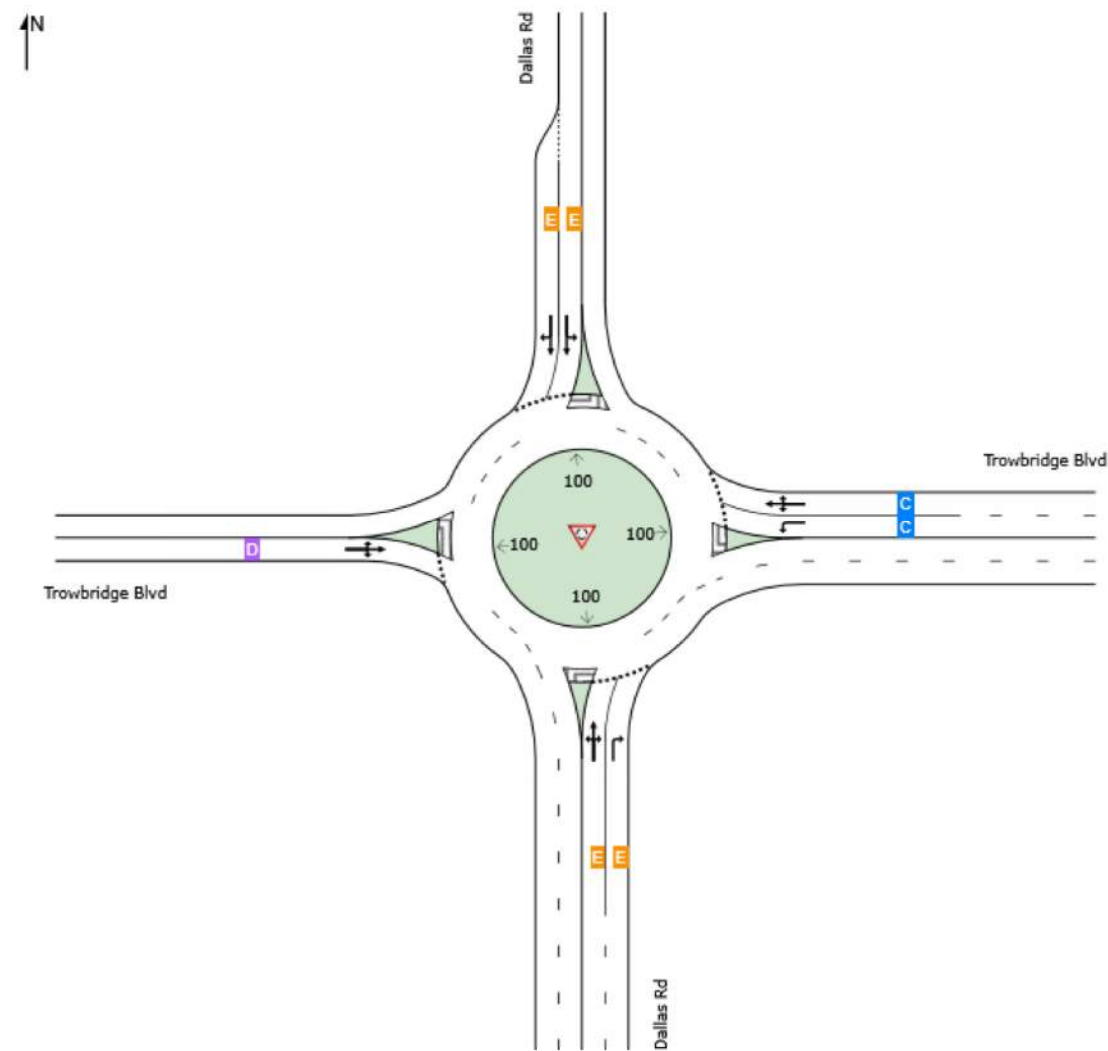
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 3 [Dallas Rd / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	E	C	E	D	D



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 3 [Dallas Rd / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] ft				
South: Dallas Rd														
3	L2	113	3.0	123	3.0	0.934	36.9	LOS E	28.4	726.1	1.00	1.88	3.22	23.4
8	T1	539	3.0	586	3.0	0.934	36.9	LOS E	28.4	726.1	1.00	1.88	3.22	23.4
18	R2	924	3.0	1004	3.0	0.934	36.9	LOS E	28.4	726.1	1.00	1.88	3.22	22.8
Approach		1576	3.0	1713	3.0	0.934	36.9	LOS E	28.4	726.1	1.00	1.88	3.22	23.0
East: Trowbridge Blvd														
1	L2	651	3.0	708	3.0	0.760	23.4	LOS C	8.2	209.7	0.87	1.23	1.95	26.1
6	T1	125	3.0	136	3.0	0.760	23.4	LOS C	8.2	209.7	0.87	1.23	1.95	26.8
16	R2	200	3.0	217	3.0	0.760	23.4	LOS C	8.2	209.7	0.87	1.23	1.95	26.1
Approach		976	3.0	1061	3.0	0.760	23.4	LOS C	8.2	209.7	0.87	1.23	1.95	26.2
North: Dallas Rd														
7	L2	355	3.0	386	3.0	0.899	44.2	LOS E	11.9	304.2	0.93	1.57	3.04	21.2
4	T1	564	3.0	613	3.0	0.899	44.2	LOS E	11.9	304.2	0.93	1.57	3.04	21.8
14	R2	3	3.0	3	3.0	0.899	44.2	LOS E	11.9	304.2	0.93	1.57	3.04	21.5
Approach		922	3.0	1002	3.0	0.899	44.2	LOS E	11.9	304.2	0.93	1.57	3.04	21.6
West: Trowbridge Blvd														
5	L2	15	3.0	16	3.0	0.468	31.9	LOS D	1.8	46.4	0.90	1.01	1.34	24.6
2	T1	26	3.0	28	3.0	0.468	31.9	LOS D	1.8	46.4	0.90	1.01	1.34	24.5
12	R2	55	3.0	60	3.0	0.468	31.9	LOS D	1.8	46.4	0.90	1.01	1.34	24.0
Approach		96	3.0	104	3.0	0.468	31.9	LOS D	1.8	46.4	0.90	1.01	1.34	24.2
All Vehicles		3570	3.0	3880	3.0	0.934	35.0	LOS D	28.4	726.1	0.95	1.60	2.77	23.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings

4: Dallas Rd & Ava Way

05/13/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	49	135	168	94	121	115	337	92	167	571	72
Future Volume (vph)	154	49	135	168	94	121	115	337	92	167	571	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		25			25			50			50	
Link Distance (ft)		233			2642			1047			11825	
Travel Time (s)		6.4			72.1			14.3			161.3	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
4: Dallas Rd & Ava Way

05/13/2021

Intersection												
Int Delay, s/veh	918.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	154	49	135	168	94	121	115	337	92	167	571	72
Future Vol, veh/h	154	49	135	168	94	121	115	337	92	167	571	72
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	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, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	167	53	147	183	102	132	125	366	100	182	621	78
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1817	1750	670	1800	1739	426	704	0	0	471	0	0
Stage 1	1029	1029	-	671	671	-	-	-	-	-	-	-
Stage 2	788	721	-	1129	1068	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 60	85	455	~ 61	~ 87	626	889	-	-	1086	-	-
Stage 1	281	310	-	444	453	-	-	-	-	-	-	-
Stage 2	383	430	-	247	297	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	-	60	451	~ 8	~ 62	621	885	-	-	1081	-	-
Mov Cap-2 Maneuver	-	60	-	~ 8	~ 62	-	-	-	-	-	-	-
Stage 1	240	257	-	380	388	-	-	-	-	-	-	-
Stage 2	190	368	-	~ 109	246	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s			\$ 4970.4		2.1		1.9					
HCM LOS	-		F									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	885	-	-	-	165	8	126	1081	-	-		
HCM Lane V/C Ratio	0.141	-	-	-	1.212	22.826	1.855	0.168	-	-		
HCM Control Delay (s)	9.7	-	-	-	193.6	10726.7	472.5	9	-	-		
HCM Lane LOS	A	-	-	-	F	F	F	A	-	-		
HCM 95th %tile Q(veh)	0.5	-	-	-	11.1	24.6	18.3	0.6	-	-		
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

Lanes, Volumes, Timings
5: Dallas Rd & Arena Rd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	6	3	263	6	30	1	556	157	18	568	15
Future Volume (vph)	1	6	3	263	6	30	1	556	157	18	568	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			4%			-5%			4%	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		259			1543			11825			569	
Travel Time (s)		7.1			42.1			230.4			11.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
5: Dallas Rd & Arena Rd

05/11/2021

Intersection												
Int Delay, s/veh	224.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	6	3	263	6	30	1	556	157	18	568	15
Future Vol, veh/h	1	6	3	263	6	30	1	556	157	18	568	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	4	-	-	-5	-	-	4	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	1	7	3	286	7	33	1	604	171	20	617	16
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1377	1442	625	1362	1365	690	633	0	0	775	0	0
Stage 1	665	665	-	692	692	-	-	-	-	-	-	-
Stage 2	712	777	-	670	673	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.93	7.33	6.63	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.93	6.33	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.93	6.33	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	122	132	483	~ 92	108	411	945	-	-	836	-	-
Stage 1	448	456	-	371	380	-	-	-	-	-	-	-
Stage 2	422	406	-	383	390	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	104	127	483	~ 85	104	411	945	-	-	836	-	-
Mov Cap-2 Maneuver	104	127	-	~ 85	104	-	-	-	-	-	-	-
Stage 1	447	439	-	370	379	-	-	-	-	-	-	-
Stage 2	381	405	-	361	376	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	29.3		\$ 1218.1		0		0.3					
HCM LOS	D		F									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	945	-	-	159	93	836	-	-				
HCM Lane V/C Ratio	0.001	-	-	0.068	3.495	0.023	-	-				
HCM Control Delay (s)	8.8	0	-	29.3	\$ 1218.1	9.4	0	-				
HCM Lane LOS	A	A	-	D	F	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.2	32.7	0.1	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

Lanes, Volumes, Timings

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	143	45	246	202	53	59	292	237	68	347	46
Future Volume (vph)	26	143	45	246	202	53	59	292	237	68	347	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		896			1478			569			1455	
Travel Time (s)		15.3			25.2			11.1			28.3	
Confl. Peds. (#/hr)	1		4	4		1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th AWSC
6: Dallas Rd/Bombing Range Rd & Kennedy Rd

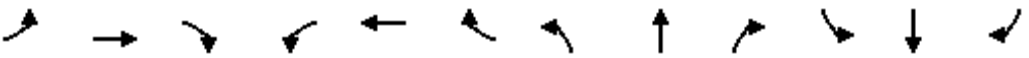
05/11/2021

Intersection												
Intersection Delay, s/veh	88.9											
Intersection LOS	F											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	143	45	246	202	53	59	292	237	68	347	46
Future Vol, veh/h	26	143	45	246	202	53	59	292	237	68	347	46
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	28	155	49	267	220	58	64	317	258	74	377	50
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	2			2			2			2		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	2			2			2			2		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	2			2			2			2		
HCM Control Delay	23			31.3			174.7			72.8		
HCM LOS	C			D			F			F		
Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2				
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%				
Vol Thru, %	0%	55%	0%	76%	0%	79%	0%	88%				
Vol Right, %	0%	45%	0%	24%	0%	21%	0%	12%				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop				
Traffic Vol by Lane	59	529	26	188	246	255	68	393				
LT Vol	59	0	26	0	246	0	68	0				
Through Vol	0	292	0	143	0	202	0	347				
RT Vol	0	237	0	45	0	53	0	46				
Lane Flow Rate	64	575	28	204	267	277	74	427				
Geometry Grp	7	7	7	7	7	7	7	7				
Degree of Util (X)	0.164	1.339	0.079	0.534	0.696	0.671	0.189	1.023				
Departure Headway (Hd)	9.486	8.637	10.986	10.278	10.16	9.481	9.909	9.299				
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Cap	380	426	328	354	358	383	364	393				
Service Time	7.186	6.337	8.686	7.978	7.86	7.181	7.609	6.999				
HCM Lane V/C Ratio	0.168	1.35	0.085	0.576	0.746	0.723	0.203	1.087				
HCM Control Delay	14	192.6	14.6	24.2	33.1	29.5	14.9	82.8				
HCM Lane LOS	B	F	B	C	D	D	B	F				
HCM 95th-tile Q	0.6	25.8	0.3	3	5	4.7	0.7	12.8				

Lanes, Volumes, Timings

7: Bombing Range Rd & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	440	96	48	588	635	114	244	13	523	359	24
Future Volume (vph)	19	440	96	48	588	635	114	244	13	523	359	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	175		225	100		0	175		0
Storage Lanes	1		1	1		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			45			30			30	
Link Distance (ft)		538			3222			1455			437	
Travel Time (s)		12.2			48.8			33.1			9.9	
Confl. Peds. (#/hr)						8			3			1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases	7	4	1	3	8	5	1	6		5	2	
Permitted Phases			4			8						
Detector Phase	7	4	1	3	8	5	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	20.0	9.0	9.0	20.0	9.0	9.0	20.0		9.0	20.0	
Total Split (s)	20.0	41.0	19.0	13.0	34.0	37.0	19.0	29.0		37.0	47.0	
Total Split (%)	16.7%	34.2%	15.8%	10.8%	28.3%	30.8%	15.8%	24.2%		30.8%	39.2%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	None	None	C-Max	None	None	Max		None	Max	

Intersection Summary

Area Type: Other

Cycle Length: 120

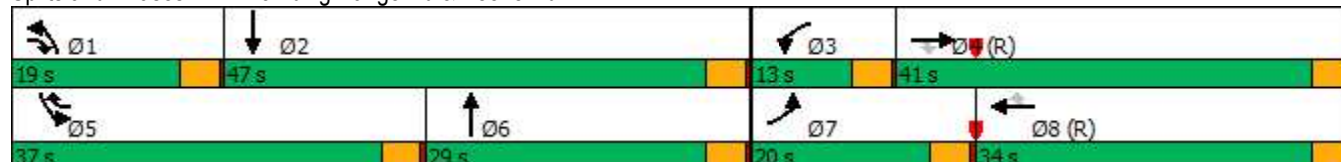
Actuated Cycle Length: 120

Offset: 52 (43%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 7: Bombing Range Rd & Keene Rd



HCM 6th Signalized Intersection Summary

7: Bombing Range Rd & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	440	96	48	588	635	114	244	13	523	359	24
Future Volume (veh/h)	19	440	96	48	588	635	114	244	13	523	359	24
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	20	458	100	50	612	661	119	254	14	545	374	25
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	29	1374	742	64	1445	929	145	445	25	634	616	41
Arrive On Green	0.02	0.39	0.39	0.04	0.41	0.41	0.08	0.26	0.26	0.18	0.36	0.36
Sat Flow, veh/h	1767	3526	1572	1767	3526	1557	1767	1742	96	3428	1720	115
Grp Volume(v), veh/h	20	458	100	50	612	661	119	0	268	545	0	399
Grp Sat Flow(s),veh/h/ln	1767	1763	1572	1767	1763	1557	1767	0	1838	1714	0	1835
Q Serve(g_s), s	1.4	10.9	4.3	3.4	14.9	35.9	8.0	0.0	15.2	18.5	0.0	21.4
Cycle Q Clear(g_c), s	1.4	10.9	4.3	3.4	14.9	35.9	8.0	0.0	15.2	18.5	0.0	21.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.05	1.00		0.06
Lane Grp Cap(c), veh/h	29	1374	742	64	1445	929	145	0	470	634	0	657
V/C Ratio(X)	0.70	0.33	0.13	0.78	0.42	0.71	0.82	0.00	0.57	0.86	0.00	0.61
Avail Cap(c_a), veh/h	236	1374	742	133	1445	929	221	0	470	943	0	657
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.86	0.86	0.86	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	58.7	25.7	17.9	57.3	25.3	17.1	54.2	0.0	38.9	47.4	0.0	31.6
Incr Delay (d2), s/veh	26.3	0.7	0.4	15.7	0.8	4.0	13.3	0.0	5.0	5.4	0.0	4.1
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	0.8	4.7	1.6	1.7	6.1	12.5	4.1	0.0	7.5	8.3	0.0	10.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.0	26.3	18.2	73.0	26.1	21.1	67.5	0.0	43.9	52.8	0.0	35.7
LnGrp LOS	F	C	B	E	C	C	E	A	D	D	A	D
Approach Vol, veh/h		578			1323			387			944	
Approach Delay, s/veh		27.0			25.4			51.1			45.6	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.9	47.0	8.4	50.8	26.2	34.7	5.9	53.2				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	43.0	9.0	37.0	33.0	25.0	16.0	30.0				
Max Q Clear Time (g_c+I1), s	10.0	23.4	5.4	12.9	20.5	17.2	3.4	37.9				
Green Ext Time (p_c), s	0.1	2.4	0.0	3.5	1.7	0.9	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			34.6									
HCM 6th LOS			C									
Notes												
User approved ignoring U-Turning movement.												

Lanes, Volumes, Timings

8: Arena Rd/E Mountain Rd & Kennedy Rd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	438	3	402	496	3	4	0	261	1	0	1
Future Volume (vph)	4	438	3	402	496	3	4	0	261	1	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1478			1363			1543			354	
Travel Time (s)		25.2			23.2			42.1			9.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
8: Arena Rd/E Mountain Rd & Kennedy Rd

05/11/2021

Intersection												
Int Delay, s/veh	6.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	438	3	402	496	3	4	0	261	1	0	1
Future Vol, veh/h	4	438	3	402	496	3	4	0	261	1	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	4	456	3	419	517	3	4	0	272	1	0	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	520	0	0	459	0	0	1823	1824	458	1959	1824	519
Stage 1	-	-	-	-	-	-	466	466	-	1357	1357	-
Stage 2	-	-	-	-	-	-	1357	1358	-	602	467	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	1041	-	-	1097	-	-	59	77	601	47	77	555
Stage 1	-	-	-	-	-	-	575	561	-	183	216	-
Stage 2	-	-	-	-	-	-	183	216	-	485	560	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1041	-	-	1097	-	-	34	35	601	15	35	555
Mov Cap-2 Maneuver	-	-	-	-	-	-	34	35	-	15	35	-
Stage 1	-	-	-	-	-	-	572	558	-	182	100	-
Stage 2	-	-	-	-	-	-	85	100	-	264	557	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			4.6			22.2			138.5		
HCM LOS							C			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	480	1041	-	-	1097	-	-	29				
HCM Lane V/C Ratio	0.575	0.004	-	-	0.382	-	-	0.072				
HCM Control Delay (s)	22.2	8.5	0	-	10.3	0	-	138.5				
HCM Lane LOS	C	A	A	-	B	A	-	F				
HCM 95th %tile Q(veh)	3.6	0	-	-	1.8	-	-	0.2				

Lanes, Volumes, Timings

9: Kennedy Rd & Keene Rd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	838	15	582	911	44	9	220	486	19	300	324
Future Volume (vph)	143	838	15	582	911	44	9	220	486	19	300	324
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	260		0	375		0	160		0	0		330
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			40			40	
Link Distance (ft)		3222			2930			1363			832	
Travel Time (s)		48.8			44.4			23.2			14.2	
Confl. Peds. (#/hr)			1			10	1		7	7		1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			6			2	
Permitted Phases							6		6	2		2
Detector Phase	7	4		3	8		6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	22.0	40.0		50.0	68.0		30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	18.3%	33.3%		41.7%	56.7%		25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Yellow Time (s)	5.0	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.0	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	-1.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?		Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

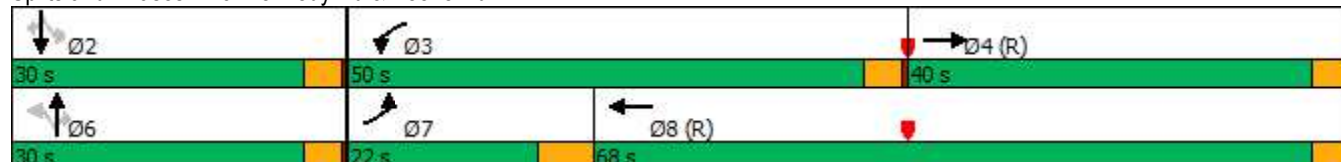
Actuated Cycle Length: 120

Offset: 102 (85%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Splits and Phases: 9: Kennedy Rd & Keene Rd



HCM 6th Signalized Intersection Summary

9: Kennedy Rd & Keene Rd

05/11/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	143	838	15	582	911	44	9	220	486	19	300	324
Future Volume (veh/h)	143	838	15	582	911	44	9	220	486	19	300	324
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	144	846	15	588	920	44	9	222	491	19	303	327
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	184	1212	21	603	1984	95	31	246	337	32	182	337
Arrive On Green	0.10	0.34	0.34	0.68	1.00	1.00	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1767	3544	63	1767	3423	164	0	1136	1557	0	840	1557
Grp Volume(v), veh/h	144	421	440	588	474	490	231	0	491	322	0	327
Grp Sat Flow(s),veh/h/ln	1767	1763	1844	1767	1763	1824	1136	0	1557	840	0	1557
Q Serve(g_s), s	9.5	24.8	24.8	37.8	0.0	0.0	0.0	0.0	26.0	0.0	0.0	25.0
Cycle Q Clear(g_c), s	9.5	24.8	24.8	37.8	0.0	0.0	26.0	0.0	26.0	26.0	0.0	25.0
Prop In Lane	1.00		0.03	1.00		0.09	0.04		1.00	0.06		1.00
Lane Grp Cap(c), veh/h	184	603	630	603	1021	1057	277	0	337	214	0	337
V/C Ratio(X)	0.78	0.70	0.70	0.97	0.46	0.46	0.83	0.00	1.46	1.51	0.00	0.97
Avail Cap(c_a), veh/h	265	603	630	677	1021	1057	277	0	337	214	0	337
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	0.79	0.57	0.57	0.57	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.5	34.1	34.1	18.5	0.0	0.0	42.5	0.0	47.0	42.9	0.0	46.6
Incr Delay (d2), s/veh	4.3	5.3	5.0	19.2	0.9	0.8	19.0	0.0	220.7	250.7	0.0	40.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	11.0	11.5	9.4	0.2	0.2	7.5	0.0	30.4	20.4	0.0	13.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.8	39.4	39.2	37.8	0.9	0.8	61.5	0.0	267.7	293.5	0.0	87.2
LnGrp LOS	E	D	D	D	A	A	E	A	F	F	A	F
Approach Vol, veh/h	1005			1552			722			649		
Approach Delay, s/veh	41.8			14.8			201.7			189.6		
Approach LOS	D			B			F			F		
Timer - Assigned Phs	2		3	4		6	7	8				
Phs Duration (G+Y+Rc), s	30.0		45.0	45.0		30.0	16.5	73.5				
Change Period (Y+Rc), s	4.0		4.0	4.0		4.0	5.0	4.0				
Max Green Setting (Gmax), s	26.0		46.0	36.0		26.0	17.0	64.0				
Max Q Clear Time (g_c+I1), s	28.0		39.8	26.8		28.0	11.5	2.0				
Green Ext Time (p_c), s	0.0		1.1	3.3		0.0	0.0	6.7				
Intersection Summary												
HCM 6th Ctrl Delay	85.0											
HCM 6th LOS	F											

Lanes, Volumes, Timings

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	476	906	11	38	847	182	15	43	43	304	95	666
Future Volume (vph)	476	906	11	38	847	182	15	43	43	304	95	666
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	300		300	65		0	250		0
Storage Lanes	2		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			25			35	
Link Distance (ft)		2930			4647			563			1514	
Travel Time (s)		44.4			70.4			15.4			29.5	
Confl. Peds. (#/hr)						1	1					1
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
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov
Protected Phases	7	4		3	8	5	1	6		5	2	7
Permitted Phases				4		8	2			6		2
Detector Phase	7	4		3	8	5	1	6		5	2	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0	9.0	9.0	20.0		9.0	20.0	9.0
Total Split (s)	26.0	57.0		9.0	40.0	22.0	9.0	32.0		22.0	45.0	26.0
Total Split (%)	21.7%	47.5%		7.5%	33.3%	18.3%	7.5%	26.7%		18.3%	37.5%	21.7%
Yellow Time (s)	5.0	3.5		5.0	3.5	5.0	5.0	3.5		5.0	3.5	5.0
All-Red Time (s)	0.0	0.5		0.0	0.5	0.0	0.0	0.5		0.0	0.5	0.0
Lost Time Adjust (s)	-1.0	0.0		-1.0	0.0	0.0	0.0	0.0		-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0	5.0	5.0	4.0		4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?		Yes			Yes			Yes			Yes	
Recall Mode	None	C-Max		None	C-Max	None	None	None		None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

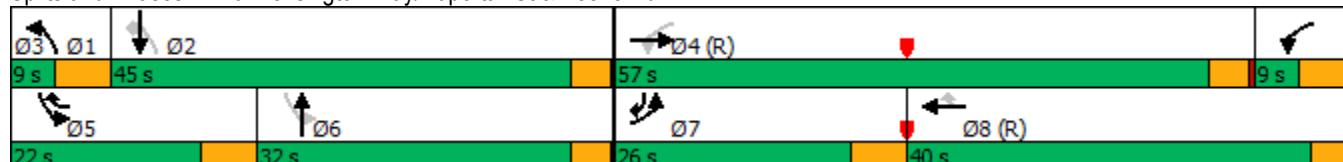
Actuated Cycle Length: 120

Offset: 84 (70%), Referenced to phase 4:EBWB and 8:WBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Splits and Phases: 10: Kensington Way/Duportail St & Keene Rd



HCM 6th Signalized Intersection Summary

10: Kensington Way/Duportail St & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 						 	
Traffic Volume (veh/h)	476	906	11	38	847	182	15	43	43	304	95	666
Future Volume (veh/h)	476	906	11	38	847	182	15	43	43	304	95	666
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	506	964	12	40	901	194	16	46	46	323	101	709
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	589	1575	20	280	1138	730	287	182	182	554	634	794
Arrive On Green	0.06	0.15	0.15	0.06	0.32	0.32	0.01	0.21	0.21	0.15	0.34	0.34
Sat Flow, veh/h	3428	3566	44	1767	3526	1570	1767	851	851	1767	1856	1571
Grp Volume(v), veh/h	506	477	499	40	901	194	16	0	92	323	101	709
Grp Sat Flow(s),veh/h/ln	1714	1763	1848	1767	1763	1570	1767	0	1701	1767	1856	1571
Q Serve(g_s), s	17.6	30.4	30.4	0.0	27.9	9.1	0.7	0.0	5.4	16.9	4.5	41.0
Cycle Q Clear(g_c), s	17.6	30.4	30.4	0.0	27.9	9.1	0.7	0.0	5.4	16.9	4.5	41.0
Prop In Lane	1.00		0.02	1.00		1.00	1.00		0.50	1.00		1.00
Lane Grp Cap(c), veh/h	589	779	816	280	1138	730	287	0	364	554	634	794
V/C Ratio(X)	0.86	0.61	0.61	0.14	0.79	0.27	0.06	0.00	0.25	0.58	0.16	0.89
Avail Cap(c_a), veh/h	629	779	816	280	1138	730	322	0	397	554	634	794
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.62	0.62	0.62	0.69	0.69	0.69	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.2	41.6	41.6	35.6	37.0	19.6	25.2	0.0	39.2	29.1	27.5	26.8
Incr Delay (d2), s/veh	6.7	2.2	2.1	0.1	4.0	0.6	0.0	0.0	0.4	1.0	0.1	12.5
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	8.6	14.7	15.4	0.9	12.1	3.3	0.3	0.0	2.3	7.2	2.0	19.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.9	43.8	43.7	35.6	40.9	20.2	25.3	0.0	39.6	30.2	27.6	39.3
LnGrp LOS	E	D	D	D	D	C	C	A	D	C	C	D
Approach Vol, veh/h	1482			1135			108			1133		
Approach Delay, s/veh	50.0			37.2			37.5			35.7		
Approach LOS	D			D			D			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.7	45.0	11.3	57.0	22.0	29.7	24.6	43.7				
Change Period (Y+Rc), s	5.0	4.0	5.0	4.0	5.0	4.0	5.0	* 5				
Max Green Setting (Gmax), s	4.0	41.0	4.0	53.0	17.0	28.0	21.0	* 36				
Max Q Clear Time (g_c+I1), s	2.7	43.0	2.0	32.4	18.9	7.4	19.6	29.9				
Green Ext Time (p_c), s	0.0	0.0	0.0	5.7	0.0	0.4	0.0	3.2				

Intersection Summary

HCM 6th Ctrl Delay	41.7
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings

11: Duportail St & Queensgate Dr

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	331	19	893	390	282	43	558	630	468	884	134
Future Volume (vph)	169	331	19	893	390	282	43	558	630	468	884	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	200		125	200		250	200		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			35	
Link Distance (ft)		1398			1249			1078			1088	
Travel Time (s)		31.8			28.4			24.5			21.2	
Confl. Peds. (#/hr)			2				3					3
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	D.P+P	NA	pt+ov	Prot	NA	
Protected Phases	7	4		3	8	8 5	1	6	6 3	5	2	
Permitted Phases							2					
Detector Phase	7	4		3	8	8 5	1	6	6 3	5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	35.0		30.0	30.0		9.0	35.0		9.0	35.0	
Total Split (s)	23.0	35.0		30.0	42.0		9.0	36.0		19.0	46.0	
Total Split (%)	19.2%	29.2%		25.0%	35.0%		7.5%	30.0%		15.8%	38.3%	
Yellow Time (s)	5.0	4.0		4.0	4.0		5.0	4.0		5.0	4.0	
All-Red Time (s)	0.0	1.0		1.0	1.0		0.0	1.0		0.0	1.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	None		None	None	

Intersection Summary

Area Type: Other

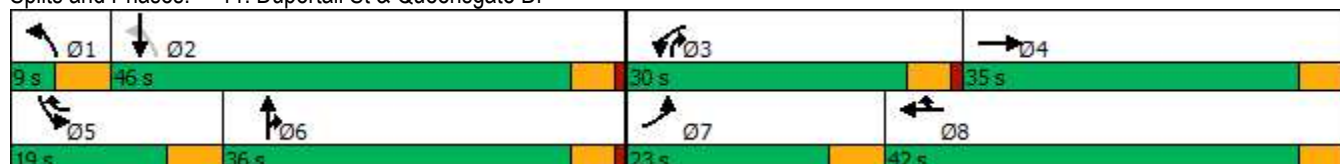
Cycle Length: 120

Actuated Cycle Length: 105

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Splits and Phases: 11: Duportail St & Queensgate Dr



HCM 6th Signalized Intersection Summary

11: Duportail St & Queensgate Dr

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	169	331	19	893	390	282	43	558	630	468	884	134
Future Volume (veh/h)	169	331	19	893	390	282	43	558	630	468	884	134
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	178	348	20	940	411	297	45	587	663	493	931	141
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	240	534	31	886	520	682	241	1114	901	271	1295	196
Arrive On Green	0.14	0.16	0.15	0.26	0.28	0.28	0.05	0.32	0.32	0.15	0.42	0.41
Sat Flow, veh/h	1767	3388	194	3428	1856	1572	1767	3526	1565	1767	3069	465
Grp Volume(v), veh/h	178	180	188	940	411	297	45	587	663	493	535	537
Grp Sat Flow(s),veh/h/ln	1767	1763	1820	1714	1856	1572	1767	1763	1565	1767	1763	1771
Q Serve(g_s), s	10.1	10.0	10.1	27.0	21.4	13.8	1.4	14.3	32.7	16.0	26.3	26.4
Cycle Q Clear(g_c), s	10.1	10.0	10.1	27.0	21.4	13.8	1.4	14.3	32.7	16.0	26.3	26.4
Prop In Lane	1.00		0.11	1.00		1.00	1.00		1.00	1.00		0.26
Lane Grp Cap(c), veh/h	240	278	287	886	520	682	241	1114	901	271	744	747
V/C Ratio(X)	0.74	0.65	0.65	1.06	0.79	0.44	0.19	0.53	0.74	1.82	0.72	0.72
Avail Cap(c_a), veh/h	338	540	557	886	693	828	259	1114	901	271	744	747
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.4	41.3	41.4	38.7	34.7	20.7	18.7	29.3	16.4	44.2	25.0	25.2
Incr Delay (d2), s/veh	2.7	1.0	0.9	47.7	3.2	0.2	0.1	0.2	2.8	383.9	2.9	2.9
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	4.6	4.4	4.6	17.0	10.0	5.0	0.6	6.0	11.6	35.7	11.1	11.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.1	42.2	42.3	86.4	37.9	20.8	18.9	29.6	19.2	428.1	28.0	28.1
LnGrp LOS	D	D	D	F	D	C	B	C	B	F	C	C
Approach Vol, veh/h		546			1648			1295			1565	
Approach Delay, s/veh		43.5			62.5			23.9			154.1	
Approach LOS		D			E			C			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.9	47.1	30.0	19.5	19.0	36.0	17.2	32.3				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	4.0	41.0	25.0	30.0	14.0	31.0	18.0	37.0				
Max Q Clear Time (g_c+I1), s	3.4	28.4	29.0	12.1	18.0	34.7	12.1	23.4				
Green Ext Time (p_c), s	0.0	5.1	0.0	1.9	0.0	0.0	0.1	2.0				

Intersection Summary

HCM 6th Ctrl Delay 78.9

HCM 6th LOS E

Notes

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

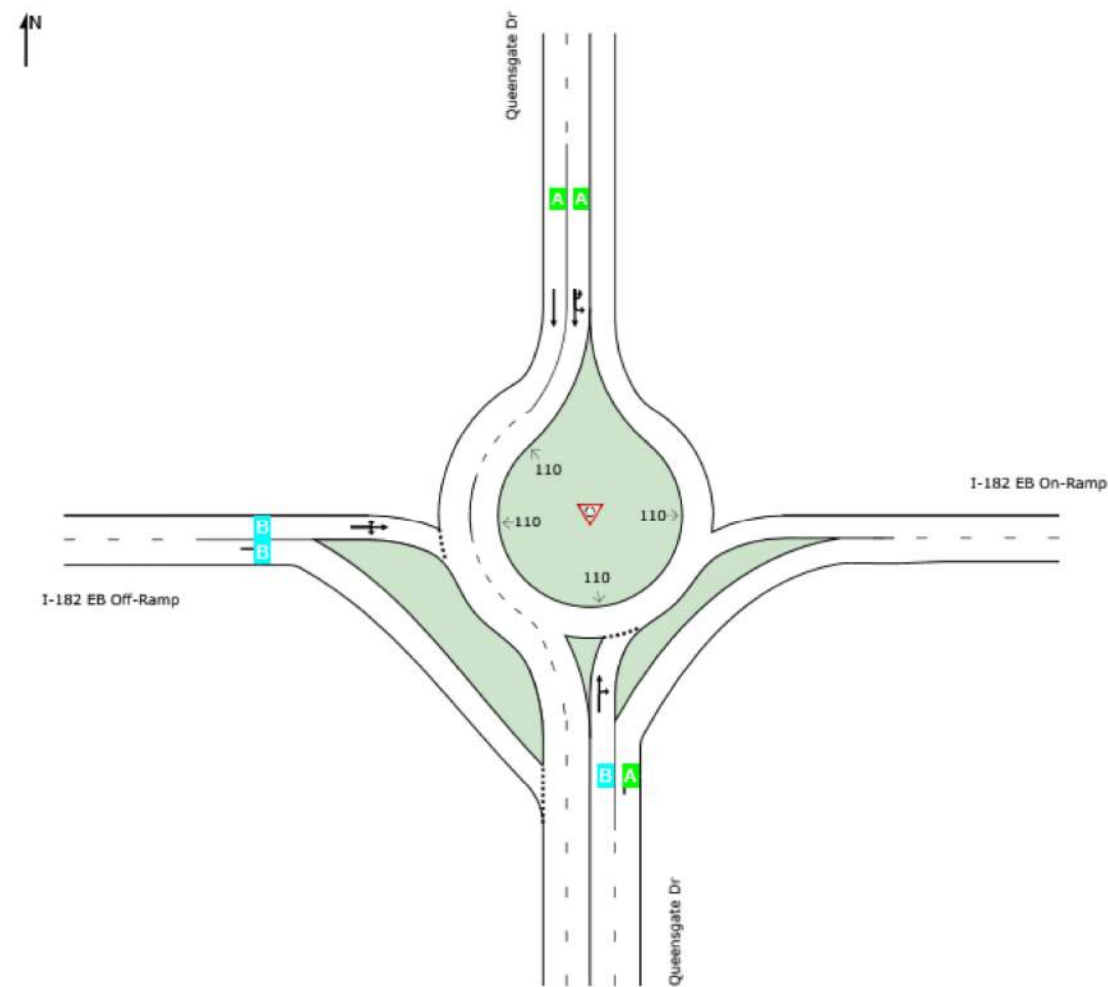
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2040 With Project - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	North	West	
LOS	A	A	B	A



Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used).
Delay Model: SIDRA Standard (Geometric Delay is included).

MOVEMENT SUMMARY

 **Site: 13 [Queensgate Dr / I-182 Ramps (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Queensgate Dr														
8	T1	390	3.0	398	3.0	0.541	16.5	LOS B	5.8	149.6	0.98	1.08	1.34	31.8
18	R2	889	3.0	907	3.0	0.541	4.0	LOS A	5.8	149.6	0.03	0.44	0.04	37.0
Approach		1279	3.0	1305	3.0	0.541	7.8	LOS A	5.8	149.6	0.32	0.64	0.44	35.2
North: Queensgate Dr														
7u	U	11	3.0	11	3.0	0.763	12.5	LOS B	0.0	0.0	0.00	0.65	0.00	36.5
7	L2	942	3.0	961	3.0	0.763	9.9	LOS A	0.0	0.0	0.00	0.65	0.00	35.5
4	T1	1385	3.0	1413	3.0	0.763	4.1	LOS A	0.0	0.0	0.00	0.41	0.00	37.8
Approach		2338	3.0	2386	3.0	0.763	6.5	LOS A	0.0	0.0	0.00	0.51	0.00	36.8
West: I-182 EB Off-Ramp														
5	L2	115	3.0	117	3.0	0.201	19.3	LOS B	1.0	26.3	0.83	0.94	0.83	30.9
2	T1	1	3.0	1	3.0	0.201	13.0	LOS B	1.0	26.3	0.83	0.94	0.83	30.8
12	R2	122	3.0	124	3.0	0.179	11.2	LOS B	1.0	24.5	0.76	0.85	0.76	33.0
Approach		238	3.0	243	3.0	0.201	15.1	LOS B	1.0	26.3	0.79	0.90	0.79	31.9
All Vehicles		3855	3.0	3934	3.0	0.763	7.4	LOS A	5.8	149.6	0.15	0.57	0.19	36.0

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - Roundabout Analysis.sip9

Lanes, Volumes, Timings
14: Queensgate Dr & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	428	709	150	25	729	551	75	129	18	743	225	261
Future Volume (vph)	428	709	150	25	729	551	75	129	18	743	225	261
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350		250	150		175	100		0	200		200
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	1811	0	3400	1845	1568
Flt Permitted	0.149			0.257			0.950			0.950		
Satd. Flow (perm)	275	3505	1568	474	3505	1568	1752	1811	0	3400	1845	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			160			542		5				195
Link Speed (mph)		45			45			30			35	
Link Distance (ft)		4647			3045			8170			1355	
Travel Time (s)		70.4			46.1			185.7			26.4	
Confl. Peds. (#/hr)	3											
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
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	455	754	160	27	776	586	80	156	0	790	239	278
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA	custom	Prot	NA		Prot	NA	pm+ov
Protected Phases	7!	4	1	3	8	2 6 14!	1	6!		5	2	7
Permitted Phases	8		4	4								2
Detector Phase	7	4	1	3	8	2 6 14	1	6		5	2	7
Switch Phase												
Minimum Initial (s)	4.0	8.0	4.0	4.0	8.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.5	22.0	19.0	9.0	30.0		19.0	20.0		8.5	20.0	8.5
Total Split (s)	33.0	57.0	19.0	9.0	33.0		19.0	20.0		34.0	35.0	33.0
Total Split (%)	27.5%	47.5%	15.8%	7.5%	27.5%		15.8%	16.7%		28.3%	29.2%	27.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	0.5
Lost Time Adjust (s)	0.0	-2.0	0.0	0.0	-2.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	2.0	4.0	4.0	2.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?		Yes								Yes		
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	None
Act Effect Green (s)	59.4	60.0	70.4	61.4	32.8	94.0	10.8	14.7		29.9	33.8	62.4
Actuated g/C Ratio	0.50	0.50	0.59	0.51	0.27	0.78	0.09	0.12		0.25	0.28	0.52
v/c Ratio	0.93	0.43	0.16	0.09	0.81	0.44	0.51	0.69		0.93	0.46	0.31
Control Delay	65.0	15.6	1.6	14.8	45.2	2.2	62.6	65.1		62.5	39.4	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	65.0	15.6	1.6	14.8	45.2	2.2	62.6	65.1		62.5	39.4	3.6
LOS	E	B	A	B	D	A	E	E		E	D	A
Approach Delay		30.4			26.5			64.2			45.8	
Approach LOS		C			C			E			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												

Lanes, Volumes, Timings
14: Queensgate Dr & Keene Rd

05/12/2021

Lane Group	Ø14	Ø15
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	14	15
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	22.0	44.0
Total Split (%)	18%	37%
Yellow Time (s)	5.0	5.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?		
Recall Mode	Ped	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Intersection Summary		

Lanes, Volumes, Timings

14: Queensgate Dr & Keene Rd

05/12/2021

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 4:EBWB and 8:EBWB, Start of Green, Master Intersection

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 35.7

Intersection LOS: D

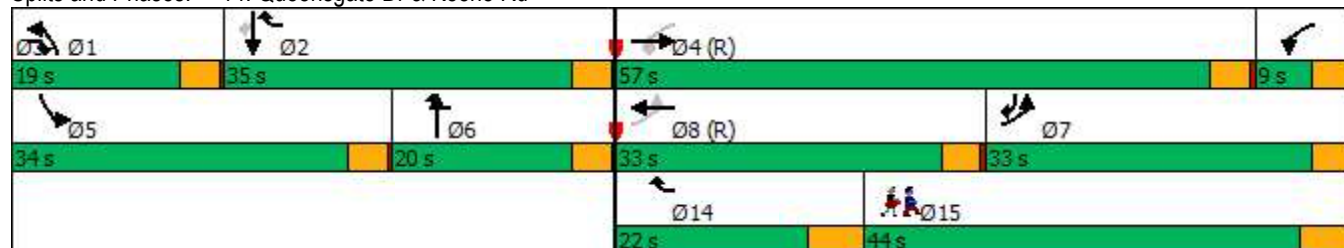
Intersection Capacity Utilization 86.3%

ICU Level of Service E

Analysis Period (min) 15

! Phase conflict between lane groups.

Splits and Phases: 14: Queensgate Dr & Keene Rd



Lanes, Volumes, Timings

15: N Bermuda Rd/Queensgate Dr & Gage Blvd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	139	249	10	50	308	25	10	50	25	10	150	196
Future Volume (vph)	139	249	10	50	308	25	10	50	25	10	150	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			40			30			30	
Link Distance (ft)		2604			6334			551			8170	
Travel Time (s)		59.2			108.0			12.5			185.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th AWSC
15: N Bermuda Rd/Queensgate Dr & Gage Blvd

05/11/2021

Intersection

Intersection Delay, s/veh 21.7
Intersection LOS C

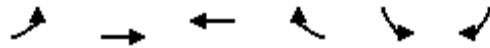
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	139	249	10	50	308	25	10	50	25	10	150	196
Future Vol, veh/h	139	249	10	50	308	25	10	50	25	10	150	196
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	151	271	11	54	335	27	11	54	27	11	163	213
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	17.2	24.2	12.5	26.3
HCM LOS	C	C	B	D

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	67%	0%	96%	0%	92%	0%	43%
Vol Right, %	0%	33%	0%	4%	0%	8%	0%	57%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	10	75	139	259	50	333	10	346
LT Vol	10	0	139	0	50	0	10	0
Through Vol	0	50	0	249	0	308	0	150
RT Vol	0	25	0	10	0	25	0	196
Lane Flow Rate	11	82	151	282	54	362	11	376
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.027	0.182	0.324	0.561	0.116	0.717	0.024	0.732
Departure Headway (Hd)	8.783	8.023	7.715	7.175	7.699	7.133	7.924	7.005
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	406	446	465	501	465	507	451	515
Service Time	6.561	5.801	5.481	4.94	5.46	4.894	5.678	4.759
HCM Lane V/C Ratio	0.027	0.184	0.325	0.563	0.116	0.714	0.024	0.73
HCM Control Delay	11.8	12.6	14.2	18.8	11.5	26.1	10.9	26.7
HCM Lane LOS	B	B	B	C	B	D	B	D
HCM 95th-tile Q	0.1	0.7	1.4	3.4	0.4	5.7	0.1	6.1

Lanes, Volumes, Timings
16: Gage Blvd & Keene Rd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø6
Lane Configurations							
Traffic Volume (vph)	55	345	514	921	848	65	
Future Volume (vph)	55	345	514	921	848	65	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Grade (%)		-3%	3%		0%		
Storage Length (ft)	200			0	0	100	
Storage Lanes	1			1	2	1	
Taper Length (ft)	25				25		
Satd. Flow (prot)	1779	3557	1817	1544	3400	1568	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1779	3557	1817	1544	3400	1568	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				950		31	
Link Speed (mph)		40	40		45		
Link Distance (ft)		805	874		1238		
Travel Time (s)		13.7	14.9		18.8		
Confl. Peds. (#/hr)				2			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	58	363	541	969	893	68	
Turn Type	Prot	NA	NA	pt+ov	Prot	Prot	
Protected Phases	7	4	8	8 5	5	5	6
Permitted Phases							
Detector Phase	7	4	8	8 5	5	5	
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	20.0	27.0		20.0	20.0	27.0
Total Split (s)	9.0	54.0	45.0		39.0	39.0	27.0
Total Split (%)	7.5%	45.0%	37.5%		32.5%	32.5%	23%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0	4.0
All-Red Time (s)	0.0	0.0	0.0		0.0	0.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0	
Lead/Lag	Lag		Lead		Lag	Lag	Lead
Lead-Lag Optimize?							
Recall Mode	None	None	None		C-Max	C-Max	None
Act Effct Green (s)	5.5	46.1	38.4	103.7	60.5	60.5	
Actuated g/C Ratio	0.05	0.38	0.32	0.86	0.50	0.50	
v/c Ratio	0.71	0.27	0.93	0.66	0.52	0.08	
Control Delay	98.4	25.2	39.9	10.1	20.7	10.7	
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	
Total Delay	98.4	25.2	39.9	10.2	20.7	10.7	
LOS	F	C	D	B	C	B	
Approach Delay		35.3	20.9		20.0		
Approach LOS		D	C		C		

Intersection Summary

Area Type: Other

Lanes, Volumes, Timings

16: Gage Blvd & Keene Rd

05/12/2021

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 110 (92%), Referenced to phase 5:SBL, Start of Green

Natural Cycle: 95

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 22.7

Intersection LOS: C

Intersection Capacity Utilization 67.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 16: Gage Blvd & Keene Rd



Lanes, Volumes, Timings

17: Leslie Rd & Gage Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	770	312	199	1136	125	299	276	181	171	613	201
Future Volume (vph)	129	770	312	199	1136	125	299	276	181	171	613	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	350		0	200		275	200		200
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		874			3504			345			536	
Travel Time (s)		14.9			59.7			6.7			10.4	
Confl. Peds. (#/hr)	2		1	1		2	5		1	1		5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6		6	2		2
Detector Phase	7	4		3	8		1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		9.0	20.0		9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	16.0	49.0		14.0	47.0		19.0	44.0	44.0	13.0	38.0	38.0
Total Split (%)	13.3%	40.8%		11.7%	39.2%		15.8%	36.7%	36.7%	10.8%	31.7%	31.7%
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 22 (18%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Splits and Phases: 17: Leslie Rd & Gage Blvd

 Ø1	 Ø2	 Ø4 (R)	 Ø3
19 s	38 s	49 s	14 s
 Ø5	 Ø6	 Ø7	 Ø8 (R)
13 s	44 s	16 s	47 s

HCM 6th Signalized Intersection Summary

17: Leslie Rd & Gage Blvd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	129	770	312	199	1136	125	299	276	181	171	613	201
Future Volume (veh/h)	129	770	312	199	1136	125	299	276	181	171	613	201
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	140	837	339	216	1235	136	325	300	197	186	666	218
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	201	919	371	223	1213	133	281	619	522	375	526	430
Arrive On Green	0.11	0.50	0.49	0.08	0.38	0.37	0.13	0.33	0.33	0.08	0.28	0.28
Sat Flow, veh/h	1767	2449	989	1767	3203	352	1767	1856	1565	1767	1856	1564
Grp Volume(v), veh/h	140	602	574	216	678	693	325	300	197	186	666	218
Grp Sat Flow(s),veh/h/ln	1767	1763	1676	1767	1763	1792	1767	1856	1565	1767	1856	1564
Q Serve(g_s), s	6.6	37.6	38.0	9.4	45.4	45.4	15.0	15.4	11.5	9.0	34.0	11.0
Cycle Q Clear(g_c), s	6.6	37.6	38.0	9.4	45.4	45.4	15.0	15.4	11.5	9.0	34.0	11.0
Prop In Lane	1.00		0.59	1.00		0.20	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	201	661	628	223	668	679	281	619	522	375	526	430
V/C Ratio(X)	0.70	0.91	0.91	0.97	1.02	1.02	1.16	0.49	0.38	0.50	1.27	0.51
Avail Cap(c_a), veh/h	237	661	628	223	668	679	281	619	522	375	526	430
HCM Platoon Ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.89	0.82	0.82	0.82	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.6	28.2	28.7	52.9	37.3	37.4	36.2	31.8	30.5	28.1	43.0	22.4
Incr Delay (d2), s/veh	4.4	17.2	18.4	45.3	35.5	36.8	103.0	0.2	0.2	0.4	134.6	0.4
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	2.9	16.7	16.3	8.9	25.2	25.9	13.4	6.9	4.3	3.8	34.9	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.0	45.4	47.1	98.3	72.7	74.2	139.2	32.0	30.7	28.5	177.6	22.8
LnGrp LOS	D	D	D	F	F	F	F	C	C	C	F	C
Approach Vol, veh/h		1316			1587			822			1070	
Approach Delay, s/veh		45.0			76.8			74.1			120.1	
Approach LOS		D			E			E			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.0	38.0	14.0	49.0	13.0	44.0	13.6	49.4				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	14.0	33.0	9.0	44.0	8.0	39.0	11.0	42.0				
Max Q Clear Time (g_c+I1), s	17.0	36.0	11.4	40.0	11.0	17.4	8.6	47.4				
Green Ext Time (p_c), s	0.0	0.0	0.0	0.9	0.0	0.4	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay				77.3								
HCM 6th LOS				E								

Lanes, Volumes, Timings
18: Leslie Rd & Reata Rd

05/11/2021

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	191	398	627	468	388	231
Future Volume (vph)	191	398	627	468	388	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	0			285
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Link Speed (mph)	40			40	40	
Link Distance (ft)	5360			1600	7773	
Travel Time (s)	91.4			27.3	132.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
18: Leslie Rd & Reata Rd

05/11/2021

Intersection

Int Delay, s/veh 82.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	191	398	627	468	388	231
Future Vol, veh/h	191	398	627	468	388	231
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	0	-	-	285
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	205	428	674	503	417	248

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	2268	417	665
Stage 1	417	-	-
Stage 2	1851	-	-
Critical Hdwy	6.43	6.23	4.13
Critical Hdwy Stg 1	5.43	-	-
Critical Hdwy Stg 2	5.43	-	-
Follow-up Hdwy	3.527	3.327	2.227
Pot Cap-1 Maneuver	~ 44	634	919
Stage 1	663	-	-
Stage 2	~ 136	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	~ 12	634	919
Mov Cap-2 Maneuver	~ 76	-	-
Stage 1	~ 177	-	-
Stage 2	~ 136	-	-

Approach	EB	NB	SB
HCM Control Delay, s	302.4	10.8	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	919	-	76	634	-	-
HCM Lane V/C Ratio	0.734	-	2.702	0.675	-	-
HCM Control Delay (s)	18.9	-	\$ 887.4	21.6	-	-
HCM Lane LOS	C	-	F	C	-	-
HCM 95th %tile Q(veh)	6.8	-	20	5.2	-	-

Notes

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

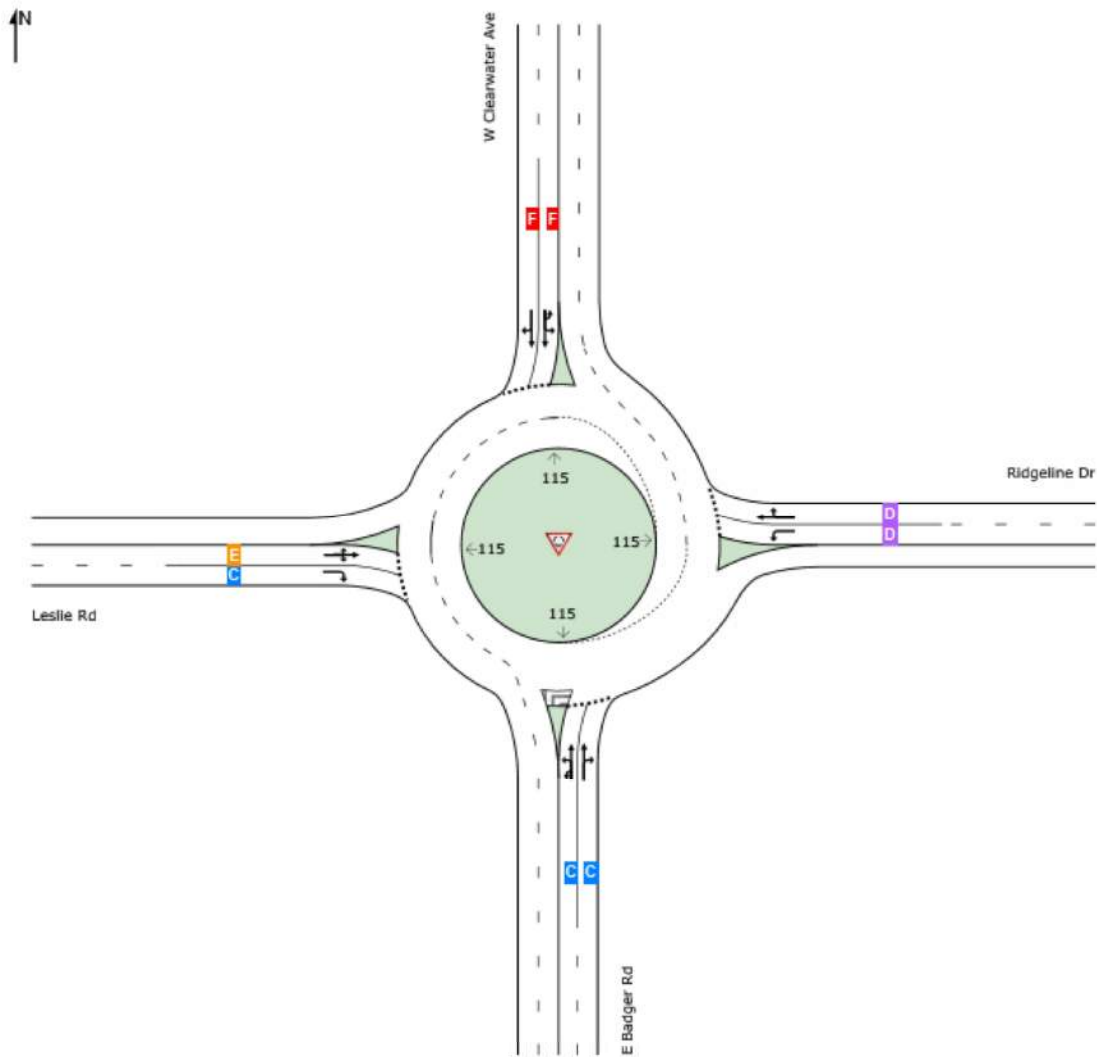
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	D	F	E	F



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Delay Model: HCM Delay Formula (Geometric Delay is not included).

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - Roundabout Analysis.sip9

MOVEMENT SUMMARY

 **Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] ft				mph
South: E Badger Rd														
3u	U	9	3.0	10	3.0	0.809	24.9	LOS C	11.7	300.7	0.92	1.37	2.20	26.8
3	L2	380	3.0	409	3.0	0.809	24.9	LOS C	11.7	300.7	0.92	1.37	2.20	26.3
8	T1	643	3.0	691	3.0	0.809	24.9	LOS C	11.7	300.7	0.92	1.37	2.20	26.9
18	R2	151	3.0	162	3.0	0.809	24.9	LOS C	11.7	300.7	0.92	1.37	2.20	26.5
Approach		1183	3.0	1272	3.0	0.809	24.9	LOS C	11.7	300.7	0.92	1.37	2.20	26.6
East: Ridgeline Dr														
1	L2	203	3.0	218	3.0	0.636	30.3	LOS D	3.2	81.7	0.88	1.08	1.63	24.3
6	T1	204	3.0	219	3.0	0.737	34.1	LOS D	4.5	115.4	0.90	1.18	1.96	24.4
16	R2	70	3.0	75	3.0	0.737	34.1	LOS D	4.5	115.4	0.90	1.18	1.96	23.9
Approach		477	3.0	513	3.0	0.737	32.5	LOS D	4.5	115.4	0.89	1.14	1.81	24.3
North: W Clearwater Ave														
7u	U	1	3.0	1	3.0	1.190	125.7	LOS F	49.4	1265.7	1.00	3.26	8.38	12.5
7	L2	73	3.0	78	3.0	1.190	125.7	LOS F	49.4	1265.7	1.00	3.26	8.38	12.4
4	T1	764	3.0	822	3.0	1.190	124.9	LOS F	54.5	1394.0	1.00	3.31	8.50	12.4
14	R2	528	3.0	568	3.0	1.190	122.6	LOS F	54.5	1394.0	1.00	3.45	8.85	12.2
Approach		1366	3.0	1469	3.0	1.190	124.1	LOS F	54.5	1394.0	1.00	3.36	8.63	12.3
West: Leslie Rd														
5	L2	283	3.0	304	3.0	0.921	46.9	LOS E	13.2	337.1	0.93	1.65	3.33	21.2
2	T1	212	3.0	228	3.0	0.921	46.9	LOS E	13.2	337.1	0.93	1.65	3.33	21.1
12	R2	289	3.0	311	3.0	0.608	20.3	LOS C	3.6	93.1	0.79	0.98	1.43	27.7
Approach		784	3.0	843	3.0	0.921	37.1	LOS E	13.2	337.1	0.88	1.40	2.63	23.1
All Vehicles		3810	3.0	4097	3.0	1.190	63.9	LOS F	54.5	1394.0	0.94	2.06	4.55	18.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings
20: E Badger Rd & I-82 WB Ramps

05/11/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	78	545	636	45	474	846
Future Volume (vph)	78	545	636	45	474	846
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%		-3%			3%
Storage Length (ft)	0	0		0	95	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	405		216			508
Travel Time (s)	9.2		2.9			6.9
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
20: E Badger Rd & I-82 WB Ramps

05/11/2021

Intersection						
Int Delay, s/veh	372.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	78	545	636	45	474	846
Future Vol, veh/h	78	545	636	45	474	846
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	-	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-3	-	-3	-	-	3
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	83	580	677	48	504	900
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2159	701	0	0	725	0
Stage 1	701	-	-	-	-	-
Stage 2	1458	-	-	-	-	-
Critical Hdwy	6.045	5.945	-	-	4.145	-
Critical Hdwy Stg 1	4.845	-	-	-	-	-
Critical Hdwy Stg 2	5.245	-	-	-	-	-
Follow-up Hdwy	3.5285	3.3285	-	-	2.2285	-
Pot Cap-1 Maneuver	~ 65	~ 462	-	-	870	-
Stage 1	549	-	-	-	-	-
Stage 2	229	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 27	~ 462	-	-	870	-
Mov Cap-2 Maneuver	~ 27	-	-	-	-	-
Stage 1	549	-	-	-	-	-
Stage 2	96	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, \$	1557.8		0		5.3	
HCM LOS	F					
Minor Lane/Major Mvmt			NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)			-	- 153	870	-
HCM Lane V/C Ratio			-	- 4.332	0.58	-
HCM Control Delay (s)			-	\$ 1557.8	14.7	-
HCM Lane LOS			-	- F	B	-
HCM 95th %tile Q(veh)			-	- 67.4	3.8	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Lanes, Volumes, Timings
21: E Badger Rd & I-82 EB Ramps

05/11/2021

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	33	310	403	64	327	591
Future Volume (vph)	33	310	403	64	327	591
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%		3%			-3%
Storage Length (ft)	0	0		0	250	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Link Speed (mph)	30		50			50
Link Distance (ft)	410		360			542
Travel Time (s)	9.3		4.9			7.4
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
21: E Badger Rd & I-82 EB Ramps

05/11/2021

Intersection						
Int Delay, s/veh	11.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	33	310	403	64	327	591
Future Vol, veh/h	33	310	403	64	327	591
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	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-5	-	3	-	-	-3
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	35	330	429	68	348	629
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1788	463	0	0	497	0
Stage 1	463	-	-	-	-	-
Stage 2	1325	-	-	-	-	-
Critical Hdwy	5.43	5.73	-	-	4.13	-
Critical Hdwy Stg 1	4.43	-	-	-	-	-
Critical Hdwy Stg 2	4.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	146	637	-	-	1062	-
Stage 1	718	-	-	-	-	-
Stage 2	357	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	98	637	-	-	1062	-
Mov Cap-2 Maneuver	98	-	-	-	-	-
Stage 1	718	-	-	-	-	-
Stage 2	240	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	50.2	0		3.6		
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 417		1062	-	
HCM Lane V/C Ratio	-	- 0.875		0.328	-	
HCM Control Delay (s)	-	- 50.2		10	-	
HCM Lane LOS	-	- F		B	-	
HCM 95th %tile Q(veh)	-	- 8.9		1.4	-	

Lanes, Volumes, Timings
22: Bermuda Rd & Reata Rd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	454	28	56	579	84	22	8	48	58	4	15
Future Volume (vph)	22	454	28	56	579	84	22	8	48	58	4	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		6954			5360			569			542	
Travel Time (s)		118.5			91.4			11.1			10.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
22: Bermuda Rd & Reata Rd

05/11/2021

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	22	454	28	56	579	84	22	8	48	58	4	15
Future Vol, veh/h	22	454	28	56	579	84	22	8	48	58	4	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	24	493	30	61	629	91	24	9	52	63	4	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	720	0	0	523	0	0	1363	1398	508	1384	1368	675
Stage 1	-	-	-	-	-	-	556	556	-	797	797	-
Stage 2	-	-	-	-	-	-	807	842	-	587	571	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	877	-	-	1038	-	-	124	140	563	120	146	452
Stage 1	-	-	-	-	-	-	514	511	-	379	397	-
Stage 2	-	-	-	-	-	-	374	379	-	494	503	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	877	-	-	1038	-	-	104	121	563	92	126	452
Mov Cap-2 Maneuver	-	-	-	-	-	-	104	121	-	92	126	-
Stage 1	-	-	-	-	-	-	494	491	-	364	357	-
Stage 2	-	-	-	-	-	-	321	341	-	423	483	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.7			32.2			100.7		
HCM LOS							D			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	215	877	-	-	1038	-	-	111				
HCM Lane V/C Ratio	0.394	0.027	-	-	0.059	-	-	0.754				
HCM Control Delay (s)	32.2	9.2	0	-	8.7	0	-	100.7				
HCM Lane LOS	D	A	A	-	A	A	-	F				
HCM 95th %tile Q(veh)	1.8	0.1	-	-	0.2	-	-	4.2				

Lanes, Volumes, Timings
23: Reata Rd & Gage Blvd

05/11/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	50	195	208	251	192	31
Future Volume (vph)	50	195	208	251	192	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	0			0	1	1
Taper Length (ft)	25				25	
Link Speed (mph)		40	40		30	
Link Distance (ft)		1666	6954		1188	
Travel Time (s)		28.4	118.5		27.0	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection

Int Delay, s/veh 6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	50	195	208	251	192	31
Future Vol, veh/h	50	195	208	251	192	31
Conflicting Peds, #/hr	5	0	0	5	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	54	212	226	273	209	34

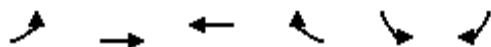
Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	504	0	688
Stage 1	-	-	368
Stage 2	-	-	320
Critical Hdwy	4.13	-	6.43
Critical Hdwy Stg 1	-	-	5.43
Critical Hdwy Stg 2	-	-	5.43
Follow-up Hdwy	2.227	-	3.527
Pot Cap-1 Maneuver	1055	-	411
Stage 1	-	-	698
Stage 2	-	-	734
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1051	-	384
Mov Cap-2 Maneuver	-	-	384
Stage 1	-	-	655
Stage 2	-	-	731

Approach	EB	WB	SB
HCM Control Delay, s	1.8	0	23
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1051	-	-	-	384	672
HCM Lane V/C Ratio	0.052	-	-	-	0.543	0.05
HCM Control Delay (s)	8.6	0	-	-	25	10.6
HCM Lane LOS	A	A	-	-	D	B
HCM 95th %tile Q(veh)	0.2	-	-	-	3.1	0.2

Lanes, Volumes, Timings
24: Reata Rd & Unnamed N/S

05/11/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Traffic Volume (vph)	35	128	105	134	117	25
Future Volume (vph)	35	128	105	134	117	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	0			0	1	1
Taper Length (ft)	25				25	
Link Speed (mph)		30	40		30	
Link Distance (ft)		275	1666		1350	
Travel Time (s)		6.3	28.4		30.7	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	3.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	128	105	134	117	25
Future Vol, veh/h	35	128	105	134	117	25
Conflicting Peds, #/hr	5	0	0	5	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	38	139	114	146	127	27
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	265	0	-	0	407	192
Stage 1	-	-	-	-	192	-
Stage 2	-	-	-	-	215	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1293	-	-	-	598	847
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	818	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1288	-	-	-	574	843
Mov Cap-2 Maneuver	-	-	-	-	574	-
Stage 1	-	-	-	-	808	-
Stage 2	-	-	-	-	815	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.7	0		12.4		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1288	-	-	-	574	843
HCM Lane V/C Ratio	0.03	-	-	-	0.222	0.032
HCM Control Delay (s)	7.9	0	-	-	13	9.4
HCM Lane LOS	A	A	-	-	B	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.8	0.1

Appendix C

Trip Generation Calculations for Year 2040

**Badger Mountain South
FULL BUILD Development (by 2040)
Weekday Daily Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY DAILY								
Proposed Use:								
Single-Family Detached Housing	2,382 DU	210	50%	50%	Ln(T) = 0.92 Ln(X) + 2.71	9,609	9,610	19,219
Internal Trips (15%) ³						-1,441	-1,442	-2,883
Subtotal (less internal) =						8,168	8,168	16,336
Multifamily Housing (Mid-Rise)	903 DU	221	50%	50%	T = 5.45(X) - 1.75	2,460	2,460	4,920
Internal Trips (15%) ³						-369	-369	-738
Subtotal (less internal) =						2,091	2,091	4,182
Multifamily Housing (Low-Rise)	1,155 DU	220	50%	50%	T = 7.56(X) - 40.86	4,346	4,345	8,691
Internal Trips (15%) ³						-652	-652	-1,304
Subtotal (less internal) =						3,694	3,693	7,387
Senior Adult Housing - Detached	120 DU	251	50%	50%	Ln(T) = 0.88 Ln(X) + 2.28	330	330	660
Internal Trips (15%) ³						-49	-50	-99
Subtotal (less internal) =						281	280	561
Senior Adult Housing - Attached	30 DU	252	50%	50%	3.70	55	56	111
Internal Trips (15%) ³						-9	-8	-17
Subtotal (less internal) =						46	48	94
Medical-Dental Office	40,000 SF	720	50%	50%	T = 38.42(X) - 87.62	725	724	1,449
Internal Trips (15%) ³						-109	-108	-217
Subtotal (less internal) =						616	616	1,232
Mini Warehouse	175,000 SF	151	50%	50%	1.51	132	132	264
Internal Trips (15%) ³						-20	-20	-40
Subtotal (less internal) =						112	112	224
Church	20,000 SF	560	50%	50%	6.95	69	70	139
Internal Trips (15%) ³						-11	-10	-21
Subtotal (less internal) =						58	60	118
Grocery Store	18,030 SF	850	50%	50%	106.78	963	962	1,925
Internal Trips (15%) ³						-144	-145	-289
Passby Trips ⁴	36%					-294	-295	-589
Subtotal (less internal and passby) =						525	522	1,047
Sporting Good Superstore	130,000 SF	861	50%	50%	28.75	1,869	1,869	3,738
Internal Trips (15%) ³						-281	-280	-561
Passby Trips ⁴	34%					-540	-540	-1,080
Subtotal (less internal and passby) =						1,048	1,049	2,097
Home Improvement Superstore	130,000 SF	862	50%	50%	30.74	1,998	1,998	3,996
Internal Trips (15%) ³						-299	-300	-599
Passby Trips ⁴	42%					-714	-713	-1,427
Subtotal (less internal and passby) =						985	985	1,970
Shopping Center	500,000 SF	820	50%	50%	Ln(T) = 0.68 Ln(X) + 5.57	8,980	8,981	17,961
Internal Trips (15%) ³						-1,347	-1,347	-2,694
Passby Trips ⁴	34%					-2,595	-2,596	-5,191
Subtotal (less internal and passby) =						5,038	5,038	10,076
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	837.58	1,340	1,340	2,680
Internal Trips (15%) ³						-201	-201	-402
Pass-By Trips ⁴	76%					-866	-865	-1,731
Subtotal (less internal and passby) =						273	274	547
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	50%	50%	470.95	165	165	330
Internal Trips (15%) ³						-25	-25	-50
Pass-By Trips ⁴	50%					-70	-70	-140
Subtotal (less internal and passby) =						70	70	140
Gross Proposed PM Peak Hour Trips =						33,041	33,042	66,083
Less Total Internal Trips =						-4,957	-4,957	-9,914
Less Total Pass-By Trips =						-5,079	-5,079	-10,158
Net New PM Peak Hour Trips =						23,005	23,006	46,011

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions for weekday daily time period were estimated to be 15% based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

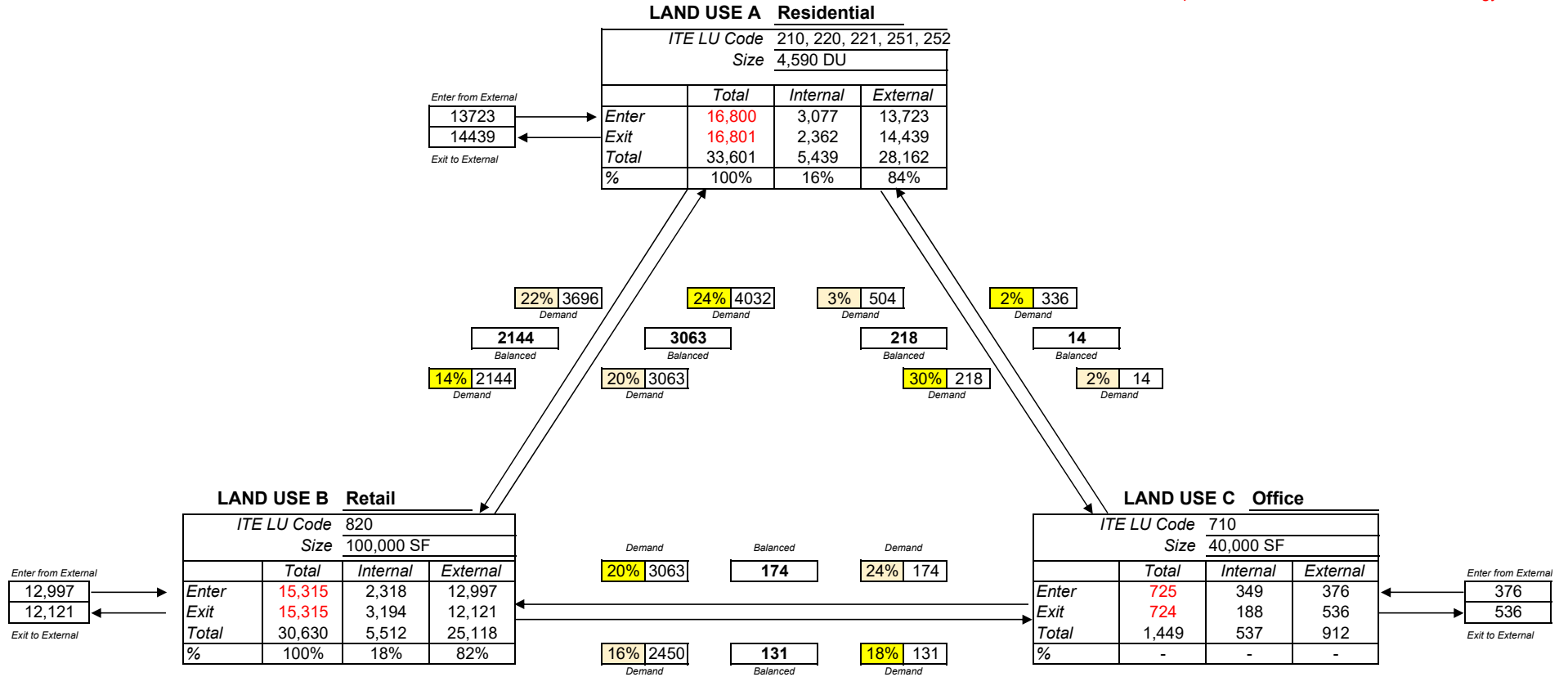
⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

Analyst TENW
Date 12/28/2020

Multi-Use Development Trip Generation and Internal Capture Summary - Daily

Project Name BMS Full Build
Time Period Weekday Daily

Assumed Average of AM and PM internal
capture rates from NCHRP 8-51 Methodology



**Badger Mountain South
FULL BUILD Development (by 2040)
Weekday AM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY AM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	2,382 DU	210	25%	75%	T = 0.71 (X) + 4.80	424	1,272	1,696
Internal Trips ³						-9	-16	-25
					Subtotal (less internal) =	415	1,256	1,671
Multifamily Housing (Mid-Rise)	903 DU	221	26%	74%	Ln(T) = 0.98 Ln(X) - 0.98	77	219	296
Internal Trips ³						-2	-3	-5
					Subtotal (less internal) =	75	216	291
Multifamily Housing (Low-Rise)	1,155 DU	220	23%	77%	Ln(T) = 0.95Ln(X)-0.51	112	375	487
Internal Trips ³						-2	-5	-7
					Subtotal (less internal) =	110	370	480
Senior Adult Housing - Detached	120 DU	251	33%	67%	Ln(T) = 0.76 Ln(X) + 0.21	16	31	47
Internal Trips ³						0	0	0
					Subtotal (less internal) =	16	31	47
Senior Adult Housing - Attached	30 DU	252	35%	65%	0.20	2	4	6
Internal Trips ³						-1	0	-1
					Subtotal (less internal) =	1	4	5
Medical-Dental Office	40,000 SF	720	78%	22%	Ln(T) = 0.89 Ln(X) + 1.31	77	22	99
Internal Trips ³						-9	-9	-18
					Subtotal (less internal) =	68	13	81
Mini Warehouse	175,000 SF	151	60%	40%	0.10	11	7	18
Internal Trips ³						0	0	0
					Subtotal (less internal) =	11	7	18
Church	20,000 SF	560	60%	40%	T = 0.36(X) - 0.74	4	2	6
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	2	6
Grocery Store	18,030 SF	850	60%	40%	3.82	41	28	69
Internal Trips ³						-2	-2	-4
Passby Trips ⁴	36%					-14	-9	-23
					Subtotal (less internal and passby) =	25	17	42
Sporting Good Superstore	130,000 SF	861	80%	20%	0.34	35	9	44
Internal Trips ³						-2	-1	-3
Passby Trips ⁴	34%					-11	-3	-14
					Subtotal (less internal and passby) =	22	5	27
Home Improvement Superstore	130,000 SF	862	57%	43%	1.57	116	88	204
Internal Trips ³						-6	-6	-12
Passby Trips ⁴	42%					-46	-35	-81
					Subtotal (less internal and passby) =	64	47	111
Shopping Center	500,000 SF	820	62%	38%	T = 0.50(X) + 151.78	249	153	402
Internal Trips ³						-13	-10	-23
Passby Trips ⁴	34%					-80	-49	-129
					Subtotal (less internal and passby) =	156	94	250
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	T = 137.38(X) - 264.53	88	87	175
Internal Trips ³						-4	-4	-8
Pass-By Trips ⁴	76%					-63	-64	-127
					Subtotal (less internal and passby) =	21	19	40
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	51%	49%	40.19	14	14	28
Internal Trips ³						-13	-7	-20
Pass-By Trips ⁴	49%					-1	-3	-4
					Subtotal (less internal and passby) =	0	4	4
Gross Proposed AM Peak Hour Trips =						1,266	2,311	3,577
Less Total Internal Trips =						-63	-63	-126
Less Total Pass-By Trips =						-215	-163	-378
Net New AM Peak Hour Trips =						988	2,085	3,073

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	
Project Location:				Performed By:	TENW
Scenario Description:	FULL BUILD			Date:	12/7/2020
Analysis Year:	2040			Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	99	77	22
Retail		778,030	SF	894	529	365
Restaurant		700	SF	28	14	14
Cinema/Entertainment				0		
Residential		4,590	DUs	2532	631	1,901
Hotel				0		
All Other Land Uses ²				24	15	9
Total				3577	1266	2311

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	3	0	0	0
Retail	3		7	0	13	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	19	3	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	3,577	1,266	2,311
Internal Capture Percentage	4%	5%	3%
External Vehicle-Trips ³	3,451	1,203	2,248
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	12%	41%
Retail	5%	6%
Restaurant	93%	50%
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Informational Report</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
³ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
⁴ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
<i>Estimation Tool Developed by the Texas Transportation Institute</i>

Project Name:	Badger Mountain South
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	77	77	1.00	22	22
Retail	1.00	529	529	1.00	365	365
Restaurant	1.00	14	14	1.00	14	14
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	631	631	1.00	1901	1901
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	14	0	0	0
Retail	106		47	0	51	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	38	19	380	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		169	3	0	0	0
Retail	3		7	0	13	0
Restaurant	11	42		0	32	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	90	3	0		0
Hotel	2	21	1	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	68	77	68	0	0
Retail	27	502	529	502	0	0
Restaurant	13	1	14	1	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	14	617	631	617	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	15	15	15	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	13	22	13	0	0
Retail	23	342	365	342	0	0
Restaurant	7	7	14	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	24	1877	1901	1877	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	9	9	9	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
FULL BUILD Development (by 2040)
Weekday PM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY PM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	2,382 DU	210	63%	37%	$\ln(T) = 0.96\ln(X)+0.20$	1,343	789	2,132
Internal Trips ³						-243	-102	-345
					Subtotal (less internal) =	1,100	687	1,787
Multifamily Housing (Mid-Rise)	903 DU	221	61%	39%	$\ln(T) = 0.96 \ln(X) - 0.63$	223	143	366
Internal Trips ³						-40	-19	-59
					Subtotal (less internal) =	183	124	307
Multifamily Housing (Low-Rise)	1,155 DU	220	63%	37%	$\ln(T) = 0.89\ln(X)-0.02$	328	193	521
Internal Trips ³						-59	-25	-84
					Subtotal (less internal) =	269	168	437
Senior Adult Housing - Detached	120 DU	251	61%	39%	$\ln(T) = 0.78 \ln(X) + 0.28$	34	21	55
Internal Trips ³						-6	-3	-9
					Subtotal (less internal) =	28	18	46
Senior Adult Housing - Attached	30 DU	252	55%	45%	0.26	4	4	8
Internal Trips ³						-2	0	-2
					Subtotal (less internal) =	2	4	6
Medical-Dental Office	40,000 SF	720	28%	72%	$T = 3.39(X)+2.02$	39	99	138
Internal Trips ³						-34	-22	-56
					Subtotal (less internal) =	5	77	82
Mini Warehouse	175,000 SF	151	47%	53%	0.17	14	16	30
Internal Trips ³						0	0	0
					Subtotal (less internal) =	14	16	30
Church	20,000 SF	560	45%	55%	0.49	4	6	10
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	6	10
Grocery Store	18,030 SF	850	51%	49%	$\ln(T) = 0.75 \ln(X) + 3.21$	111	106	217
Internal Trips ³						-12	-27	-39
Passby Trips ⁴	36%					-33	-31	-64
					Subtotal (less internal and passby) =	66	48	114
Sporting Good Superstore	130,000 SF	861	48%	52%	$\ln(T) = 0.91\ln(X)+1.17$	130	140	270
Internal Trips ³						-14	-35	-49
Passby Trips ⁴	34%					-36	-39	-75
					Subtotal (less internal and passby) =	80	66	146
Home Improvement Superstore	130,000 SF	862	49%	51%	2.33	148	155	303
Internal Trips ³						-16	-39	-55
Passby Trips ⁴	42%					-51	-53	-104
					Subtotal (less internal and passby) =	81	63	144
Shopping Center	500,000 SF	820	48%	52%	$\ln(T) = 0.74\ln(X)+2.89$	858	930	1,788
Internal Trips ³						-95	-233	-328
Passby Trips ⁴	34%					-238	-258	-496
					Subtotal (less internal and passby) =	525	439	964
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	69.28	111	111	222
Internal Trips ³						-13	-27	-40
Pass-By Trips ⁴	76%					-69	-69	-138
					Subtotal (less internal and passby) =	29	15	44
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	52%	48%	32.67	12	11	23
Internal Trips ³						-5	-7	-12
Pass-By Trips ⁴	50%					-4	-2	-6
					Subtotal (less internal and passby) =	3	2	5
Gross Proposed PM Peak Hour Trips =						3,359	2,724	6,083
Less Total Internal Trips =						-539	-539	-1,078
Less Total Pass-By Trips =						-431	-452	-883
Net New PM Peak Hour Trips =						2,389	1,733	4,122

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	
Project Location:				Performed By:	TENW
Scenario Description:	FULL BUILD			Date:	12/7/2020
Analysis Year:	2040			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	138	39	99
Retail		778,030	SF	2578	1,247	1,331
Restaurant		700	SF	23	12	11
Cinema/Entertainment				0		
Residential		4,590	DUs	3082	1,932	1,150
Hotel				0		
All Other Land Uses ²				40	18	22
Total				5861	3248	2613

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	0	0	2	0
Retail	12		3	0	346	0
Restaurant	0	5		0	2	0
Cinema/Entertainment	0	0	0		0	0
Residential	22	125	2	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	5,861	3,248	2,613
Internal Capture Percentage	18%	17%	21%
External Vehicle-Trips ³	4,783	2,709	2,074
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	87%	22%
Retail	12%	27%
Restaurant	42%	64%
Cinema/Entertainment	N/A	N/A
Residential	18%	13%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Badger Mountain South
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	39	39	1.00	99	99
Retail	1.00	1247	1247	1.00	1331	1331
Restaurant	1.00	12	12	1.00	11	11
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	1932	1932	1.00	1150	1150
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	4	0	2	0
Retail	27		386	53	346	67
Restaurant	0	5		1	2	1
Cinema/Entertainment	0	0	0		0	0
Residential	46	483	242	0		35
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		100	0	0	77	0
Retail	12		3	0	889	0
Restaurant	12	624		0	309	0
Cinema/Entertainment	2	50	0		77	0
Residential	22	125	2	0		0
Hotel	0	25	1	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	34	5	39	5	0	0
Retail	150	1097	1247	1097	0	0
Restaurant	5	7	12	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	350	1582	1932	1582	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	18	18	18	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	22	77	99	77	0	0
Retail	361	970	1331	970	0	0
Restaurant	7	4	11	4	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	149	1001	1150	1001	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	22	22	22	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Appendix D

Trip Generation Calculations for Year 2025, 2030, and 2035

BADGER MOUNTAIN SOUTH
TRIP GENERATION SUMMARY - NET NEW TRIPS (Gross Trips less internal and pass-by trips)

Scenario	Land Use Assumptions	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
A) Existing	428 single family DU 283 multi family DU 18,030 SF grocery store 3,200 SF gas station/super convenience market 700 SF fast food restaurant with drive-thru	149	337	486	399	265	664
B) Year 2025	1,247 single family DU 808 multi family DU 150 senior housing DU 40,000 SF medical office 18,030 SF grocery store 3,200 SF gas station/super convenience market 700 SF fast food restaurant with drive-thru 175,000 SF mini-warehouse 20,000 SF church	435	994	1,429	1,088	745	1,833
C) Year 2030	1,617 single family DU 1,258 multi family DU 150 senior housing DU 260,000 SF shopping center 40,000 SF medical office 18,030 SF grocery store 3,200 SF gas station/super convenience market 700 SF fast food restaurant with drive-thru 175,000 SF mini-warehouse 20,000 SF church	651	1,382	2,033	1,574	1,135	2,709
D) Year 2035	2,152 single family DU 1,598 multi family DU 150 senior housing DU 485,000 SF shopping center 130,000 SF home improvement superstore 130,000 SF sporting goods superstore 40,000 SF medical office 18,030 SF grocery store 3,200 SF gas station/super convenience market 700 SF fast food restaurant with drive-thru 175,000 SF mini-warehouse 20,000 SF church	906	1,847	2,753	2,146	1,582	3,728
E) Year 2040	2,382 single family DU 2,058 multi family DU 150 senior housing DU 500,000 SF shopping center 130,000 SF home improvement superstore 130,000 SF sporting goods superstore 40,000 SF medical office 18,030 SF grocery store 3,200 SF gas station/super convenience market 700 SF fast food restaurant with drive-thru 175,000 SF mini-warehouse 20,000 SF church	988	2,085	3,073	2,389	1,733	4,122
Difference between B) and A)		286	657	943	689	480	1,169
Difference between C) and B)		216	388	604	486	390	876
Difference between D) and C)		255	465	720	572	447	1,019
Difference between E) and D)		82	238	320	243	151	394

**Badger Mountain South
Development by 2025
Weekday AM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY AM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	1,247 DU	210	25%	75%	T = 0.71 (X) + 4.80	222	668	890
Internal Trips ³						-5	-11	-16
					Subtotal (less internal) =	217	657	874
Multifamily Housing (Mid-Rise)	283 DU	221	26%	74%	Ln(T) = 0.98 Ln(X) - 0.98	25	70	95
Internal Trips ³						-1	-1	-2
					Subtotal (less internal) =	24	69	93
Multifamily Housing (Low-Rise)	525 DU	220	23%	77%	Ln(T) = 0.95Ln(X)-0.51	53	177	230
Internal Trips ³						-1	-3	-4
					Subtotal (less internal) =	52	174	226
Senior Adult Housing - Detached	120 DU	251	33%	67%	Ln(T) = 0.76 Ln(X) + 0.21	16	31	47
Internal Trips ³						0	0	0
					Subtotal (less internal) =	16	31	47
Senior Adult Housing - Attached	30 DU	252	35%	65%	0.20	2	4	6
Internal Trips ³						0	0	0
					Subtotal (less internal) =	2	4	6
Medical-Dental Office	40,000 SF	720	78%	22%	Ln(T) = 0.89 Ln(X) + 1.31	77	22	99
Internal Trips ³						-9	-9	-18
					Subtotal (less internal) =	68	13	81
Mini Warehouse	175,000 SF	151	60%	40%	0.10	11	7	18
Internal Trips ³						0	0	0
					Subtotal (less internal) =	11	7	18
Church	20,000 SF	560	60%	40%	T = 0.36(X) - 0.74	4	2	6
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	2	6
Grocery Store	18,030 SF	850	60%	40%	3.82	41	28	69
Internal Trips ³						-6	-4	-10
Passby Trips ⁴	36%					-13	-8	-21
					Subtotal (less internal and passby) =	22	16	38
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	T = 137.38(X) - 264.53	88	87	175
Internal Trips ³						-12	-12	-24
Pass-By Trips ⁴	76%					-57	-58	-115
					Subtotal (less internal and passby) =	19	17	36
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	51%	49%	40.19	14	14	28
Internal Trips ³						-13	-7	-20
Pass-By Trips ⁴	49%					-1	-3	-4
					Subtotal (less internal and passby) =	0	4	4
Gross Proposed AM Peak Hour Trips =						553	1,110	1,663
Less Total Internal Trips =						-47	-47	-94
Less Total Pass-By Trips =						-71	-69	-140
Net New AM Peak Hour Trips =						435	994	1,429

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	TENW
Project Location:				Performed By:	
Scenario Description:				Date:	1/4/2021
Analysis Year:	2025			Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	99	77	22
Retail		#REF!	SF	244	129	115
Restaurant		700	SF	28	14	14
Cinema/Entertainment				0		
Residential		2,205	DUs	1268	318	950
Hotel				0		
All Other Land Uses ²				24	15	9
Total				1663	553	1110

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	3	0	0	0
Retail	3		7	0	6	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	10	3	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,663	553	1,110
Internal Capture Percentage	6%	8%	4%
External Vehicle-Trips ³	1,569	506	1,063
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	12%	41%
Retail	14%	14%
Restaurant	93%	50%
Cinema/Entertainment	N/A	N/A
Residential	2%	2%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Informational Report</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
³ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
⁴ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
<i>Estimation Tool Developed by the Texas Transportation Institute</i>

Project Name:	Badger Mountain South
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	77	77	1.00	22	22
Retail	1.00	129	129	1.00	115	115
Restaurant	1.00	14	14	1.00	14	14
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	318	318	1.00	950	950
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	14	0	0	0
Retail	33		15	0	16	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	10	190	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		41	3	0	0	0
Retail	3		7	0	6	0
Restaurant	11	10		0	16	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	22	3	0		0
Hotel	2	5	1	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	68	77	68	0	0
Retail	18	111	129	111	0	0
Restaurant	13	1	14	1	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	7	311	318	311	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	15	15	15	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	13	22	13	0	0
Retail	16	99	115	99	0	0
Restaurant	7	7	14	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	15	935	950	935	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	9	9	9	0	0

¹ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
² Person-Trips
³ Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
Development by 2025
Weekday PM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY PM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	1,247 DU	210	63%	37%	Ln(T) = 0.96Ln(X)+0.20	721	424	1,145
Internal Trips ³						-23	-25	-48
					Subtotal (less internal) =	698	399	1,097
Multifamily Housing (Mid-Rise)	283 DU	221	61%	39%	Ln(T) = 0.96 Ln(X) - 0.63	73	47	120
Internal Trips ³						-2	-3	-5
					Subtotal (less internal) =	71	44	115
Multifamily Housing (Low-Rise)	525 DU	220	63%	37%	Ln(T) = 0.89Ln(X)-0.02	163	95	258
Internal Trips ³						-5	-6	-11
					Subtotal (less internal) =	158	89	247
Senior Adult Housing - Detached	120 DU	251	61%	39%	Ln(T) = 0.78 Ln(X) + 0.28	34	21	55
Internal Trips ³						-1	-1	-2
					Subtotal (less internal) =	33	20	53
Senior Adult Housing - Attached	30 DU	252	55%	45%	0.26	4	4	8
Internal Trips ³						-1	0	-1
					Subtotal (less internal) =	3	4	7
Medical-Dental Office	40,000 SF	720	28%	72%	T = 3.39(X)+2.02	39	99	138
Internal Trips ³						-24	-11	-35
					Subtotal (less internal) =	15	88	103
Mini Warehouse	175,000 SF	151	47%	53%	0.17	14	16	30
Internal Trips ³						0	0	0
					Subtotal (less internal) =	14	16	30
Church	20,000 SF	560	45%	55%	0.49	4	6	10
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	6	10
Grocery Store	18,030 SF	850	51%	49%	Ln(T) = 0.75 Ln(X) + 3.21	111	106	217
Internal Trips ³						-13	-16	-29
Passby Trips ⁴	36%					-35	-33	-68
					Subtotal (less internal and passby) =	63	57	120
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	69.28	111	111	222
Internal Trips ³						-12	-17	-29
Pass-By Trips ⁴	76%					-73	-74	-147
					Subtotal (less internal and passby) =	26	20	46
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	52%	48%	32.67	12	11	23
Internal Trips ³						-5	-7	-12
Pass-By Trips ⁴	50%					-4	-2	-6
					Subtotal (less internal and passby) =	3	2	5
Gross Proposed PM Peak Hour Trips =						1,286	940	2,226
Less Total Internal Trips =						-86	-86	-172
Less Total Pass-By Trips =						-112	-109	-221
Net New PM Peak Hour Trips =						1,088	745	1,833

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	TENW
Project Location:				Performed By:	
Scenario Description:				Date:	1/4/2021
Analysis Year:	2025			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	138	39	99
Retail		#REF!	SF	#REF!	#REF!	#REF!
Restaurant		700	SF	23	12	11
Cinema/Entertainment				0		
Residential		2,205	DUs	1586	995	591
Hotel				0		
All Other Land Uses ²				40	18	22
Total				#REF!	#REF!	#REF!

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		#REF!	#REF!	#REF!	#REF!	#REF!
Retail	#REF!		#REF!	#REF!	#REF!	#REF!
Restaurant	#REF!	#REF!		#REF!	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!	#REF!		#REF!	#REF!
Residential	#REF!	#REF!	#REF!	#REF!		#REF!
Hotel	#REF!	#REF!	#REF!	#REF!	#REF!	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	#REF!	#REF!	#REF!
Internal Capture Percentage	#REF!	#REF!	#REF!
External Vehicle-Trips ³	#REF!	#REF!	#REF!
External Transit-Trips ⁴	#REF!	#REF!	#REF!
External Non-Motorized Trips ⁴	#REF!	#REF!	#REF!

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	#REF!	#REF!
Retail	#REF!	#REF!
Restaurant	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!
Residential	#REF!	#REF!
Hotel	#REF!	#REF!

¹ Land Use Codes (LUCs) from <i>Trip Generation Informational Report</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
³ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
⁴ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Badger Mountain South
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	39	39	1.00	99	99
Retail	1.00	#REF!	#REF!	1.00	#REF!	#REF!
Restaurant	1.00	12	12	1.00	11	11
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	995	995	1.00	591	591
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	4	0	2	0
Retail	#REF!		#REF!	#REF!	#REF!	#REF!
Restaurant	0	5		1	2	1
Cinema/Entertainment	0	0	0		0	0
Residential	24	248	124	0		18
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		#REF!	0	0	40	0
Retail	12		3	0	458	0
Restaurant	12	#REF!		0	159	0
Cinema/Entertainment	2	#REF!	0		40	0
Residential	22	#REF!	2	0		0
Hotel	0	#REF!	1	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Retail	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Restaurant	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Residential	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Hotel	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
All Other Land Uses ³	0	18	18	18	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Retail	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Restaurant	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Residential	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Hotel	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
All Other Land Uses ³	0	22	22	22	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
Development by 2030
Weekday AM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY AM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	1,617 DU	210	25%	75%	T = 0.71 (X) + 4.80	288	865	1,153
Internal Trips ³						-6	-12	-18
					Subtotal (less internal) =	282	853	1,135
Multifamily Housing (Mid-Rise)	503 DU	221	26%	74%	Ln(T) = 0.98 Ln(X) - 0.98	43	124	167
Internal Trips ³						-1	-2	-3
					Subtotal (less internal) =	42	122	164
Multifamily Housing (Low-Rise)	755 DU	220	23%	77%	Ln(T) = 0.95Ln(X)-0.51	75	251	326
Internal Trips ³						-2	-4	-6
					Subtotal (less internal) =	73	247	320
Senior Adult Housing - Detached	120 DU	251	33%	67%	Ln(T) = 0.76 Ln(X) + 0.21	16	31	47
Internal Trips ³						0	0	0
					Subtotal (less internal) =	16	31	47
Senior Adult Housing - Attached	30 DU	252	35%	65%	0.20	2	4	6
Internal Trips ³						0	0	0
					Subtotal (less internal) =	2	4	6
Medical-Dental Office	40,000 SF	720	78%	22%	Ln(T) = 0.89 Ln(X) + 1.31	77	22	99
Internal Trips ³						-9	-9	-18
					Subtotal (less internal) =	68	13	81
Mini Warehouse	175,000 SF	151	60%	40%	0.10	11	7	18
Internal Trips ³						0	0	0
					Subtotal (less internal) =	11	7	18
Church	20,000 SF	560	60%	40%	T = 0.36(X) - 0.74	4	2	6
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	2	6
Grocery Store	18,030 SF	850	60%	40%	3.82	41	28	69
Internal Trips ³						-3	-2	-5
Passby Trips ⁴	36%					-14	-9	-23
					Subtotal (less internal and passby) =	24	17	41
Shopping Center	260,000 SF	820	62%	38%	T = 0.50(X) + 151.78	175	107	282
Internal Trips ³						-12	-9	-21
Passby Trips ⁴	34%					-55	-34	-89
					Subtotal (less internal and passby) =	108	64	172
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	T = 137.38(X) - 264.53	88	87	175
Internal Trips ³						-6	-7	-13
Passby Trips ⁴	76%					-61	-62	-123
					Subtotal (less internal and passby) =	21	18	39
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	51%	49%	40.19	14	14	28
Internal Trips ³						-13	-7	-20
Passby Trips ⁴	49%					-1	-3	-4
					Subtotal (less internal and passby) =	0	4	4
Gross Proposed AM Peak Hour Trips =						834	1,542	2,376
Less Total Internal Trips =						-52	-52	-104
Less Total Pass-By Trips =						-131	-108	-239
Net New AM Peak Hour Trips =						651	1,382	2,033

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	TENW
Project Location:				Performed By:	
Scenario Description:				Date:	1/4/2021
Analysis Year:	2030			Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	99	77	22
Retail		#REF!	SF	526	304	222
Restaurant		700	SF	28	14	14
Cinema/Entertainment				0		
Residential		3,025	DUs	1699	424	1,275
Hotel				0		
All Other Land Uses ²				24	15	9
Total				2376	834	1542

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	3	0	0	0
Retail	3		7	0	8	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	13	3	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,376	834	1,542
Internal Capture Percentage	4%	6%	3%
External Vehicle-Trips ³	2,272	782	1,490
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	12%	41%
Retail	7%	8%
Restaurant	93%	50%
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Project Name:	Badger Mountain South
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	77	77	1.00	22	22
Retail	1.00	304	304	1.00	222	222
Restaurant	1.00	14	14	1.00	14	14
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	424	424	1.00	1275	1275
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	14	0	0	0
Retail	64		29	0	31	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	26	13	255	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		97	3	0	0	0
Retail	3		7	0	8	0
Restaurant	11	24		0	21	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	52	3	0		0
Hotel	2	12	1	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	68	77	68	0	0
Retail	21	283	304	283	0	0
Restaurant	13	1	14	1	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	9	415	424	415	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	15	15	15	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	13	22	13	0	0
Retail	18	204	222	204	0	0
Restaurant	7	7	14	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	18	1257	1275	1257	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	9	9	9	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
Development by 2030
Weekday PM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY PM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	1,617 DU	210	63%	37%	Ln(T) = 0.96Ln(X)+0.20	926	544	1,470
Internal Trips ³						-127	-61	-188
					Subtotal (less internal) =	799	483	1,282
Multifamily Housing (Mid-Rise)	503 DU	221	61%	39%	Ln(T) = 0.96 Ln(X) - 0.63	127	82	209
Internal Trips ³						-17	-9	-26
					Subtotal (less internal) =	110	73	183
Multifamily Housing (Low-Rise)	755 DU	220	63%	37%	Ln(T) = 0.89Ln(X)-0.02	225	132	357
Internal Trips ³						-31	-15	-46
					Subtotal (less internal) =	194	117	311
Senior Adult Housing - Detached	120 DU	251	61%	39%	Ln(T) = 0.78 Ln(X) + 0.28	34	21	55
Internal Trips ³						-5	-2	-7
					Subtotal (less internal) =	29	19	48
Senior Adult Housing - Attached	30 DU	252	55%	45%	0.26	4	4	8
Internal Trips ³						-1	-1	-2
					Subtotal (less internal) =	3	3	6
Medical-Dental Office	40,000 SF	720	28%	72%	T = 3.39(X)+2.02	39	99	138
Internal Trips ³						-34	-22	-56
					Subtotal (less internal) =	5	77	82
Mini Warehouse	175,000 SF	151	47%	53%	0.17	14	16	30
Internal Trips ³						0	0	0
					Subtotal (less internal) =	14	16	30
Church	20,000 SF	560	45%	55%	0.49	4	6	10
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	6	10
Grocery Store	18,030 SF	850	51%	49%	Ln(T) = 0.75 Ln(X) + 3.21	111	106	217
Internal Trips ³						-13	-26	-39
Passby Trips ⁴	36%					-33	-31	-64
					Subtotal (less internal and passby) =	65	49	114
Shopping Center	260,000 SF	820	48%	52%	Ln(T) = 0.74Ln(X)+2.89	529	573	1,102
Internal Trips ³						-63	-139	-202
Passby Trips ⁴	34%					-147	-159	-306
					Subtotal (less internal and passby) =	319	275	594
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	69.28	111	111	222
Internal Trips ³						-13	-27	-40
Passby Trips ⁴	76%					-69	-69	-138
					Subtotal (less internal and passby) =	29	15	44
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	52%	48%	32.67	12	11	23
Internal Trips ³						-5	-7	-12
Passby Trips ⁴	50%					-4	-2	-6
					Subtotal (less internal and passby) =	3	2	5
Gross Proposed PM Peak Hour Trips =						2,136	1,705	3,841
Less Total Internal Trips =						-309	-309	-618
Less Total Pass-By Trips =						-253	-261	-514
Net New PM Peak Hour Trips =						1,574	1,135	2,709

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	TENW
Project Location:				Performed By:	
Scenario Description:				Date:	1/4/2021
Analysis Year:	2030			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	138	39	99
Retail		#REF!	SF	#REF!	#REF!	#REF!
Restaurant		700	SF	23	12	11
Cinema/Entertainment				0		
Residential		3,025	DUs	2099	1,316	783
Hotel				0		
All Other Land Uses ²				40	18	22
Total				#REF!	#REF!	#REF!

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		#REF!	#REF!	#REF!	#REF!	#REF!
Retail	#REF!		#REF!	#REF!	#REF!	#REF!
Restaurant	#REF!	#REF!		#REF!	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!	#REF!		#REF!	#REF!
Residential	#REF!	#REF!	#REF!	#REF!		#REF!
Hotel	#REF!	#REF!	#REF!	#REF!	#REF!	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	#REF!	#REF!	#REF!
Internal Capture Percentage	#REF!	#REF!	#REF!
External Vehicle-Trips ³	#REF!	#REF!	#REF!
External Transit-Trips ⁴	#REF!	#REF!	#REF!
External Non-Motorized Trips ⁴	#REF!	#REF!	#REF!

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	#REF!	#REF!
Retail	#REF!	#REF!
Restaurant	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!
Residential	#REF!	#REF!
Hotel	#REF!	#REF!

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Badger Mountain South
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	39	39	1.00	99	99
Retail	1.00	#REF!	#REF!	1.00	#REF!	#REF!
Restaurant	1.00	12	12	1.00	11	11
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	1316	1316	1.00	783	783
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	4	0	2	0
Retail	#REF!		#REF!	#REF!	#REF!	#REF!
Restaurant	0	5		1	2	1
Cinema/Entertainment	0	0	0		0	0
Residential	31	329	164	0		23
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		#REF!	0	0	53	0
Retail	12		3	0	605	0
Restaurant	12	#REF!		0	211	0
Cinema/Entertainment	2	#REF!	0		53	0
Residential	22	#REF!	2	0		0
Hotel	0	#REF!	1	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Retail	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Restaurant	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Residential	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Hotel	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
All Other Land Uses ³	0	18	18	18	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Retail	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Restaurant	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Cinema/Entertainment	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Residential	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Hotel	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
All Other Land Uses ³	0	22	22	22	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
Development by 2035
Weekday AM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY AM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	2,152 DU	210	25%	75%	T = 0.71 (X) + 4.80	383	1,150	1,533
Internal Trips ³						-8	-15	-23
					Subtotal (less internal) =	375	1,135	1,510
Multifamily Housing (Mid-Rise)	563 DU	221	26%	74%	Ln(T) = 0.98 Ln(X) - 0.98	48	138	186
Internal Trips ³						-1	-2	-3
					Subtotal (less internal) =	47	136	183
Multifamily Housing (Low-Rise)	1,035 DU	220	23%	77%	Ln(T) = 0.95Ln(X)-0.51	101	338	439
Internal Trips ³						-2	-4	-6
					Subtotal (less internal) =	99	334	433
Senior Adult Housing - Detached	120 DU	251	33%	67%	Ln(T) = 0.76 Ln(X) + 0.21	16	31	47
Internal Trips ³						0	0	0
					Subtotal (less internal) =	16	31	47
Senior Adult Housing - Attached	30 DU	252	35%	65%	0.20	2	4	6
Internal Trips ³						-1	-1	-2
					Subtotal (less internal) =	1	3	4
Medical-Dental Office	40,000 SF	720	78%	22%	Ln(T) = 0.89 Ln(X) + 1.31	77	22	99
Internal Trips ³						-9	-9	-18
					Subtotal (less internal) =	68	13	81
Mini Warehouse	175,000 SF	151	60%	40%	0.10	11	7	18
Internal Trips ³						0	0	0
					Subtotal (less internal) =	11	7	18
Church	20,000 SF	560	60%	40%	T = 0.36(X) - 0.74	4	2	6
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	2	6
Grocery Store	18,030 SF	850	60%	40%	3.82	41	28	69
Internal Trips ³						-2	-2	-4
Passby Trips ⁴	36%					-14	-9	-23
					Subtotal (less internal and passby) =	25	17	42
Sporting Good Superstore	130,000 SF	861	80%	20%	0.34	35	9	44
Internal Trips ³						-2	-1	-3
Passby Trips ⁴	34%					-11	-3	-14
					Subtotal (less internal and passby) =	22	5	27
Home Improvement Superstore	130,000 SF	862	57%	43%	1.57	116	88	204
Internal Trips ³						-6	-5	-11
Passby Trips ⁴	42%					-46	-35	-81
					Subtotal (less internal and passby) =	64	48	112
Shopping Center	485,000 SF	820	62%	38%	T = 0.50(X) + 151.78	244	150	394
Internal Trips ³						-12	-9	-21
Passby Trips ⁴	34%					-79	-48	-127
					Subtotal (less internal and passby) =	153	93	246
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	T = 137.38(X) - 264.53	88	87	175
Internal Trips ³						-3	-4	-7
Pass-By Trips ⁴	76%					-64	-64	-128
					Subtotal (less internal and passby) =	21	19	40
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	51%	49%	40.19	14	14	28
Internal Trips ³						-13	-7	-20
Pass-By Trips ⁴	49%					-1	-3	-4
					Subtotal (less internal and passby) =	0	4	4
Gross Proposed AM Peak Hour Trips =						1,180	2,068	3,248
Less Total Internal Trips =						-59	-59	-118
Less Total Pass-By Trips =						-215	-162	-377
Net New AM Peak Hour Trips =						906	1,847	2,753

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	TENW
Project Location:				Performed By:	
Scenario Description:				Date:	1/4/2021
Analysis Year:	2035			Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	99	77	22
Retail		763,030	SF	886	524	362
Restaurant		700	SF	28	14	14
Cinema/Entertainment				0		
Residential		3,900	DUs	2211	550	1,661
Hotel				0		
All Other Land Uses ²				24	15	9
Total				3248	1180	2068

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	3	0	0	0
Retail	3		7	0	11	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	17	3	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	3,248	1,180	2,068
Internal Capture Percentage	4%	5%	3%
External Vehicle-Trips ³	3,130	1,121	2,009
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	12%	41%
Retail	5%	6%
Restaurant	93%	50%
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Badger Mountain South
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	77	77	1.00	22	22
Retail	1.00	524	524	1.00	362	362
Restaurant	1.00	14	14	1.00	14	14
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	550	550	1.00	1661	1661
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	14	0	0	0
Retail	105		47	0	51	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	33	17	332	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		168	3	0	0	0
Retail	3		7	0	11	0
Restaurant	11	42		0	28	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	89	3	0		0
Hotel	2	21	1	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	68	77	68	0	0
Retail	25	499	524	499	0	0
Restaurant	13	1	14	1	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	12	538	550	538	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	15	15	15	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	13	22	13	0	0
Retail	21	341	362	341	0	0
Restaurant	7	7	14	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	22	1639	1661	1639	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	9	9	9	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
Development by 2035
Weekday PM Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY PM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	2,152 DU	210	63%	37%	Ln(T) = 0.96Ln(X)+0.20	1,218	716	1,934
Internal Trips ³						-248	-105	-353
					Subtotal (less internal) =	970	611	1,581
Multifamily Housing (Mid-Rise)	563 DU	221	61%	39%	Ln(T) = 0.96 Ln(X) - 0.63	142	91	233
Internal Trips ³						-29	-13	-42
					Subtotal (less internal) =	113	78	191
Multifamily Housing (Low-Rise)	1,035 DU	220	63%	37%	Ln(T) = 0.89Ln(X)-0.02	298	175	473
Internal Trips ³						-61	-26	-87
					Subtotal (less internal) =	237	149	386
Senior Adult Housing - Detached	120 DU	251	61%	39%	Ln(T) = 0.78 Ln(X) + 0.28	34	21	55
Internal Trips ³						-7	-3	-10
					Subtotal (less internal) =	27	18	45
Senior Adult Housing - Attached	30 DU	252	55%	45%	0.26	4	4	8
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	4	8
Medical-Dental Office	40,000 SF	720	28%	72%	T = 3.39(X)+2.02	39	99	138
Internal Trips ³						-34	-22	-56
					Subtotal (less internal) =	5	77	82
Mini Warehouse	175,000 SF	151	47%	53%	0.17	14	16	30
Internal Trips ³						0	0	0
					Subtotal (less internal) =	14	16	30
Church	20,000 SF	560	45%	55%	0.49	4	6	10
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	6	10
Grocery Store	18,030 SF	850	51%	49%	Ln(T) = 0.75 Ln(X) + 3.21	111	106	217
Internal Trips ³						-12	-27	-39
Passby Trips ⁴	36%					-33	-31	-64
					Subtotal (less internal and passby) =	66	48	114
Sporting Good Superstore	130,000 SF	861	48%	52%	Ln(T) = 0.91Ln(X)+1.17	130	140	270
Internal Trips ³						-14	-35	-49
Passby Trips ⁴	34%					-36	-39	-75
					Subtotal (less internal and passby) =	80	66	146
Home Improvement Superstore	130,000 SF	862	49%	51%	2.33	148	155	303
Internal Trips ³						-16	-39	-55
Passby Trips ⁴	42%					-51	-53	-104
					Subtotal (less internal and passby) =	81	63	144
Shopping Center	485,000 SF	820	48%	52%	Ln(T) = 0.74Ln(X)+2.89	839	909	1,748
Internal Trips ³						-93	-228	-321
Passby Trips ⁴	34%					-233	-252	-485
					Subtotal (less internal and passby) =	513	429	942
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	69.28	111	111	222
Internal Trips ³						-13	-27	-40
Pass-By Trips ⁴	76%					-69	-69	-138
					Subtotal (less internal and passby) =	29	15	44
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	52%	48%	32.67	12	11	23
Internal Trips ³						-5	-7	-12
Pass-By Trips ⁴	50%					-4	-2	-6
					Subtotal (less internal and passby) =	3	2	5
Gross Proposed PM Peak Hour Trips =						3,104	2,560	5,664
Less Total Internal Trips =						-532	-532	-1,064
Less Total Pass-By Trips =						-426	-446	-872
Net New PM Peak Hour Trips =						2,146	1,582	3,728

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	TENW
Project Location:				Performed By:	
Scenario Description:				Date:	1/4/2021
Analysis Year:	2035			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	138	39	99
Retail		763,030	SF	2538	1,228	1,310
Restaurant		700	SF	23	12	11
Cinema/Entertainment				0		
Residential		3,900	DUs	2703	1,696	1,007
Hotel				0		
All Other Land Uses ²				40	18	22
Total				5442	2993	2449

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	0	0	2	0
Retail	12		3	0	341	0
Restaurant	0	5		0	2	0
Cinema/Entertainment	0	0	0		0	0
Residential	22	123	2	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	5,442	2,993	2,449
Internal Capture Percentage	20%	18%	22%
External Vehicle-Trips ³	4,378	2,461	1,917
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	87%	22%
Retail	12%	27%
Restaurant	42%	64%
Cinema/Entertainment	N/A	N/A
Residential	20%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Badger Mountain South
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	39	39	1.00	99	99
Retail	1.00	1228	1228	1.00	1310	1310
Restaurant	1.00	12	12	1.00	11	11
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	1696	1696	1.00	1007	1007
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	4	0	2	0
Retail	26		380	52	341	66
Restaurant	0	5		1	2	1
Cinema/Entertainment	0	0	0		0	0
Residential	40	423	211	0		30
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		98	0	0	68	0
Retail	12		3	0	780	0
Restaurant	12	614		0	271	0
Cinema/Entertainment	2	49	0		68	0
Residential	22	123	2	0		0
Hotel	0	25	1	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	34	5	39	5	0	0
Retail	148	1080	1228	1080	0	0
Restaurant	5	7	12	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	345	1351	1696	1351	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	18	18	18	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	22	77	99	77	0	0
Retail	356	954	1310	954	0	0
Restaurant	7	4	11	4	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	147	860	1007	860	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	22	22	22	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
FULL BUILD Development (by 2040)
Weekday Daily Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY DAILY								
Proposed Use:								
Single-Family Detached Housing	2,382 DU	210	50%	50%	Ln(T) = 0.92 Ln(X) + 2.71	9,609	9,610	19,219
Internal Trips (15%) ³						-1,441	-1,442	-2,883
Subtotal (less internal) =						8,168	8,168	16,336
Multifamily Housing (Mid-Rise)	903 DU	221	50%	50%	T = 5.45(X) - 1.75	2,460	2,460	4,920
Internal Trips (15%) ³						-369	-369	-738
Subtotal (less internal) =						2,091	2,091	4,182
Multifamily Housing (Low-Rise)	1,155 DU	220	50%	50%	T = 7.56(X) - 40.86	4,346	4,345	8,691
Internal Trips (15%) ³						-652	-652	-1,304
Subtotal (less internal) =						3,694	3,693	7,387
Senior Adult Housing - Detached	120 DU	251	50%	50%	Ln(T) = 0.88 Ln(X) + 2.28	330	330	660
Internal Trips (15%) ³						-49	-50	-99
Subtotal (less internal) =						281	280	561
Senior Adult Housing - Attached	30 DU	252	50%	50%	3.70	55	56	111
Internal Trips (15%) ³						-9	-8	-17
Subtotal (less internal) =						46	48	94
Medical-Dental Office	40,000 SF	720	50%	50%	T = 38.42(X) - 87.62	725	724	1,449
Internal Trips (15%) ³						-109	-108	-217
Subtotal (less internal) =						616	616	1,232
Mini Warehouse	175,000 SF	151	50%	50%	1.51	132	132	264
Internal Trips (15%) ³						-20	-20	-40
Subtotal (less internal) =						112	112	224
Church	20,000 SF	560	50%	50%	6.95	69	70	139
Internal Trips (15%) ³						-11	-10	-21
Subtotal (less internal) =						58	60	118
Grocery Store	18,030 SF	850	50%	50%	106.78	963	962	1,925
Internal Trips (15%) ³						-144	-145	-289
Passby Trips ⁴	36%					-294	-295	-589
Subtotal (less internal and passby) =						525	522	1,047
Sporting Good Superstore	130,000 SF	861	50%	50%	28.75	1,869	1,869	3,738
Internal Trips (15%) ³						-281	-280	-561
Passby Trips ⁴	34%					-540	-540	-1,080
Subtotal (less internal and passby) =						1,048	1,049	2,097
Home Improvement Superstore	130,000 SF	862	50%	50%	30.74	1,998	1,998	3,996
Internal Trips (15%) ³						-299	-300	-599
Passby Trips ⁴	42%					-714	-713	-1,427
Subtotal (less internal and passby) =						985	985	1,970
Shopping Center	500,000 SF	820	50%	50%	Ln(T) = 0.68 Ln(X) + 5.57	8,980	8,981	17,961
Internal Trips (15%) ³						-1,347	-1,347	-2,694
Passby Trips ⁴	34%					-2,595	-2,596	-5,191
Subtotal (less internal and passby) =						5,038	5,038	10,076
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	837.58	1,340	1,340	2,680
Internal Trips (15%) ³						-201	-201	-402
Pass-By Trips ⁴	76%					-866	-865	-1,731
Subtotal (less internal and passby) =						273	274	547
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	50%	50%	470.95	165	165	330
Internal Trips (15%) ³						-25	-25	-50
Pass-By Trips ⁴	50%					-70	-70	-140
Subtotal (less internal and passby) =						70	70	140
Gross Proposed PM Peak Hour Trips =						33,041	33,042	66,083
Less Total Internal Trips =						-4,957	-4,957	-9,914
Less Total Pass-By Trips =						-5,079	-5,079	-10,158
Net New PM Peak Hour Trips =						23,005	23,006	46,011

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions for weekday daily time period were estimated to be 15% based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

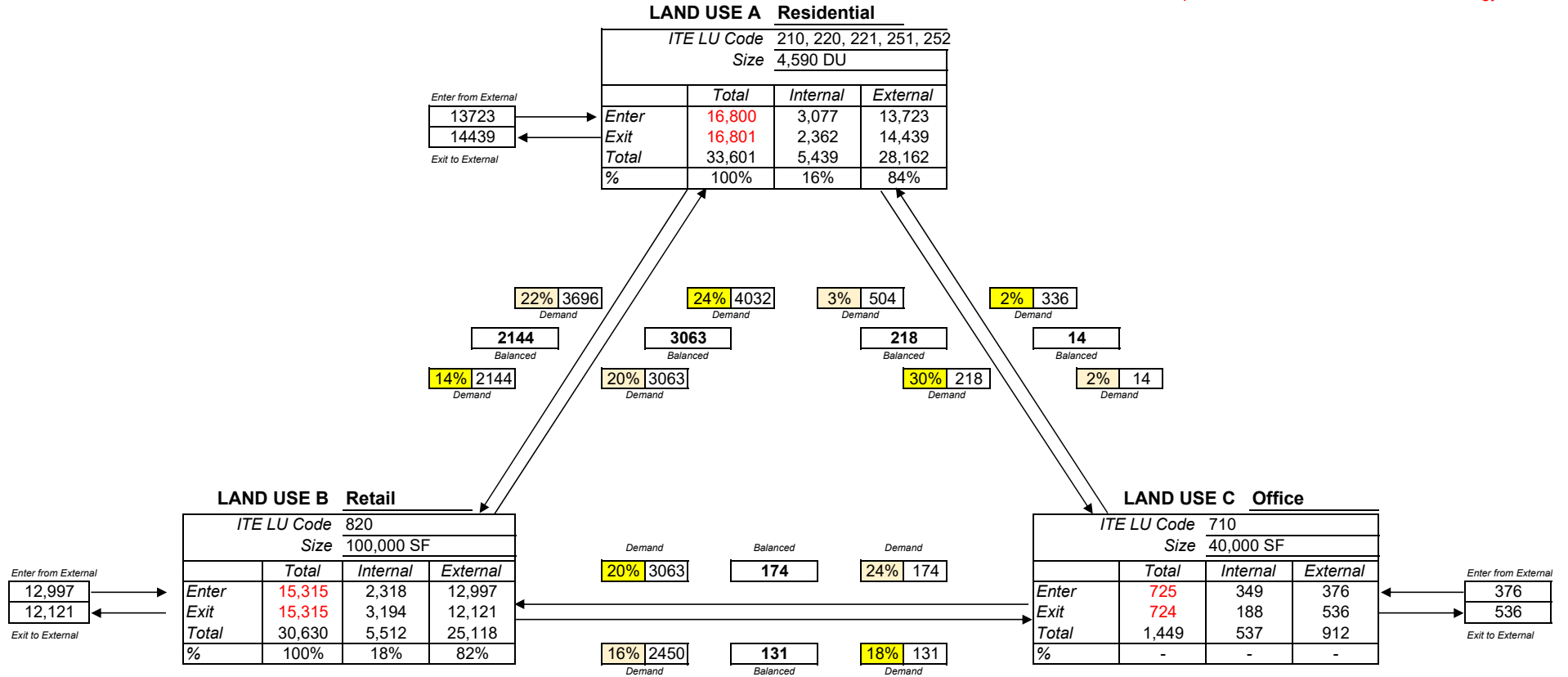
⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

Analyst TENW
Date 12/28/2020

Multi-Use Development Trip Generation and Internal Capture Summary - Daily

Project Name BMS Full Build
Time Period Weekday Daily

Assumed Average of AM and PM internal
capture rates from NCHRP 8-51 Methodology



**Badger Mountain South
FULL BUILD Development (by 2040)
Weekday AM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY AM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	2,382 DU	210	25%	75%	T = 0.71 (X) + 4.80	424	1,272	1,696
Internal Trips ³						-9	-16	-25
					Subtotal (less internal) =	415	1,256	1,671
Multifamily Housing (Mid-Rise)	903 DU	221	26%	74%	Ln(T) = 0.98 Ln(X) - 0.98	77	219	296
Internal Trips ³						-2	-3	-5
					Subtotal (less internal) =	75	216	291
Multifamily Housing (Low-Rise)	1,155 DU	220	23%	77%	Ln(T) = 0.95Ln(X)-0.51	112	375	487
Internal Trips ³						-2	-5	-7
					Subtotal (less internal) =	110	370	480
Senior Adult Housing - Detached	120 DU	251	33%	67%	Ln(T) = 0.76 Ln(X) + 0.21	16	31	47
Internal Trips ³						0	0	0
					Subtotal (less internal) =	16	31	47
Senior Adult Housing - Attached	30 DU	252	35%	65%	0.20	2	4	6
Internal Trips ³						-1	0	-1
					Subtotal (less internal) =	1	4	5
Medical-Dental Office	40,000 SF	720	78%	22%	Ln(T) = 0.89 Ln(X) + 1.31	77	22	99
Internal Trips ³						-9	-9	-18
					Subtotal (less internal) =	68	13	81
Mini Warehouse	175,000 SF	151	60%	40%	0.10	11	7	18
Internal Trips ³						0	0	0
					Subtotal (less internal) =	11	7	18
Church	20,000 SF	560	60%	40%	T = 0.36(X) - 0.74	4	2	6
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	2	6
Grocery Store	18,030 SF	850	60%	40%	3.82	41	28	69
Internal Trips ³						-2	-2	-4
Passby Trips ⁴	36%					-14	-9	-23
					Subtotal (less internal and passby) =	25	17	42
Sporting Good Superstore	130,000 SF	861	80%	20%	0.34	35	9	44
Internal Trips ³						-2	-1	-3
Passby Trips ⁴	34%					-11	-3	-14
					Subtotal (less internal and passby) =	22	5	27
Home Improvement Superstore	130,000 SF	862	57%	43%	1.57	116	88	204
Internal Trips ³						-6	-6	-12
Passby Trips ⁴	42%					-46	-35	-81
					Subtotal (less internal and passby) =	64	47	111
Shopping Center	500,000 SF	820	62%	38%	T = 0.50(X) + 151.78	249	153	402
Internal Trips ³						-13	-10	-23
Passby Trips ⁴	34%					-80	-49	-129
					Subtotal (less internal and passby) =	156	94	250
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	T = 137.38(X) - 264.53	88	87	175
Internal Trips ³						-4	-4	-8
Pass-By Trips ⁴	76%					-63	-64	-127
					Subtotal (less internal and passby) =	21	19	40
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	51%	49%	40.19	14	14	28
Internal Trips ³						-13	-7	-20
Pass-By Trips ⁴	49%					-1	-3	-4
					Subtotal (less internal and passby) =	0	4	4
Gross Proposed AM Peak Hour Trips =						1,266	2,311	3,577
Less Total Internal Trips =						-63	-63	-126
Less Total Pass-By Trips =						-215	-163	-378
Net New AM Peak Hour Trips =						988	2,085	3,073

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	
Project Location:				Performed By:	TENW
Scenario Description:	FULL BUILD			Date:	12/7/2020
Analysis Year:	2040			Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	99	77	22
Retail		778,030	SF	894	529	365
Restaurant		700	SF	28	14	14
Cinema/Entertainment				0		
Residential		4,590	DUs	2532	631	1,901
Hotel				0		
All Other Land Uses ²				24	15	9
Total				3577	1266	2311

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	3	0	0	0
Retail	3		7	0	13	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	19	3	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	3,577	1,266	2,311
Internal Capture Percentage	4%	5%	3%
External Vehicle-Trips ³	3,451	1,203	2,248
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	12%	41%
Retail	5%	6%
Restaurant	93%	50%
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Badger Mountain South
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	77	77	1.00	22	22
Retail	1.00	529	529	1.00	365	365
Restaurant	1.00	14	14	1.00	14	14
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	631	631	1.00	1901	1901
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	14	0	0	0
Retail	106		47	0	51	0
Restaurant	4	2		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	38	19	380	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		169	3	0	0	0
Retail	3		7	0	13	0
Restaurant	11	42		0	32	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	90	3	0		0
Hotel	2	21	1	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	68	77	68	0	0
Retail	27	502	529	502	0	0
Restaurant	13	1	14	1	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	14	617	631	617	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	15	15	15	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	13	22	13	0	0
Retail	23	342	365	342	0	0
Restaurant	7	7	14	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	24	1877	1901	1877	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	9	9	9	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

**Badger Mountain South
FULL BUILD Development (by 2040)
Weekday PM Peak Hour Trip Generation Summary**

Land Use	Units ¹	ITE LUC ²	Directional Distribution ²		Trip Rate or Equation ²	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY PM PEAK HOUR								
Proposed Use:								
Single-Family Detached Housing	2,382 DU	210	63%	37%	$\ln(T) = 0.96\ln(X)+0.20$	1,343	789	2,132
Internal Trips ³						-243	-102	-345
					Subtotal (less internal) =	1,100	687	1,787
Multifamily Housing (Mid-Rise)	903 DU	221	61%	39%	$\ln(T) = 0.96 \ln(X) - 0.63$	223	143	366
Internal Trips ³						-40	-19	-59
					Subtotal (less internal) =	183	124	307
Multifamily Housing (Low-Rise)	1,155 DU	220	63%	37%	$\ln(T) = 0.89\ln(X)-0.02$	328	193	521
Internal Trips ³						-59	-25	-84
					Subtotal (less internal) =	269	168	437
Senior Adult Housing - Detached	120 DU	251	61%	39%	$\ln(T) = 0.78 \ln(X) + 0.28$	34	21	55
Internal Trips ³						-6	-3	-9
					Subtotal (less internal) =	28	18	46
Senior Adult Housing - Attached	30 DU	252	55%	45%	0.26	4	4	8
Internal Trips ³						-2	0	-2
					Subtotal (less internal) =	2	4	6
Medical-Dental Office	40,000 SF	720	28%	72%	$T = 3.39(X)+2.02$	39	99	138
Internal Trips ³						-34	-22	-56
					Subtotal (less internal) =	5	77	82
Mini Warehouse	175,000 SF	151	47%	53%	0.17	14	16	30
Internal Trips ³						0	0	0
					Subtotal (less internal) =	14	16	30
Church	20,000 SF	560	45%	55%	0.49	4	6	10
Internal Trips ³						0	0	0
					Subtotal (less internal) =	4	6	10
Grocery Store	18,030 SF	850	51%	49%	$\ln(T) = 0.75 \ln(X) + 3.21$	111	106	217
Internal Trips ³						-12	-27	-39
Passby Trips ⁴	36%					-33	-31	-64
					Subtotal (less internal and passby) =	66	48	114
Sporting Good Superstore	130,000 SF	861	48%	52%	$\ln(T) = 0.91\ln(X)+1.17$	130	140	270
Internal Trips ³						-14	-35	-49
Passby Trips ⁴	34%					-36	-39	-75
					Subtotal (less internal and passby) =	80	66	146
Home Improvement Superstore	130,000 SF	862	49%	51%	2.33	148	155	303
Internal Trips ³						-16	-39	-55
Passby Trips ⁴	42%					-51	-53	-104
					Subtotal (less internal and passby) =	81	63	144
Shopping Center	500,000 SF	820	48%	52%	$\ln(T) = 0.74\ln(X)+2.89$	858	930	1,788
Internal Trips ³						-95	-233	-328
Passby Trips ⁴	34%					-238	-258	-496
					Subtotal (less internal and passby) =	525	439	964
Super Convenience Market/Gas Station	3,200 SF	960	50%	50%	69.28	111	111	222
Internal Trips ³						-13	-27	-40
Pass-By Trips ⁴	76%					-69	-69	-138
					Subtotal (less internal and passby) =	29	15	44
Fast-Food Restaurant w/ Drive-Thru	700 SF	934	52%	48%	32.67	12	11	23
Internal Trips ³						-5	-7	-12
Pass-By Trips ⁴	50%					-4	-2	-6
					Subtotal (less internal and passby) =	3	2	5
Gross Proposed PM Peak Hour Trips =						3,359	2,724	6,083
Less Total Internal Trips =						-539	-539	-1,078
Less Total Pass-By Trips =						-431	-452	-883
Net New PM Peak Hour Trips =						2,389	1,733	4,122

Notes:

¹ DU = Dwelling Units, SF = Square Feet.

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition.

³ Internal trip reductions based on methodology documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

⁴ Passby percent based on studies documented in the ITE Trip Generation Handbook, 3rd Edition, 2017.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Badger Mountain South			Organization:	
Project Location:				Performed By:	TENW
Scenario Description:	FULL BUILD			Date:	12/7/2020
Analysis Year:	2040			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		40,000	SF	138	39	99
Retail		778,030	SF	2578	1,247	1,331
Restaurant		700	SF	23	12	11
Cinema/Entertainment				0		
Residential		4,590	DUs	3082	1,932	1,150
Hotel				0		
All Other Land Uses ²				40	18	22
Total				5861	3248	2613

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	0	0	2	0
Retail	12		3	0	346	0
Restaurant	0	5		0	2	0
Cinema/Entertainment	0	0	0		0	0
Residential	22	125	2	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	5,861	3,248	2,613
Internal Capture Percentage	18%	17%	21%
External Vehicle-Trips ³	4,783	2,709	2,074
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	87%	22%
Retail	12%	27%
Restaurant	42%	64%
Cinema/Entertainment	N/A	N/A
Residential	18%	13%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Badger Mountain South
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	39	39	1.00	99	99
Retail	1.00	1247	1247	1.00	1331	1331
Restaurant	1.00	12	12	1.00	11	11
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	1932	1932	1.00	1150	1150
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		20	4	0	2	0
Retail	27		386	53	346	67
Restaurant	0	5		1	2	1
Cinema/Entertainment	0	0	0		0	0
Residential	46	483	242	0		35
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		100	0	0	77	0
Retail	12		3	0	889	0
Restaurant	12	624		0	309	0
Cinema/Entertainment	2	50	0		77	0
Residential	22	125	2	0		0
Hotel	0	25	1	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	34	5	39	5	0	0
Retail	150	1097	1247	1097	0	0
Restaurant	5	7	12	7	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	350	1582	1932	1582	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	18	18	18	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	22	77	99	77	0	0
Retail	361	970	1331	970	0	0
Restaurant	7	4	11	4	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	149	1001	1150	1001	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	22	22	22	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

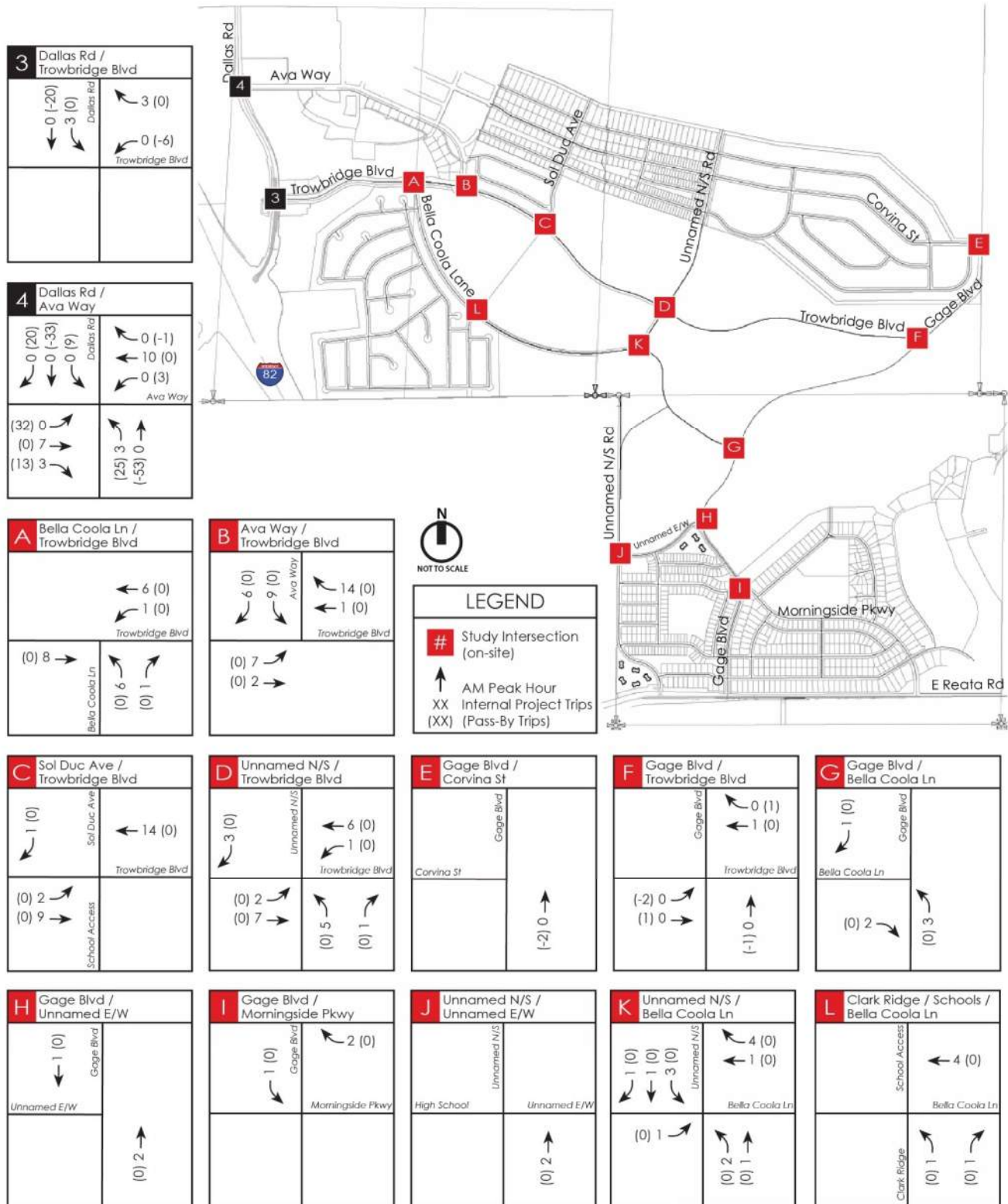
²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

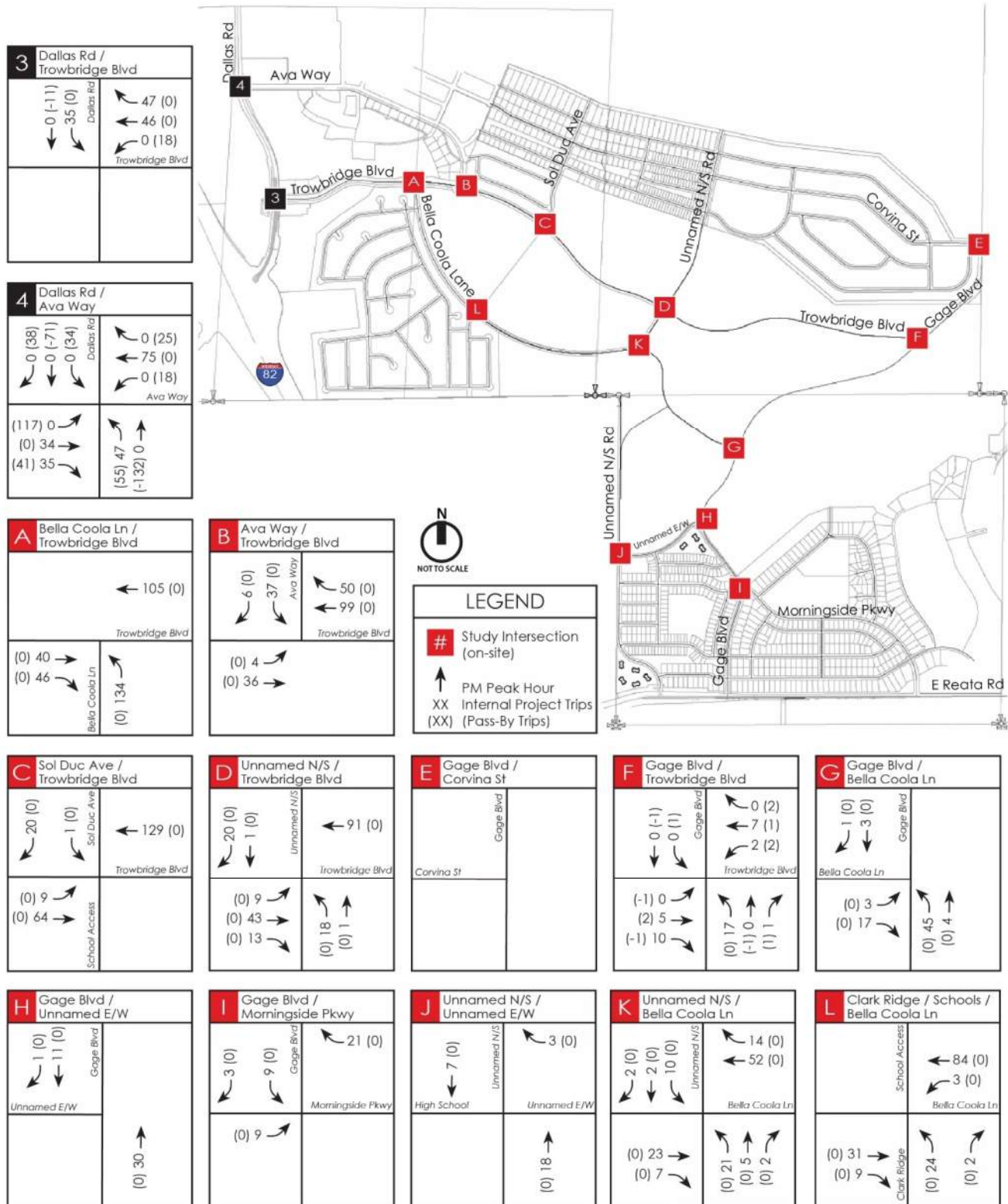
*Indicates computation that has been rounded to the nearest whole number.

Appendix E

Year 2040 with Full BMS Buildout Trip Assignment Figures for Internal and Pass-
by Trips



Appendix E1: Year 2040 AM Peak Hour Pass-By & Internal Project Trip Assignment



Appendix E2: Year 2040 PM Peak Hour Pass-By & Internal Project Trip Assignment

Appendix F

Level of Service (LOS) Calculations at On-Site Study Intersections

2040 With BMS Full Buildout AM Peak Hour

Lanes, Volumes, Timings

A: Bella Coola Ln & Trowbridge Blvd

05/12/2021

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	338	136	37	818	326	41
Future Volume (vph)	338	136	37	818	326	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	100		100	0
Storage Lanes		0	1		1	1
Taper Length (ft)			25		25	
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	1524			478	3007	
Travel Time (s)	34.6			10.9	68.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	6	
Permitted Phases			8			6
Detector Phase	4		3	8	6	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	20.5		9.5	20.5	20.5	20.5
Total Split (s)	35.0		11.0	46.0	44.0	44.0
Total Split (%)	38.9%		12.2%	51.1%	48.9%	48.9%
Yellow Time (s)	5.0		5.0	5.0	5.0	5.0
All-Red Time (s)	0.5		0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5		5.5	5.5	5.5	5.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Recall Mode	None		None	None	Min	Min

Intersection Summary

Area Type: Other

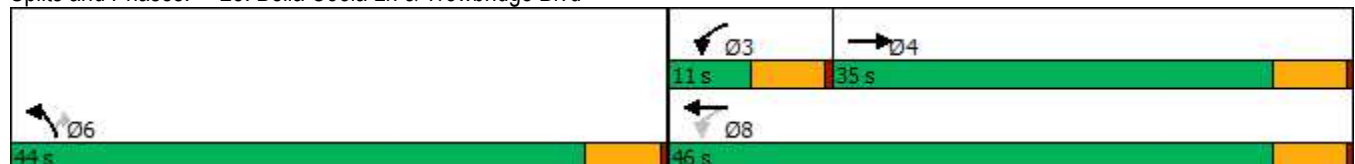
Cycle Length: 90

Actuated Cycle Length: 39.4

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Splits and Phases: 25: Bella Coola Ln & Trowbridge Blvd



HCM 6th Signalized Intersection Summary

A: Bella Coola Ln & Trowbridge Blvd

05/12/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (veh/h)	338	136	37	818	326	41
Future Volume (veh/h)	338	136	37	818	326	41
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.99	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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	367	148	40	889	354	45
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	564	224	357	1508	441	392
Arrive On Green	0.23	0.23	0.04	0.43	0.25	0.25
Sat Flow, veh/h	2549	974	1767	3618	1767	1572
Grp Volume(v), veh/h	262	253	40	889	354	45
Grp Sat Flow(s),veh/h/ln	1763	1667	1767	1763	1767	1572
Q Serve(g_s), s	4.6	4.7	0.5	6.6	6.4	0.8
Cycle Q Clear(g_c), s	4.6	4.7	0.5	6.6	6.4	0.8
Prop In Lane		0.58	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	405	383	357	1508	441	392
V/C Ratio(X)	0.65	0.66	0.11	0.59	0.80	0.11
Avail Cap(c_a), veh/h	1526	1443	577	4190	1996	1776
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.9	11.9	8.6	7.5	12.0	9.9
Incr Delay (d2), s/veh	0.6	0.7	0.1	0.1	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	1.4	0.1	1.5	2.0	0.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.5	12.7	8.7	7.6	13.3	9.9
LnGrp LOS	B	B	A	A	B	A
Approach Vol, veh/h	515			929	399	
Approach Delay, s/veh	12.6			7.6	12.9	
Approach LOS	B			A	B	
Timer - Assigned Phs			3	4	6	8
Phs Duration (G+Y+Rc), s			6.8	13.3	14.0	20.1
Change Period (Y+Rc), s			5.5	5.5	5.5	5.5
Max Green Setting (Gmax), s			5.5	29.5	38.5	40.5
Max Q Clear Time (g_c+I1), s			2.5	6.7	8.4	8.6
Green Ext Time (p_c), s			0.0	0.8	0.1	1.8
Intersection Summary						
HCM 6th Ctrl Delay			10.2			
HCM 6th LOS			B			

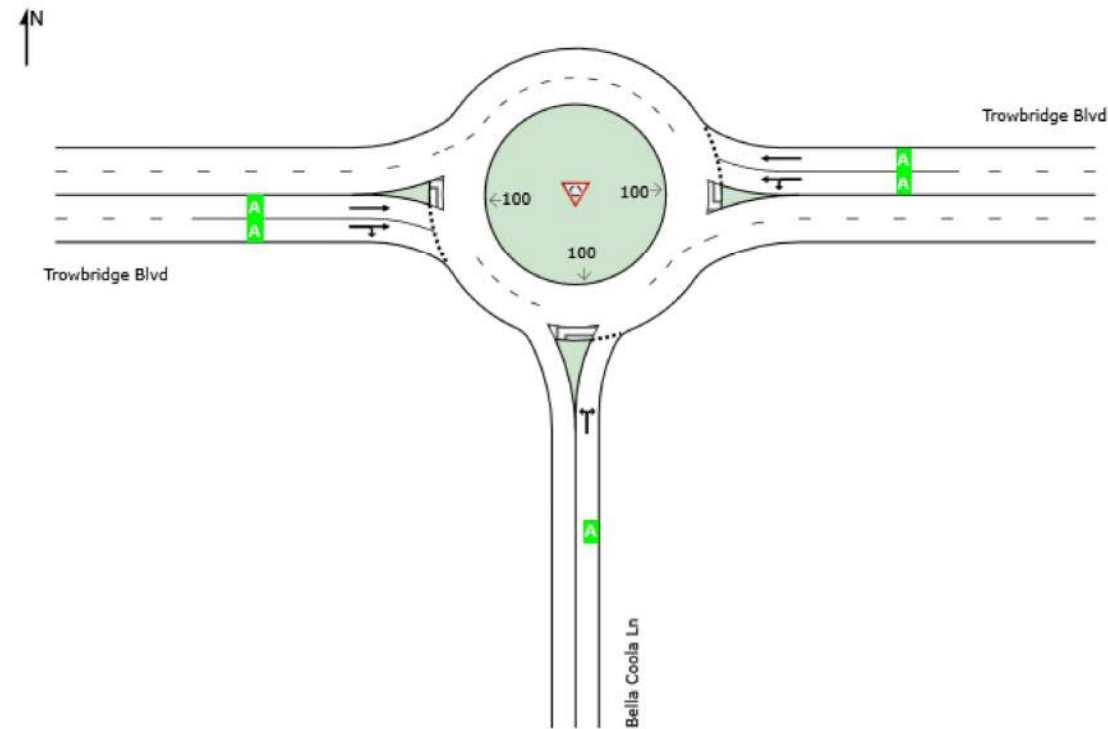
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: A: Bella Coola Ln / Trowbridge Blvd (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	East	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: A: Bella Coola Ln / Trowbridge Blvd (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Bella Coola Ln														
3	L2	326	3.0	354	3.0	0.438	9.2	LOS A	2.5	63.8	0.62	0.57	0.65	30.9
18	R2	41	3.0	45	3.0	0.438	9.2	LOS A	2.5	63.8	0.62	0.57	0.65	30.1
Approach		367	3.0	399	3.0	0.438	9.2	LOS A	2.5	63.8	0.62	0.57	0.65	30.8
East: Trowbridge Blvd														
1	L2	37	3.0	40	3.0	0.472	9.2	LOS A	2.8	72.7	0.59	0.55	0.66	32.9
6	T1	818	3.0	889	3.0	0.472	9.2	LOS A	2.8	72.7	0.59	0.55	0.66	33.0
Approach		855	3.0	929	3.0	0.472	9.2	LOS A	2.8	72.7	0.59	0.55	0.66	33.0
West: Trowbridge Blvd														
2	T1	338	3.0	367	3.0	0.195	4.4	LOS A	0.9	22.6	0.15	0.05	0.15	35.6
12	R2	136	3.0	148	3.0	0.195	4.4	LOS A	0.9	22.6	0.15	0.05	0.15	34.3
Approach		474	3.0	515	3.0	0.195	4.4	LOS A	0.9	22.6	0.15	0.05	0.15	35.2
All Vehicles		1696	3.0	1843	3.0	0.472	7.9	LOS A	2.8	72.7	0.47	0.42	0.52	33.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

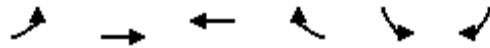
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Organisation: TENW | Licence: PLUS / 1PC | Processed: Wednesday, May 12, 2021 8:10:10 PM

Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings
B: Trowbridge Blvd & Ava Way

05/12/2021

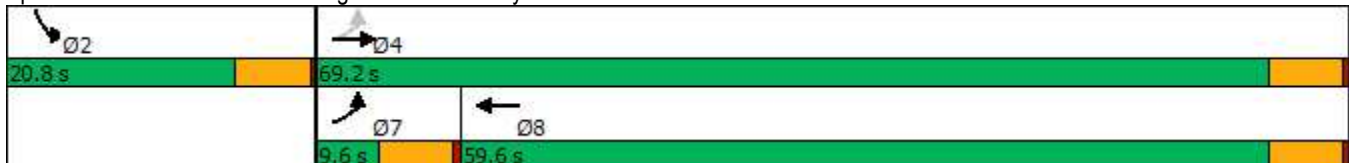


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	29	350	789	100	83	66
Future Volume (vph)	29	350	789	100	83	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		30	
Link Distance (ft)		478	2362		2528	
Travel Time (s)		10.9	53.7		57.5	
Confl. Peds. (#/hr)	5			5	5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA		Prot	
Protected Phases	7	4	8		2	
Permitted Phases	4					
Detector Phase	7	4	8		2	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	9.5	20.5	20.5		20.5	
Total Split (s)	9.6	69.2	59.6		20.8	
Total Split (%)	10.7%	76.9%	66.2%		23.1%	
Yellow Time (s)	5.0	5.0	5.0		5.0	
All-Red Time (s)	0.5	0.5	0.5		0.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.5	5.5	5.5		5.5	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Recall Mode	None	None	None		Min	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 62.8
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

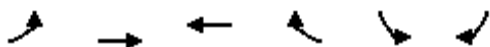
Splits and Phases: 26: Trowbridge Blvd & Ava Way



HCM 6th Signalized Intersection Summary

B: Trowbridge Blvd & Ava Way

05/12/2021



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	350	789	100	83	66
Future Volume (veh/h)	29	350	789	100	83	66
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	0.98
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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	32	380	858	109	90	72
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	207	1266	907	115	122	98
Arrive On Green	0.03	0.68	0.56	0.56	0.13	0.13
Sat Flow, veh/h	1767	1856	1613	205	917	734
Grp Volume(v), veh/h	32	380	0	967	163	0
Grp Sat Flow(s),veh/h/ln	1767	1856	0	1818	1661	0
Q Serve(g_s), s	0.4	4.9	0.0	29.7	5.6	0.0
Cycle Q Clear(g_c), s	0.4	4.9	0.0	29.7	5.6	0.0
Prop In Lane	1.00			0.11	0.55	0.44
Lane Grp Cap(c), veh/h	207	1266	0	1022	222	0
V/C Ratio(X)	0.15	0.30	0.00	0.95	0.74	0.00
Avail Cap(c_a), veh/h	280	1983	0	1650	426	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.2	3.8	0.0	12.2	24.8	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	5.9	1.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	1.2	0.0	10.7	2.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.3	3.8	0.0	18.1	26.6	0.0
LnGrp LOS	B	A	A	B	C	A
Approach Vol, veh/h		412	967		163	
Approach Delay, s/veh		4.6	18.1		26.6	
Approach LOS		A	B		C	
Timer - Assigned Phs		2		4		7
Phs Duration (G+Y+Rc), s		13.4		46.2		7.1
Change Period (Y+Rc), s		5.5		5.5		5.5
Max Green Setting (Gmax), s		15.3		63.7		4.1
Max Q Clear Time (g_c+I1), s		7.6		6.9		2.4
Green Ext Time (p_c), s		0.0		0.5		0.0

Intersection Summary

HCM 6th Ctrl Delay 15.4

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

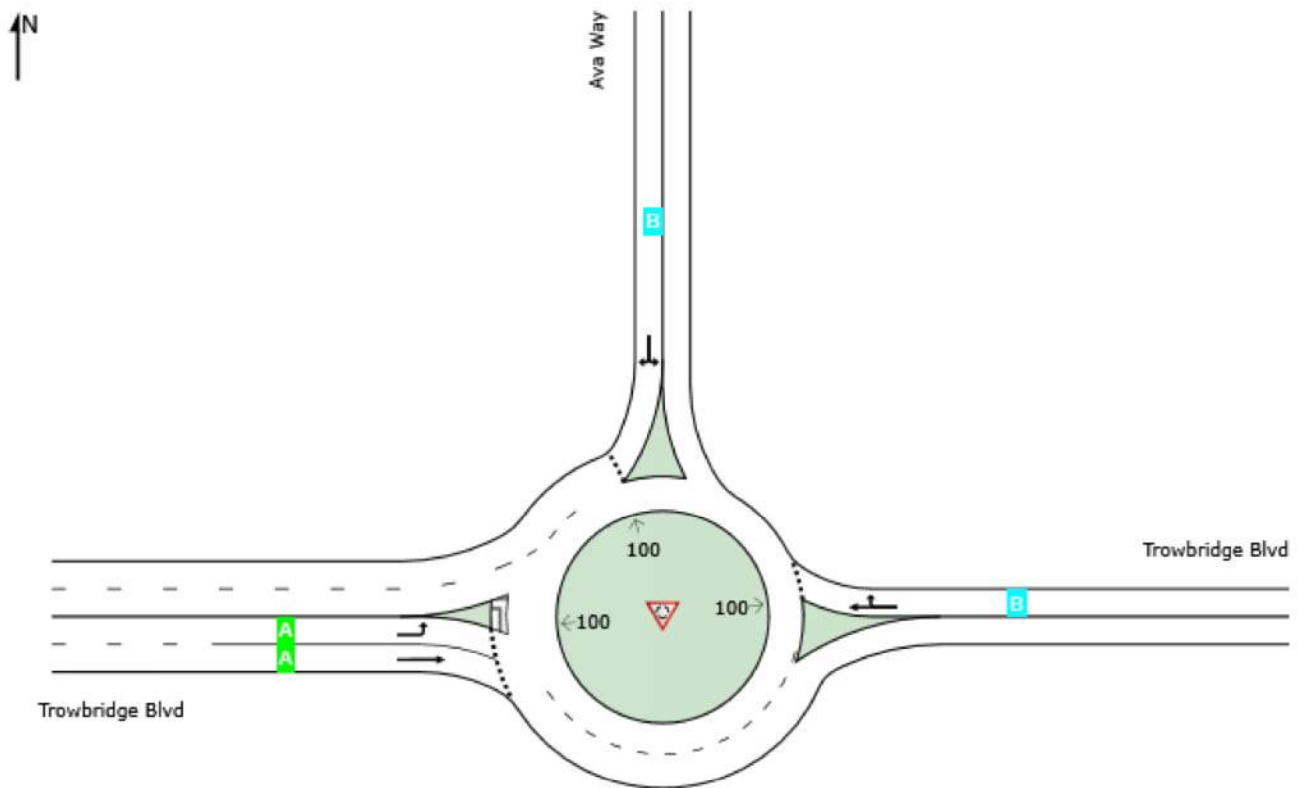
LANE LEVEL OF SERVICE

Lane Level of Service

 Site: B: Ava Way / Trowbridge Blvd (Site Folder: 2040 With Project - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	B	B	A	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: B: [Ava Way / Trowbridge Blvd (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] ft				
East: Trowbridge Blvd														
6	T1	789	3.0	858	3.0	0.746	14.2	LOS B	10.1	258.2	0.38	0.14	0.38	30.8
16	R2	100	3.0	109	3.0	0.746	14.2	LOS B	10.1	258.2	0.38	0.14	0.38	30.0
Approach		889	3.0	966	3.0	0.746	14.2	LOS B	10.1	258.2	0.38	0.14	0.38	30.8
North: Ava Way														
7	L2	83	3.0	90	3.0	0.298	10.9	LOS B	1.2	31.4	0.70	0.71	0.74	30.9
14	R2	66	3.0	72	3.0	0.298	10.9	LOS B	1.2	31.4	0.70	0.71	0.74	30.1
Approach		149	3.0	162	3.0	0.298	10.9	LOS B	1.2	31.4	0.70	0.71	0.74	30.6
West: Trowbridge Blvd														
5	L2	29	3.0	32	3.0	0.025	3.1	LOS A	0.1	2.4	0.20	0.08	0.20	33.4
2	T1	350	3.0	380	3.0	0.302	5.6	LOS A	1.5	38.9	0.26	0.13	0.26	34.9
Approach		379	3.0	412	3.0	0.302	5.4	LOS A	1.5	38.9	0.26	0.13	0.26	34.8
All Vehicles		1417	3.0	1540	3.0	0.746	11.5	LOS B	10.1	258.2	0.38	0.20	0.39	31.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings
C: Sol Duc Ave & Trowbridge Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	383	6	25	792	40	5	0	26	63	6	93
Future Volume (vph)	43	383	6	25	792	40	5	0	26	63	6	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2362			1402			439			307	
Travel Time (s)		53.7			31.9			10.0			7.0	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection												
Int Delay, s/veh	5.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	43	383	6	25	792	40	5	0	26	63	6	93
Future Vol, veh/h	43	383	6	25	792	40	5	0	26	63	6	93
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	47	416	7	27	861	43	5	0	28	68	7	101

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	909	0	0	428	0	0	1515	1482	430	1475	1464	893
Stage 1	-	-	-	-	-	-	519	519	-	942	942	-
Stage 2	-	-	-	-	-	-	996	963	-	533	522	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	745	-	-	1126	-	-	97	125	623	104	128	339
Stage 1	-	-	-	-	-	-	538	531	-	314	340	-
Stage 2	-	-	-	-	-	-	293	333	-	529	529	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	742	-	-	1121	-	-	61	113	618	92	116	336
Mov Cap-2 Maneuver	-	-	-	-	-	-	122	208	-	201	227	-
Stage 1	-	-	-	-	-	-	502	495	-	293	330	-
Stage 2	-	-	-	-	-	-	195	324	-	471	494	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1			0.2			15.6			42.6		
HCM LOS							C			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	373	742	-	-	1121	-	-	263
HCM Lane V/C Ratio	0.09	0.063	-	-	0.024	-	-	0.67
HCM Control Delay (s)	15.6	10.2	-	-	8.3	-	-	42.6
HCM Lane LOS	C	B	-	-	A	-	-	E
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0.1	-	-	4.3

Lanes, Volumes, Timings

D: Unnamed N/S & Trowbridge Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	284	170	74	412	5	325	56	97	14	98	195
Future Volume (vph)	74	284	170	74	412	5	325	56	97	14	98	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1402			2993			733			411	
Travel Time (s)		31.9			68.0			16.7			9.3	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	20.5		9.5	20.5		9.5	20.5		9.5	20.5	
Total Split (s)	9.8	33.0		9.6	32.8		21.0	37.8		9.6	26.4	
Total Split (%)	10.9%	36.7%		10.7%	36.4%		23.3%	42.0%		10.7%	29.3%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	Min		None	Min	

Intersection Summary

Area Type: Other

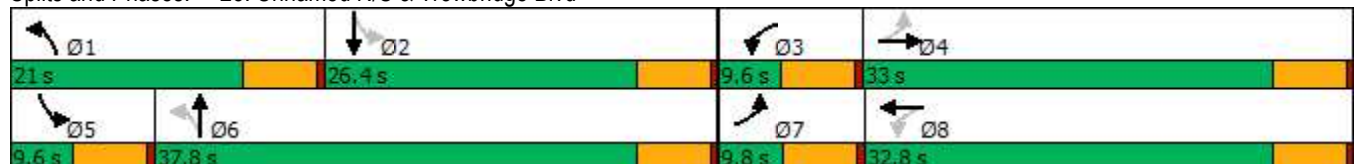
Cycle Length: 90

Actuated Cycle Length: 75.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Splits and Phases: 28: Unnamed N/S & Trowbridge Blvd



HCM 6th Signalized Intersection Summary

D: Unnamed N/S & Trowbridge Blvd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	284	170	74	412	5	325	56	97	14	98	195
Future Volume (veh/h)	74	284	170	74	412	5	325	56	97	14	98	195
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		0.99	0.99		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	80	309	185	80	448	5	353	61	105	15	107	212
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	241	330	198	192	558	6	416	227	391	369	119	235
Arrive On Green	0.05	0.30	0.30	0.05	0.30	0.30	0.17	0.37	0.37	0.01	0.22	0.22
Sat Flow, veh/h	1767	1084	649	1767	1831	20	1767	609	1049	1767	551	1092
Grp Volume(v), veh/h	80	0	494	80	0	453	353	0	166	15	0	319
Grp Sat Flow(s),veh/h/ln	1767	0	1732	1767	0	1852	1767	0	1658	1767	0	1644
Q Serve(g_s), s	2.6	0.0	23.2	2.6	0.0	18.9	12.3	0.0	5.8	0.6	0.0	15.8
Cycle Q Clear(g_c), s	2.6	0.0	23.2	2.6	0.0	18.9	12.3	0.0	5.8	0.6	0.0	15.8
Prop In Lane	1.00		0.37	1.00		0.01	1.00		0.63	1.00		0.66
Lane Grp Cap(c), veh/h	241	0	528	192	0	564	416	0	618	369	0	354
V/C Ratio(X)	0.33	0.00	0.94	0.42	0.00	0.80	0.85	0.00	0.27	0.04	0.00	0.90
Avail Cap(c_a), veh/h	251	0	569	197	0	604	441	0	640	431	0	410
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.8	0.0	28.3	22.0	0.0	26.8	20.5	0.0	18.3	25.1	0.0	32.0
Incr Delay (d2), s/veh	0.3	0.0	21.7	0.5	0.0	6.6	12.9	0.0	0.1	0.0	0.0	19.2
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	1.0	0.0	12.4	1.0	0.0	9.0	6.2	0.0	2.2	0.2	0.0	8.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.1	0.0	50.0	22.6	0.0	33.4	33.3	0.0	18.4	25.1	0.0	51.2
LnGrp LOS	C	A	D	C	A	C	C	A	B	C	A	D
Approach Vol, veh/h	574			533			519			334		
Approach Delay, s/veh	45.9			31.7			28.6			50.0		
Approach LOS	D			C			C			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.8	23.5	9.4	31.0	6.7	36.7	9.4	31.0				
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5				
Max Green Setting (Gmax), s	15.5	20.9	4.1	27.5	4.1	32.3	4.3	27.3				
Max Q Clear Time (g_c+I1), s	14.3	17.8	4.6	25.2	2.6	7.8	4.6	20.9				
Green Ext Time (p_c), s	0.0	0.2	0.0	0.3	0.0	0.2	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay	38.2											
HCM 6th LOS	D											

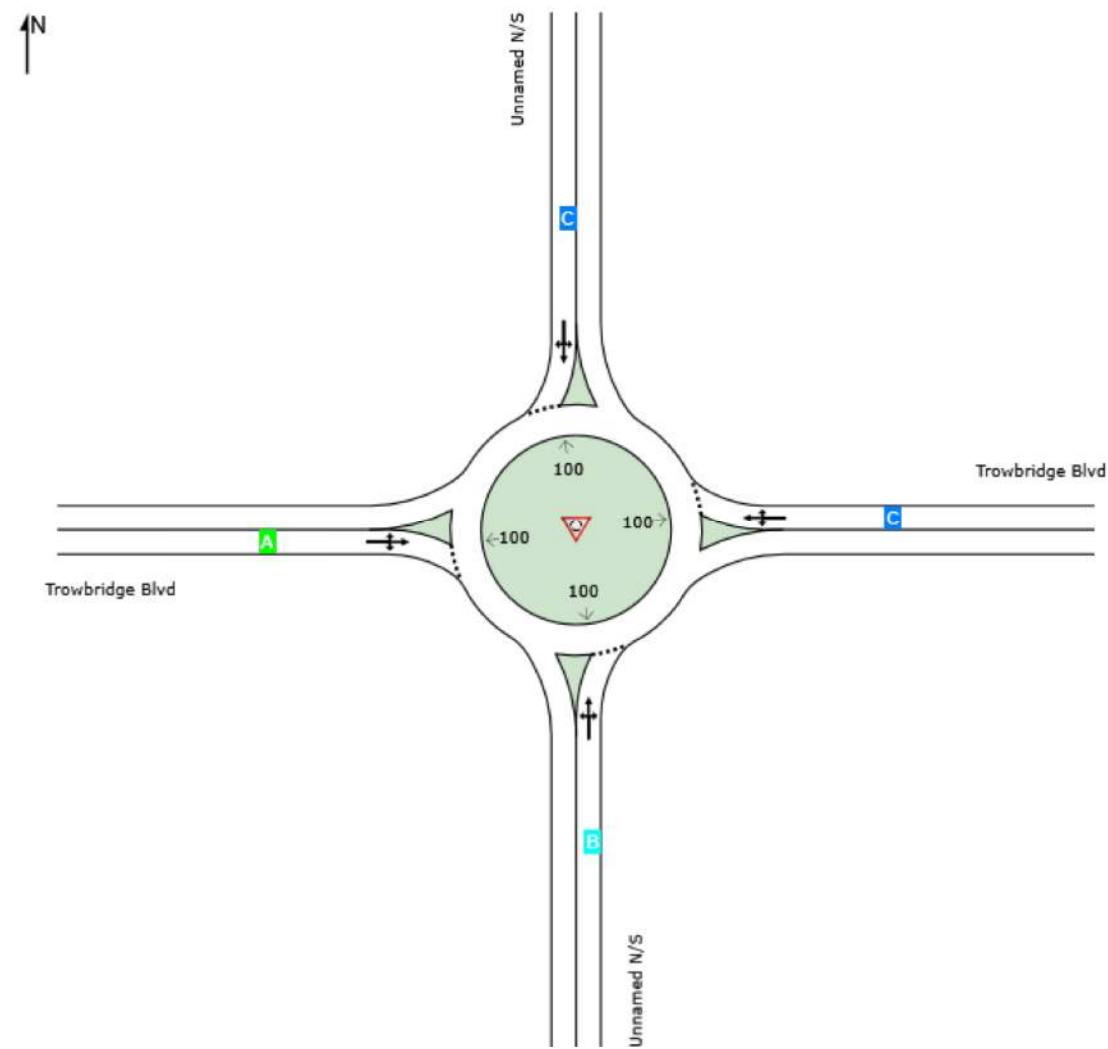
LANE LEVEL OF SERVICE

Lane Level of Service

Site: D: Unnamed N/S / Trowbridge Blvd (Site Folder: 2040 With Project - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	A	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: D: [Unnamed N/S / Trowbridge Blvd (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Unnamed N/S														
3	L2	325	3.0	353	3.0	0.593	12.9	LOS B	5.7	145.0	0.74	0.86	1.13	29.9
8	T1	56	3.0	61	3.0	0.593	12.9	LOS B	5.7	145.0	0.74	0.86	1.13	29.9
18	R2	97	3.0	105	3.0	0.593	12.9	LOS B	5.7	145.0	0.74	0.86	1.13	29.1
Approach		478	3.0	520	3.0	0.593	12.9	LOS B	5.7	145.0	0.74	0.86	1.13	29.7
East: Trowbridge Blvd														
1	L2	74	3.0	80	3.0	0.670	16.6	LOS C	7.2	185.3	0.82	1.07	1.48	29.6
6	T1	412	3.0	448	3.0	0.670	16.6	LOS C	7.2	185.3	0.82	1.07	1.48	29.6
16	R2	5	3.0	5	3.0	0.670	16.6	LOS C	7.2	185.3	0.82	1.07	1.48	28.8
Approach		491	3.0	534	3.0	0.670	16.6	LOS C	7.2	185.3	0.82	1.07	1.48	29.6
North: Unnamed N/S														
7	L2	14	3.0	15	3.0	0.629	20.7	LOS C	4.3	111.0	0.82	1.03	1.50	28.2
4	T1	98	3.0	107	3.0	0.629	20.7	LOS C	4.3	111.0	0.82	1.03	1.50	28.1
14	R2	195	3.0	212	3.0	0.629	20.7	LOS C	4.3	111.0	0.82	1.03	1.50	27.4
Approach		307	3.0	334	3.0	0.629	20.7	LOS C	4.3	111.0	0.82	1.03	1.50	27.7
West: Trowbridge Blvd														
5	L2	74	3.0	80	3.0	0.530	9.7	LOS A	3.6	91.7	0.56	0.41	0.56	32.5
2	T1	284	3.0	309	3.0	0.530	9.7	LOS A	3.6	91.7	0.56	0.41	0.56	32.5
12	R2	170	3.0	185	3.0	0.530	9.7	LOS A	3.6	91.7	0.56	0.41	0.56	31.6
Approach		528	3.0	574	3.0	0.530	9.7	LOS A	3.6	91.7	0.56	0.41	0.56	32.2
All Vehicles		1804	3.0	1961	3.0	0.670	14.3	LOS B	7.2	185.3	0.72	0.82	1.12	30.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings
E: Gage Blvd & Corvina St

05/12/2021

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	41	22	15	408	242	13
Future Volume (vph)	41	22	15	408	242	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	100			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	799			1385	2592	
Travel Time (s)	18.2			31.5	58.9	
Confl. Peds. (#/hr)	5	5	5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	41	22	15	408	242	13
Future Vol, veh/h	41	22	15	408	242	13
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	45	24	16	443	263	14

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	755	280	282
Stage 1	275	-	-
Stage 2	480	-	-
Critical Hdwy	6.43	6.23	4.13
Critical Hdwy Stg 1	5.43	-	-
Critical Hdwy Stg 2	5.43	-	-
Follow-up Hdwy	3.527	3.327	2.227
Pot Cap-1 Maneuver	375	756	1275
Stage 1	769	-	-
Stage 2	620	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	367	750	1270
Mov Cap-2 Maneuver	474	-	-
Stage 1	756	-	-
Stage 2	618	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.6	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1270	-	544	-	-
HCM Lane V/C Ratio	0.013	-	0.126	-	-
HCM Control Delay (s)	7.9	-	12.6	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lanes, Volumes, Timings
F: Gage Blvd & Trowbridge Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	288	21	43	5	35	6	68	129	2	2	54	209
Future Volume (vph)	288	21	43	5	35	6	68	129	2	2	54	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	0		0	100		0	100		0
Storage Lanes	1		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2993			388			1923			1385	
Travel Time (s)		68.0			8.8			43.7			31.5	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection												
Int Delay, s/veh	10.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	288	21	43	5	35	6	68	129	2	2	54	209
Future Vol, veh/h	288	21	43	5	35	6	68	129	2	2	54	209
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	313	23	47	5	38	7	74	140	2	2	59	227

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	499	477	183	511	589	151	291	0	0	147	0	0
Stage 1	182	182	-	294	294	-	-	-	-	-	-	-
Stage 2	317	295	-	217	295	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	480	486	857	472	419	893	1265	-	-	1429	-	-
Stage 1	817	747	-	712	668	-	-	-	-	-	-	-
Stage 2	692	667	-	783	667	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	422	453	850	408	391	886	1260	-	-	1423	-	-
Mov Cap-2 Maneuver	493	511	-	484	455	-	-	-	-	-	-	-
Stage 1	766	743	-	667	626	-	-	-	-	-	-	-
Stage 2	605	625	-	713	664	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	21.7		13.2		2.7		0.1	
HCM LOS	C		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1260	-	-	493	698	489	1423	-	-
HCM Lane V/C Ratio	0.059	-	-	0.635	0.1	0.102	0.002	-	-
HCM Control Delay (s)	8	-	-	24.2	10.7	13.2	7.5	-	-
HCM Lane LOS	A	-	-	C	B	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	4.4	0.3	0.3	0	-	-

Lanes, Volumes, Timings
G: Gage Blvd & Bella Coola Ln

05/12/2021

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	44	209	173	89	92	57
Future Volume (vph)	44	209	173	89	92	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	100			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	2314			1298	1923	
Travel Time (s)	52.6			29.5	43.7	
Confl. Peds. (#/hr)	5	5	5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

Intersection						
Int Delay, s/veh	6.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	44	209	173	89	92	57
Future Vol, veh/h	44	209	173	89	92	57
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	100	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	48	227	188	97	100	62
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	614	141	167	0	-	0
Stage 1	136	-	-	-	-	-
Stage 2	478	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	454	904	1405	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	390	896	1399	-	-	-
Mov Cap-2 Maneuver	486	-	-	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	10.9	5.3		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1399	-	486	896	-	-
HCM Lane V/C Ratio	0.134	-	0.098	0.254	-	-
HCM Control Delay (s)	8	-	13.2	10.4	-	-
HCM Lane LOS	A	-	B	B	-	-
HCM 95th %tile Q(veh)	0.5	-	0.3	1	-	-

Lanes, Volumes, Timings

H: Gage Blvd & Unnamed E/W

05/12/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	62	79	84	217	332	98
Future Volume (vph)	62	79	84	217	332	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	100			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1643			520	1298	
Travel Time (s)	37.3			11.8	29.5	
Confl. Peds. (#/hr)	5	5	5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	3.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	62	79	84	217	332	98
Future Vol, veh/h	62	79	84	217	332	98
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	67	86	91	236	361	107
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	843	425	473	0	-	0
Stage 1	420	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	333	627	1084	-	-	-
Stage 1	661	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	303	622	1079	-	-	-
Mov Cap-2 Maneuver	425	-	-	-	-	-
Stage 1	603	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	14.9	2.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1079	-	517	-	-	
HCM Lane V/C Ratio	0.085	-	0.296	-	-	
HCM Control Delay (s)	8.6	-	14.9	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0.3	-	1.2	-	-	

Lanes, Volumes, Timings

I: Gage Blvd & Morningside Pkwy

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	24	35	35	25	182	11	98	13	165	239	6
Future Volume (vph)	21	24	35	35	25	182	11	98	13	165	239	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		194			115			1188			520	
Travel Time (s)		4.4			2.6			27.0			11.8	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection

Int Delay, s/veh 7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Vol, veh/h	21	24	35	35	25	182	11	98	13	165	239	6
Future Vol, veh/h	21	24	35	35	25	182	11	98	13	165	239	6
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	23	26	38	38	27	198	12	107	14	179	260	7

Major/Minor	Minor2		Minor1		Major1		Major2		Major2		Major2	
Conflicting Flow All	883	777	274	802	773	124	272	0	0	126	0	0
Stage 1	627	627	-	143	143	-	-	-	-	-	-	-
Stage 2	256	150	-	659	630	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	265	327	762	301	329	924	1286	-	-	1454	-	-
Stage 1	470	475	-	857	777	-	-	-	-	-	-	-
Stage 2	746	771	-	451	473	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	174	282	756	240	283	916	1281	-	-	1448	-	-
Mov Cap-2 Maneuver	268	341	-	296	344	-	-	-	-	-	-	-
Stage 1	464	414	-	846	767	-	-	-	-	-	-	-
Stage 2	557	761	-	350	412	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	16.1		15		0.7		3.2	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1281	-	-	410 621	1448	-	-
HCM Lane V/C Ratio	0.009	-	-	0.212 0.424	0.124	-	-
HCM Control Delay (s)	7.8	-	-	16.1 15	7.8	-	-
HCM Lane LOS	A	-	-	C C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8 2.1	0.4	-	-

Lanes, Volumes, Timings

J: Unnamed N/S & Unnamed E/W

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	36	115	74	73	59	232	63	40	58	119	44
Future Volume (vph)	22	36	115	74	73	59	232	63	40	58	119	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		342			1643			1350			2600	
Travel Time (s)		7.8			37.3			30.7			59.1	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC

J: Unnamed N/S & Unnamed E/W

05/12/2021

Intersection												
Int Delay, s/veh	10.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	36	115	74	73	59	232	63	40	58	119	44
Future Vol, veh/h	22	36	115	74	73	59	232	63	40	58	119	44
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	24	39	125	80	79	64	252	68	43	63	129	48
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	954	904	163	965	907	100	182	0	0	116	0	0
Stage 1	284	284	-	599	599	-	-	-	-	-	-	-
Stage 2	670	620	-	366	308	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	237	276	879	233	275	953	1387	-	-	1466	-	-
Stage 1	721	675	-	487	489	-	-	-	-	-	-	-
Stage 2	445	478	-	651	658	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	143	214	872	147	214	945	1381	-	-	1460	-	-
Mov Cap-2 Maneuver	182	277	-	199	274	-	-	-	-	-	-	-
Stage 1	587	643	-	396	399	-	-	-	-	-	-	-
Stage 2	271	390	-	499	627	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	15.5		24.6		5.7		2					
HCM LOS	C		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1381	-	-	182	577	199	401	1460	-	-		
HCM Lane V/C Ratio	0.183	-	-	0.131	0.284	0.404	0.358	0.043	-	-		
HCM Control Delay (s)	8.2	-	-	27.8	13.7	34.8	18.9	7.6	-	-		
HCM Lane LOS	A	-	-	D	B	D	C	A	-	-		
HCM 95th %tile Q(veh)	0.7	-	-	0.4	1.2	1.8	1.6	0.1	-	-		

Lanes, Volumes, Timings

K: Unnamed N/S & Bella Coola Ln

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	173	106	27	33	106	227	35	92	21	143	61	139
Future Volume (vph)	173	106	27	33	106	227	35	92	21	143	61	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1666			2314			2600			733	
Travel Time (s)		37.9			52.6			59.1			16.7	
Confl. Peds. (#/hr)	5					5				5		5
Peak Hour Factor	0.92	0.92	0.90	0.90	0.92	0.92	0.90	0.90	0.90	0.92	0.90	0.92
Heavy Vehicles (%)	3%	3%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th AWSC

K: Unnamed N/S & Bella Coola Ln

05/12/2021

Intersection												
Intersection Delay, s/veh	15.9											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	173	106	27	33	106	227	35	92	21	143	61	139
Future Vol, veh/h	173	106	27	33	106	227	35	92	21	143	61	139
Peak Hour Factor	0.92	0.92	0.90	0.90	0.92	0.92	0.90	0.90	0.90	0.92	0.90	0.92
Heavy Vehicles, %	3	3	2	3	3	3	3	3	3	3	3	3
Mvmt Flow	188	115	30	37	115	247	39	102	23	155	68	151
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	14.1	20.2	12.7	14.2
HCM LOS	B	C	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	81%	0%	80%	0%	32%	0%	31%
Vol Right, %	0%	19%	0%	20%	0%	68%	0%	69%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	35	113	173	133	33	333	143	200
LT Vol	35	0	173	0	33	0	143	0
Through Vol	0	92	0	106	0	106	0	61
RT Vol	0	21	0	27	0	227	0	139
Lane Flow Rate	39	126	188	145	37	362	155	219
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.089	0.264	0.399	0.282	0.077	0.658	0.335	0.41
Departure Headway (Hd)	8.21	7.562	7.645	6.987	7.542	6.544	7.76	6.75
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	436	475	470	514	475	554	463	534
Service Time	5.963	5.315	5.391	4.733	5.284	4.285	5.506	4.495
HCM Lane V/C Ratio	0.089	0.265	0.4	0.282	0.078	0.653	0.335	0.41
HCM Control Delay	11.8	13	15.4	12.5	10.9	21.1	14.4	14.1
HCM Lane LOS	B	B	C	B	B	C	B	B
HCM 95th-tile Q	0.3	1.1	1.9	1.1	0.2	4.8	1.5	2

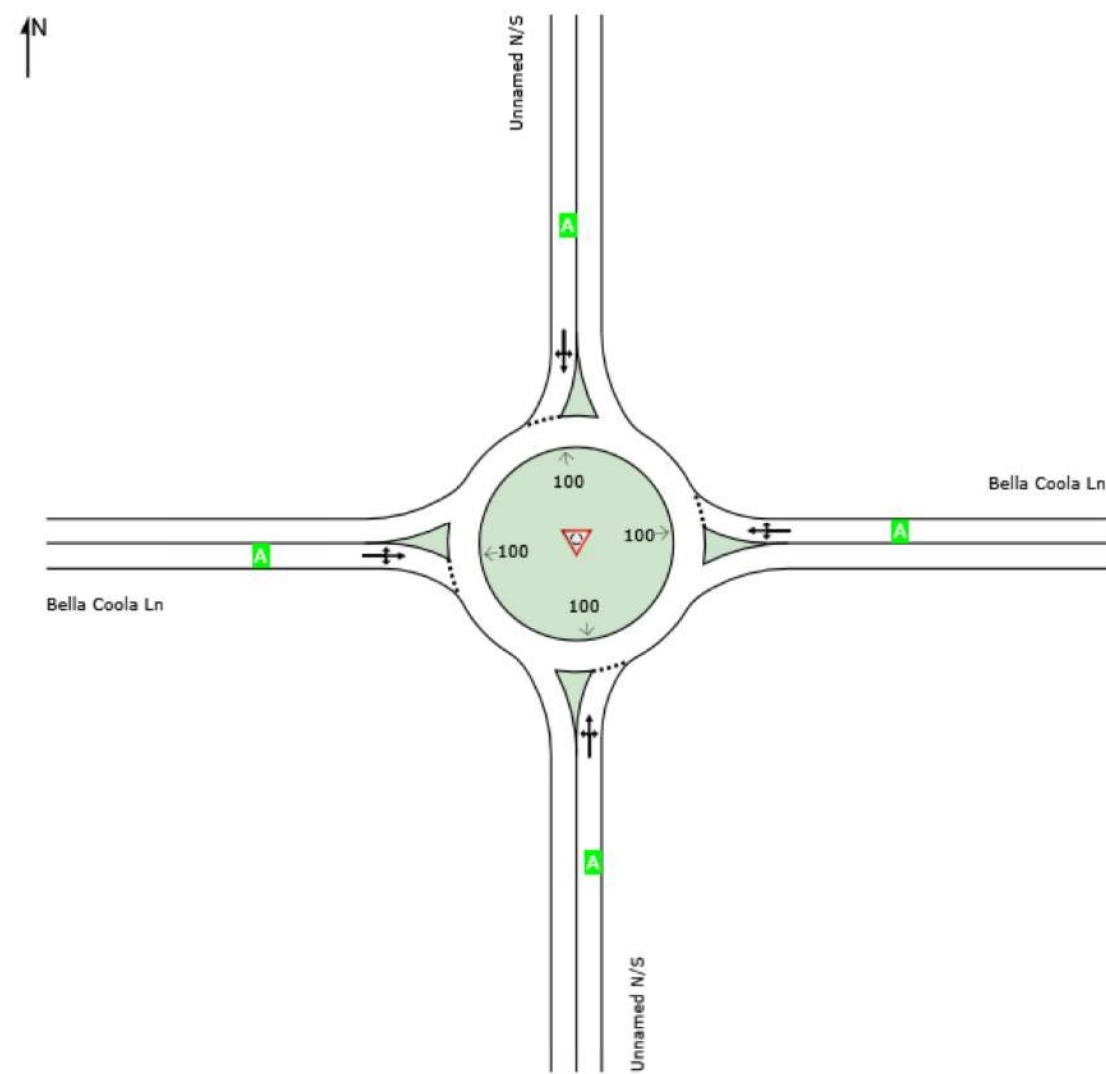
LANE LEVEL OF SERVICE

Lane Level of Service

Site: K: Unnamed N/S / Bella Coola Ln (Site Folder: 2040 With Project - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: K: Unnamed N/S / Bella Coola Ln (Site Folder: 2040 With Project - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Unnamed N/S														
3	L2	35	3.0	38	3.0	0.195	6.4	LOS A	0.8	21.3	0.55	0.49	0.55	33.9
8	T1	92	3.0	100	3.0	0.195	6.4	LOS A	0.8	21.3	0.55	0.49	0.55	33.8
18	R2	21	3.0	23	3.0	0.195	6.4	LOS A	0.8	21.3	0.55	0.49	0.55	32.9
Approach		148	3.0	161	3.0	0.195	6.4	LOS A	0.8	21.3	0.55	0.49	0.55	33.7
East: Bella Coola Ln														
1	L2	33	3.0	36	3.0	0.419	8.6	LOS A	2.3	58.2	0.59	0.50	0.59	33.1
6	T1	106	3.0	115	3.0	0.419	8.6	LOS A	2.3	58.2	0.59	0.50	0.59	33.1
16	R2	227	3.0	247	3.0	0.419	8.6	LOS A	2.3	58.2	0.59	0.50	0.59	32.1
Approach		366	3.0	398	3.0	0.419	8.6	LOS A	2.3	58.2	0.59	0.50	0.59	32.5
North: Unnamed N/S														
7	L2	143	3.0	155	3.0	0.340	6.7	LOS A	1.8	47.1	0.43	0.30	0.43	33.2
4	T1	61	3.0	66	3.0	0.340	6.7	LOS A	1.8	47.1	0.43	0.30	0.43	33.1
14	R2	139	3.0	151	3.0	0.340	6.7	LOS A	1.8	47.1	0.43	0.30	0.43	32.2
Approach		343	3.0	373	3.0	0.340	6.7	LOS A	1.8	47.1	0.43	0.30	0.43	32.8
West: Bella Coola Ln														
5	L2	173	3.0	188	3.0	0.326	6.8	LOS A	1.7	43.0	0.49	0.37	0.49	32.8
2	T1	106	3.0	115	3.0	0.326	6.8	LOS A	1.7	43.0	0.49	0.37	0.49	32.7
12	R2	27	3.0	29	3.0	0.326	6.8	LOS A	1.7	43.0	0.49	0.37	0.49	31.8
Approach		306	3.0	333	3.0	0.326	6.8	LOS A	1.7	43.0	0.49	0.37	0.49	32.7
All Vehicles		1163	3.0	1264	3.0	0.419	7.3	LOS A	2.3	58.2	0.51	0.41	0.51	32.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings
L: Clark Ridge Dr & Bella Coola Ln

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	116	40	38	174	84	97	0	91	72	16	13
Future Volume (vph)	16	116	40	38	174	84	97	0	91	72	16	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		3007			1666			247			270	
Travel Time (s)		68.3			37.9			5.6			6.1	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection												
Int Delay, s/veh	6.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	116	40	38	174	84	97	0	91	72	16	13
Future Vol, veh/h	16	116	40	38	174	84	97	0	91	72	16	13
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	17	126	43	41	189	91	105	0	99	78	17	14
Major/Minor	Major1		Major2			Minor1			Minor2			
Conflicting Flow All	285	0	0	174	0	0	524	554	158	558	530	245
Stage 1	-	-	-	-	-	-	187	187	-	322	322	-
Stage 2	-	-	-	-	-	-	337	367	-	236	208	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	1271	-	-	1397	-	-	462	439	885	439	453	791
Stage 1	-	-	-	-	-	-	812	743	-	688	649	-
Stage 2	-	-	-	-	-	-	675	620	-	765	728	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1266	-	-	1391	-	-	419	414	878	372	427	784
Mov Cap-2 Maneuver	-	-	-	-	-	-	419	414	-	372	427	-
Stage 1	-	-	-	-	-	-	797	729	-	675	624	-
Stage 2	-	-	-	-	-	-	619	596	-	666	714	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	0.7		1			15			17			
HCM LOS						C			C			
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	561	1266	-	-	1391	-	-	408				
HCM Lane V/C Ratio	0.364	0.014	-	-	0.03	-	-	0.269				
HCM Control Delay (s)	15	7.9	0	-	7.7	0	-	17				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1.7	0	-	-	0.1	-	-	1.1				

2040 With BMS Full Buildout PM Peak Hour

Lanes, Volumes, Timings

A: Bella Coola Ln & Trowbridge Blvd

05/12/2021

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	815	359	18	658	356	15
Future Volume (vph)	815	359	18	658	356	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	100		100	0
Storage Lanes		0	1		1	1
Taper Length (ft)			25		25	
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	1533			478	3007	
Travel Time (s)	34.8			10.9	68.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	6	
Permitted Phases			8			6
Detector Phase	4		3	8	6	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	20.5		9.5	20.5	20.5	20.5
Total Split (s)	63.0		9.6	72.6	47.4	47.4
Total Split (%)	52.5%		8.0%	60.5%	39.5%	39.5%
Yellow Time (s)	5.0		5.0	5.0	5.0	5.0
All-Red Time (s)	0.5		0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5		5.5	5.5	5.5	5.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Recall Mode	None		None	None	Min	Min

Intersection Summary

Area Type: Other

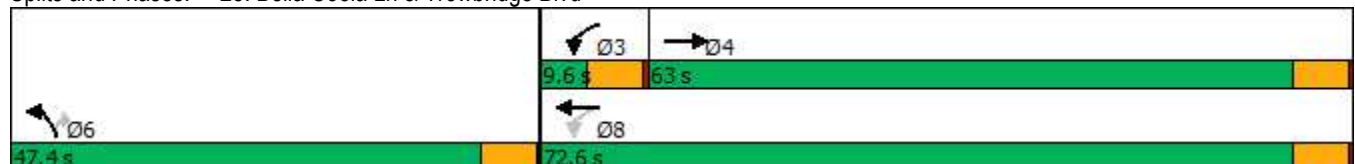
Cycle Length: 120

Actuated Cycle Length: 68.9

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Splits and Phases: 25: Bella Coola Ln & Trowbridge Blvd



HCM 6th Signalized Intersection Summary

A: Bella Coola Ln & Trowbridge Blvd

05/12/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (veh/h)	815	359	18	658	356	15
Future Volume (veh/h)	815	359	18	658	356	15
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.99	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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	886	390	20	715	387	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	1012	442	202	1925	441	392
Arrive On Green	0.42	0.42	0.02	0.55	0.25	0.25
Sat Flow, veh/h	2476	1041	1767	3618	1767	1572
Grp Volume(v), veh/h	654	622	20	715	387	16
Grp Sat Flow(s),veh/h/ln	1763	1661	1767	1763	1767	1572
Q Serve(g_s), s	18.2	18.5	0.3	6.2	11.3	0.4
Cycle Q Clear(g_c), s	18.2	18.5	0.3	6.2	11.3	0.4
Prop In Lane		0.63	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	749	705	202	1925	441	392
V/C Ratio(X)	0.87	0.88	0.10	0.37	0.88	0.04
Avail Cap(c_a), veh/h	1884	1775	303	4398	1377	1225
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	14.2	11.4	6.9	19.4	15.3
Incr Delay (d2), s/veh	1.3	1.5	0.1	0.0	2.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.2	6.0	0.1	1.8	4.4	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	15.4	15.7	11.5	7.0	21.7	15.3
LnGrp LOS	B	B	B	A	C	B
Approach Vol, veh/h	1276			735	403	
Approach Delay, s/veh	15.6			7.1	21.4	
Approach LOS	B			A	C	
Timer - Assigned Phs			3	4	6	8
Phs Duration (G+Y+Rc), s			6.5	28.3	18.9	34.9
Change Period (Y+Rc), s			5.5	5.5	5.5	5.5
Max Green Setting (Gmax), s			4.1	57.5	41.9	67.1
Max Q Clear Time (g_c+I1), s			2.3	20.5	13.3	8.2
Green Ext Time (p_c), s			0.0	2.3	0.1	1.4
Intersection Summary						
HCM 6th Ctrl Delay			14.0			
HCM 6th LOS			B			

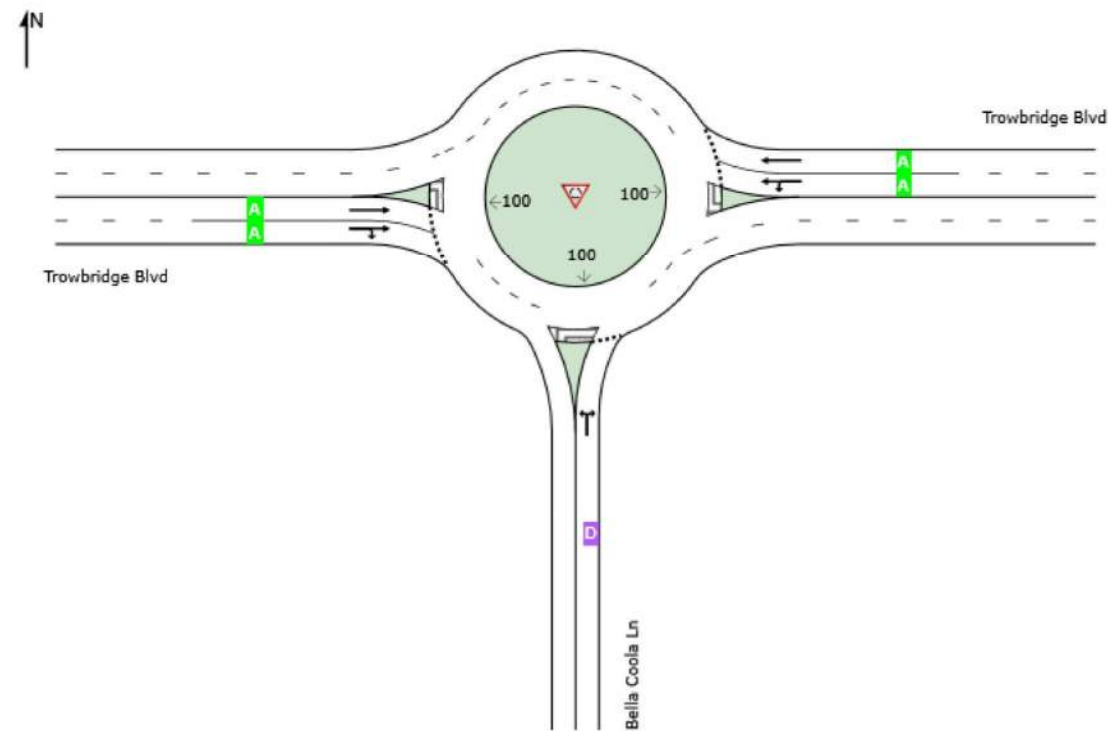
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site A: Bella Coola Ln / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	East	West	
LOS	D	A	A	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: A: Bella Coola Ln / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Bella Coola Ln														
3	L2	356	3.0	387	3.0	0.763	29.3	LOS D	6.9	176.8	0.88	1.23	2.00	24.3
18	R2	15	3.0	16	3.0	0.763	29.3	LOS D	6.9	176.8	0.88	1.23	2.00	23.8
Approach		371	3.0	403	3.0	0.763	29.3	LOS D	6.9	176.8	0.88	1.23	2.00	24.3
East: Trowbridge Blvd														
1	L2	18	3.0	20	3.0	0.385	8.0	LOS A	1.8	47.3	0.56	0.50	0.56	33.6
6	T1	658	3.0	715	3.0	0.385	8.0	LOS A	1.8	47.3	0.56	0.50	0.56	33.6
Approach		676	3.0	735	3.0	0.385	8.0	LOS A	1.8	47.3	0.56	0.50	0.56	33.6
West: Trowbridge Blvd														
2	T1	815	3.0	886	3.0	0.474	7.4	LOS A	3.2	81.8	0.14	0.04	0.14	33.9
12	R2	359	3.0	390	3.0	0.474	7.4	LOS A	3.2	81.8	0.14	0.04	0.14	32.8
Approach		1174	3.0	1276	3.0	0.474	7.4	LOS A	3.2	81.8	0.14	0.04	0.14	33.6
All Vehicles		2221	3.0	2414	3.0	0.763	11.3	LOS B	6.9	176.8	0.39	0.38	0.58	31.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

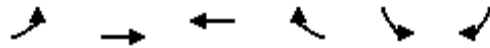
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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings
B: Trowbridge Blvd & Ava Way

05/11/2021

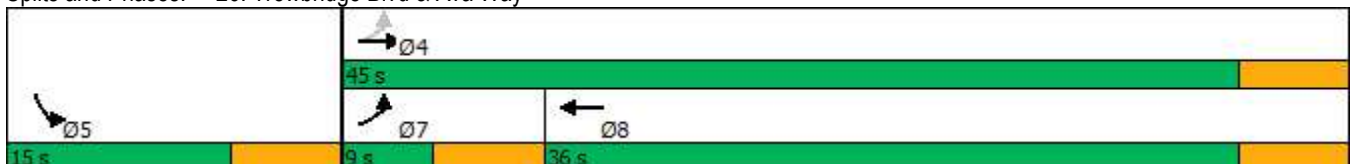


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	47	782	641	157	155	35
Future Volume (vph)	47	782	641	157	155	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	1			0	0	0
Taper Length (ft)	25				25	
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		30	
Link Distance (ft)		478	2362		2642	
Travel Time (s)		10.9	53.7		60.0	
Confl. Peds. (#/hr)	5			5	5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA		Prot	
Protected Phases	7	4	8		5	
Permitted Phases	4					
Detector Phase	7	4	8		5	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	9.0	20.0	20.0		9.0	
Total Split (s)	9.0	45.0	36.0		15.0	
Total Split (%)	15.0%	75.0%	60.0%		25.0%	
Yellow Time (s)	5.0	5.0	5.0		5.0	
All-Red Time (s)	0.0	0.0	0.0		0.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Recall Mode	None	None	None		None	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 50.1
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

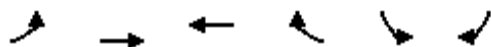
Splits and Phases: 26: Trowbridge Blvd & Ava Way



HCM 6th Signalized Intersection Summary

B: Trowbridge Blvd & Ava Way

05/11/2021



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	47	782	641	157	155	35
Future Volume (veh/h)	47	782	641	157	155	35
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	0.98
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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	51	850	697	171	168	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	252	1216	742	182	206	47
Arrive On Green	0.04	0.66	0.52	0.52	0.15	0.15
Sat Flow, veh/h	1767	1856	1437	353	1398	316
Grp Volume(v), veh/h	51	850	0	868	207	0
Grp Sat Flow(s),veh/h/ln	1767	1856	0	1790	1722	0
Q Serve(g_s), s	0.6	14.8	0.0	23.1	5.9	0.0
Cycle Q Clear(g_c), s	0.6	14.8	0.0	23.1	5.9	0.0
Prop In Lane	1.00			0.20	0.81	0.18
Lane Grp Cap(c), veh/h	252	1216	0	924	254	0
V/C Ratio(X)	0.20	0.70	0.00	0.94	0.81	0.00
Avail Cap(c_a), veh/h	320	1463	0	1094	339	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	11.0	5.6	0.0	11.5	20.9	0.0
Incr Delay (d2), s/veh	0.1	0.8	0.0	12.7	8.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	3.4	0.0	9.9	2.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	11.2	6.3	0.0	24.3	28.9	0.0
LnGrp LOS	B	A	A	C	C	A
Approach Vol, veh/h		901	868		207	
Approach Delay, s/veh		6.6	24.3		28.9	
Approach LOS		A	C		C	
Timer - Assigned Phs		2		4	7	8
Phs Duration (G+Y+Rc), s		12.5		38.2	7.1	31.2
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		10.0		40.0	4.0	31.0
Max Q Clear Time (g_c+I1), s		7.9		16.8	2.6	25.1
Green Ext Time (p_c), s		0.0		1.5	0.0	1.1

Intersection Summary

HCM 6th Ctrl Delay	16.7
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

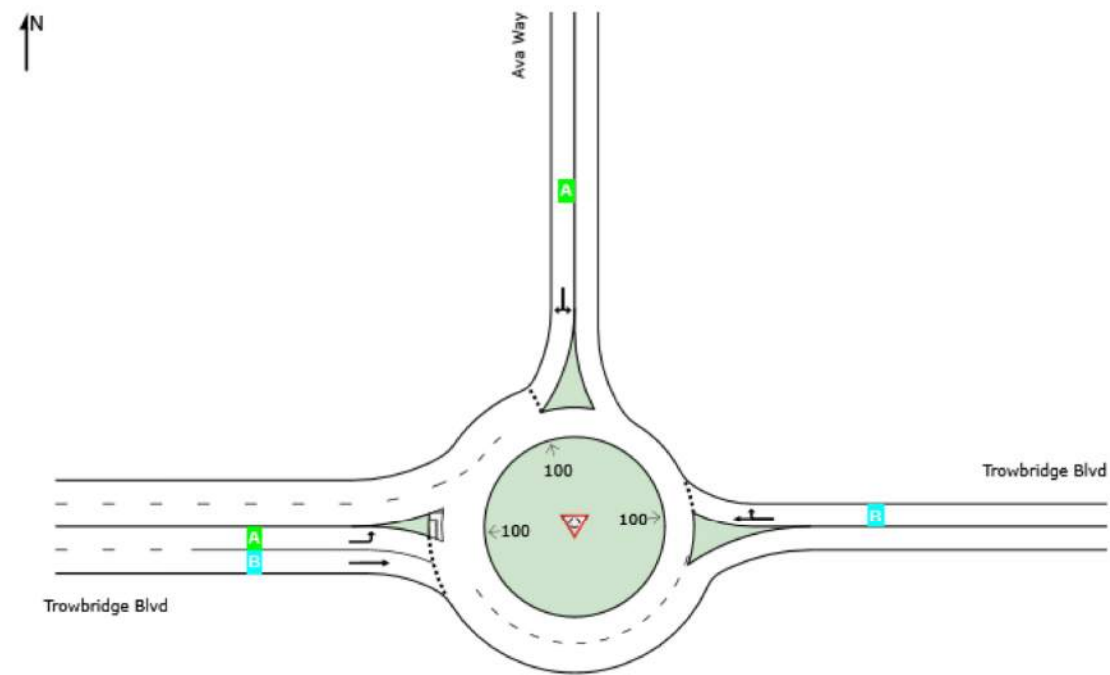
LANE LEVEL OF SERVICE

Lane Level of Service

Site: B: Ava Way / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	B	A	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: B: Ava Way / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
East: Trowbridge Blvd														
6	T1	641	3.0	697	3.0	0.684	12.1	LOS B	7.4	190.4	0.41	0.18	0.41	31.7
16	R2	157	3.0	171	3.0	0.684	12.1	LOS B	7.4	190.4	0.41	0.18	0.41	30.9
Approach		798	3.0	867	3.0	0.684	12.1	LOS B	7.4	190.4	0.41	0.18	0.41	31.5
North: Ava Way														
7	L2	155	3.0	168	3.0	0.321	9.8	LOS A	1.4	36.0	0.68	0.69	0.71	30.8
14	R2	35	3.0	38	3.0	0.321	9.8	LOS A	1.4	36.0	0.68	0.69	0.71	30.0
Approach		190	3.0	207	3.0	0.321	9.8	LOS A	1.4	36.0	0.68	0.69	0.71	30.7
West: Trowbridge Blvd														
5	L2	47	3.0	51	3.0	0.044	3.4	LOS A	0.2	4.2	0.28	0.15	0.28	33.2
2	T1	782	3.0	850	3.0	0.726	14.4	LOS B	10.6	270.4	0.67	0.58	0.86	30.8
Approach		829	3.0	901	3.0	0.726	13.8	LOS B	10.6	270.4	0.65	0.56	0.83	30.9
All Vehicles		1817	3.0	1975	3.0	0.726	12.6	LOS B	10.6	270.4	0.55	0.41	0.63	31.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings
C: Sol Duc Ave & Trowbridge Blvd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	855	1	9	735	38	1	0	11	27	1	63
Future Volume (vph)	82	855	1	9	735	38	1	0	11	27	1	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2362			1402			439			307	
Travel Time (s)		53.7			31.9			10.0			7.0	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	82	855	1	9	735	38	1	0	11	27	1	63
Future Vol, veh/h	82	855	1	9	735	38	1	0	11	27	1	63
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	89	929	1	10	799	41	1	0	12	29	1	68

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	845	0	0	935	0	0	1992	1978	940	1964	1958	830
Stage 1	-	-	-	-	-	-	1113	1113	-	845	845	-
Stage 2	-	-	-	-	-	-	879	865	-	1119	1113	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	787	-	-	728	-	-	45	61	318	47	63	368
Stage 1	-	-	-	-	-	-	252	283	-	356	377	-
Stage 2	-	-	-	-	-	-	341	369	-	250	283	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	784	-	-	725	-	-	33	53	315	41	55	365
Mov Cap-2 Maneuver	-	-	-	-	-	-	106	143	-	130	157	-
Stage 1	-	-	-	-	-	-	223	250	-	314	370	-
Stage 2	-	-	-	-	-	-	271	362	-	212	250	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			0.1			19			31		
HCM LOS							C			D		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	271	784	-	-	725	-	-	235
HCM Lane V/C Ratio	0.048	0.114	-	-	0.013	-	-	0.421
HCM Control Delay (s)	19	10.2	-	-	10	-	-	31
HCM Lane LOS	C	B	-	-	B	-	-	D
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0	-	-	2

Lanes, Volumes, Timings

D: Unnamed N/S & Trowbridge Blvd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	142	487	308	58	486	11	227	49	42	7	35	112
Future Volume (vph)	142	487	308	58	486	11	227	49	42	7	35	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1402			2993			733			411	
Travel Time (s)		31.9			68.0			16.7			9.3	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	20.5		9.5	20.5		9.5	20.5		9.5	20.5	
Total Split (s)	12.2	47.1		9.6	44.5		12.2	23.8		9.5	21.1	
Total Split (%)	13.6%	52.3%		10.7%	49.4%		13.6%	26.4%		10.6%	23.4%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	Min		None	Min	

Intersection Summary

Area Type: Other

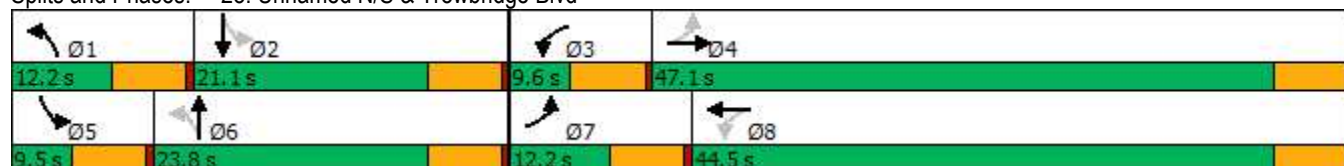
Cycle Length: 90

Actuated Cycle Length: 79.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Splits and Phases: 28: Unnamed N/S & Trowbridge Blvd



HCM 6th Signalized Intersection Summary

D: Unnamed N/S & Trowbridge Blvd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	142	487	308	58	486	11	227	49	42	7	35	112
Future Volume (veh/h)	142	487	308	58	486	11	227	49	42	7	35	112
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	0.99		0.99	0.98		0.98
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	154	529	335	63	528	12	247	53	46	8	38	122
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	412	524	332	150	839	19	264	182	158	262	49	157
Arrive On Green	0.07	0.49	0.49	0.04	0.46	0.46	0.08	0.20	0.20	0.01	0.13	0.13
Sat Flow, veh/h	1767	1060	671	1767	1807	41	1767	911	791	1767	381	1225
Grp Volume(v), veh/h	154	0	864	63	0	540	247	0	99	8	0	160
Grp Sat Flow(s),veh/h/ln	1767	0	1731	1767	0	1848	1767	0	1701	1767	0	1606
Q Serve(g_s), s	3.8	0.0	41.6	1.6	0.0	18.6	6.7	0.0	4.2	0.3	0.0	8.1
Cycle Q Clear(g_c), s	3.8	0.0	41.6	1.6	0.0	18.6	6.7	0.0	4.2	0.3	0.0	8.1
Prop In Lane	1.00		0.39	1.00		0.02	1.00		0.46	1.00		0.76
Lane Grp Cap(c), veh/h	412	0	856	150	0	858	264	0	339	262	0	206
V/C Ratio(X)	0.37	0.00	1.01	0.42	0.00	0.63	0.93	0.00	0.29	0.03	0.00	0.78
Avail Cap(c_a), veh/h	435	0	856	172	0	858	264	0	370	331	0	298
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.6	0.0	21.3	19.9	0.0	17.1	32.7	0.0	28.6	31.5	0.0	35.5
Incr Delay (d2), s/veh	0.2	0.0	33.2	0.7	0.0	1.1	37.6	0.0	0.2	0.0	0.0	4.4
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	1.4	0.0	23.0	0.6	0.0	7.6	4.5	0.0	1.7	0.1	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.9	0.0	54.5	20.6	0.0	18.2	70.3	0.0	28.8	31.6	0.0	39.9
LnGrp LOS	B	A	F	C	A	B	E	A	C	C	A	D
Approach Vol, veh/h	1018			603			346			168		
Approach Delay, s/veh	48.2			18.4			58.4			39.5		
Approach LOS	D			B			E			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.2	16.3	8.6	47.1	6.2	22.3	11.1	44.6				
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5				
Max Green Setting (Gmax), s	6.7	15.6	4.1	41.6	4.0	18.3	6.7	39.0				
Max Q Clear Time (g_c+I1), s	8.7	10.1	3.6	43.6	2.3	6.2	5.8	20.6				
Green Ext Time (p_c), s	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.8				
Intersection Summary												
HCM 6th Ctrl Delay	40.8											
HCM 6th LOS	D											

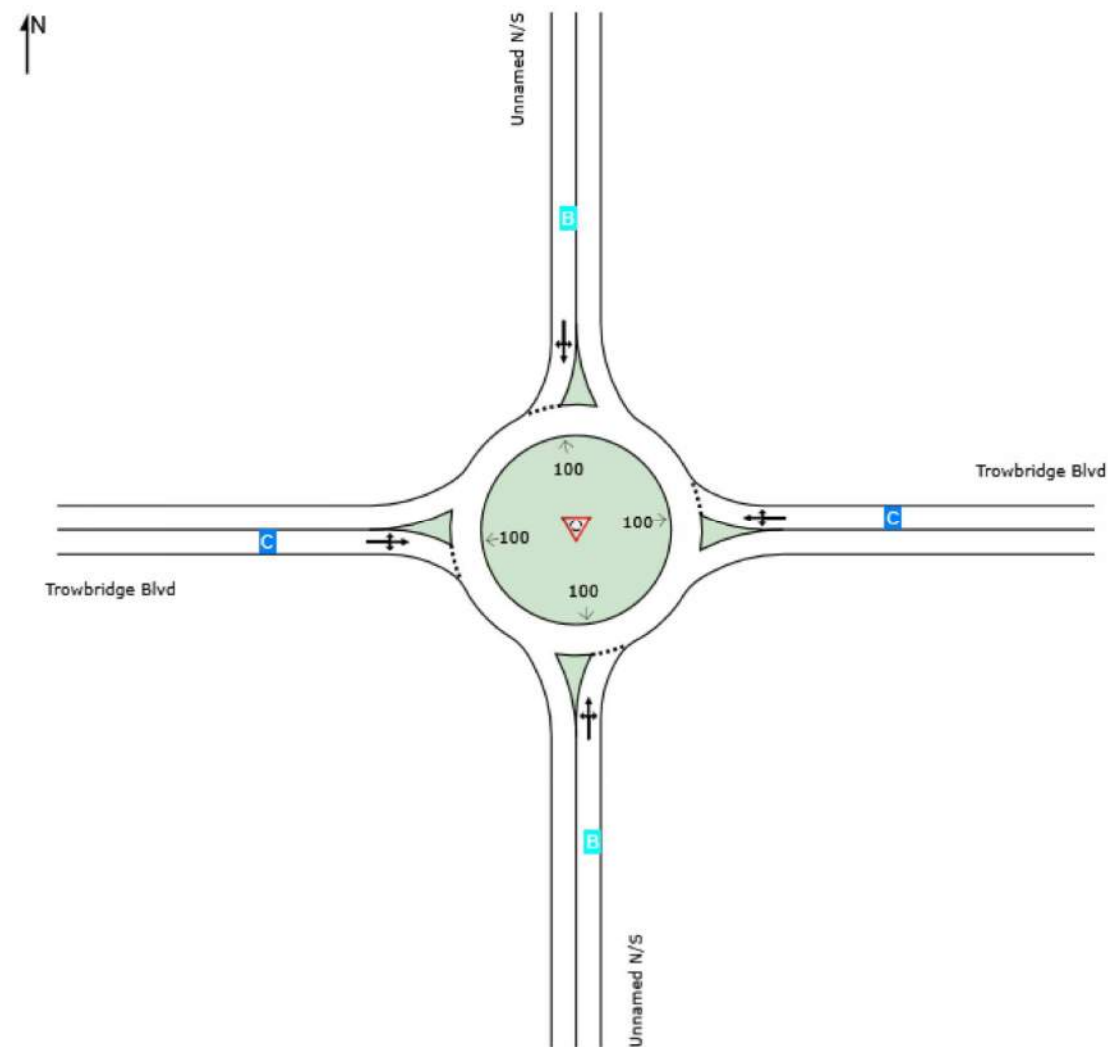
LANE LEVEL OF SERVICE

Lane Level of Service

Site: D: Unnamed N/S / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	B	C	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: D: Unnamed N/S / Trowbridge Blvd (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Unnamed N/S														
3	L2	227	3.0	247	3.0	0.534	14.4	LOS B	3.6	90.9	0.77	0.91	1.19	29.3
8	T1	49	3.0	53	3.0	0.534	14.4	LOS B	3.6	90.9	0.77	0.91	1.19	29.2
18	R2	42	3.0	46	3.0	0.534	14.4	LOS B	3.6	90.9	0.77	0.91	1.19	28.5
Approach		318	3.0	346	3.0	0.534	14.4	LOS B	3.6	90.9	0.77	0.91	1.19	29.2
East: Trowbridge Blvd														
1	L2	58	3.0	63	3.0	0.726	18.6	LOS C	9.7	248.2	0.86	1.18	1.68	29.0
6	T1	486	3.0	528	3.0	0.726	18.6	LOS C	9.7	248.2	0.86	1.18	1.68	28.9
16	R2	11	3.0	12	3.0	0.726	18.6	LOS C	9.7	248.2	0.86	1.18	1.68	28.2
Approach		555	3.0	603	3.0	0.726	18.6	LOS C	9.7	248.2	0.86	1.18	1.68	28.9
North: Unnamed N/S														
7	L2	7	3.0	8	3.0	0.302	10.8	LOS B	1.3	32.1	0.70	0.71	0.74	32.2
4	T1	35	3.0	38	3.0	0.302	10.8	LOS B	1.3	32.1	0.70	0.71	0.74	32.1
14	R2	112	3.0	122	3.0	0.302	10.8	LOS B	1.3	32.1	0.70	0.71	0.74	31.2
Approach		154	3.0	167	3.0	0.302	10.8	LOS B	1.3	32.1	0.70	0.71	0.74	31.5
West: Trowbridge Blvd														
5	L2	142	3.0	154	3.0	0.853	21.6	LOS C	17.1	438.9	0.89	0.60	0.99	27.7
2	T1	487	3.0	529	3.0	0.853	21.6	LOS C	17.1	438.9	0.89	0.60	0.99	27.7
12	R2	308	3.0	335	3.0	0.853	21.6	LOS C	17.1	438.9	0.89	0.60	0.99	27.0
Approach		937	3.0	1018	3.0	0.853	21.6	LOS C	17.1	438.9	0.89	0.60	0.99	27.5
All Vehicles		1964	3.0	2135	3.0	0.853	18.7	LOS C	17.1	438.9	0.85	0.82	1.20	28.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings
E: Gage Blvd & Corvina St

05/11/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	21	8	11	368	471	33
Future Volume (vph)	21	8	11	368	471	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	100			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	799			1385	2604	
Travel Time (s)	18.2			31.5	59.2	
Confl. Peds. (#/hr)	5	5	5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	21	8	11	368	471	33
Future Vol, veh/h	21	8	11	368	471	33
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	23	9	12	400	512	36
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	964	540	553	0	-	0
Stage 1	535	-	-	-	-	-
Stage 2	429	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	282	540	1012	-	-	-
Stage 1	585	-	-	-	-	-
Stage 2	655	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	276	536	1008	-	-	-
Mov Cap-2 Maneuver	404	-	-	-	-	-
Stage 1	576	-	-	-	-	-
Stage 2	652	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	14	0.3		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1008	-	433	-	-	
HCM Lane V/C Ratio	0.012	-	0.073	-	-	
HCM Control Delay (s)	8.6	-	14	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

Lanes, Volumes, Timings
F: Gage Blvd & Trowbridge Blvd

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	33	79	8	27	6	72	81	8	7	121	351
Future Volume (vph)	291	33	79	8	27	6	72	81	8	7	121	351
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	0		0	100		0	100		0
Storage Lanes	1		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2993			388			1923			1385	
Travel Time (s)		68.0			8.8			43.7			31.5	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th TWSC
F: Gage Blvd & Trowbridge Blvd

05/11/2021

Intersection												
Int Delay, s/veh	10.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	291	33	79	8	27	6	72	81	8	7	121	351
Future Vol, veh/h	291	33	79	8	27	6	72	81	8	7	121	351
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	316	36	86	9	29	7	78	88	9	8	132	382

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	616	602	333	659	789	103	519	0	0	102	0	0
Stage 1	344	344	-	254	254	-	-	-	-	-	-	-
Stage 2	272	258	-	405	535	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	401	412	706	376	322	949	1042	-	-	1484	-	-
Stage 1	669	635	-	748	695	-	-	-	-	-	-	-
Stage 2	732	692	-	620	522	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	348	376	700	289	294	941	1038	-	-	1478	-	-
Mov Cap-2 Maneuver	443	459	-	359	362	-	-	-	-	-	-	-
Stage 1	616	629	-	689	640	-	-	-	-	-	-	-
Stage 2	639	637	-	508	517	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.8		15.2		3.9		0.1	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1038	-	-	443	606	397	1478	-	-
HCM Lane V/C Ratio	0.075	-	-	0.714	0.201	0.112	0.005	-	-
HCM Control Delay (s)	8.8	-	-	30.9	12.4	15.2	7.4	-	-
HCM Lane LOS	A	-	-	D	B	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	5.5	0.7	0.4	0	-	-

Lanes, Volumes, Timings
G: Gage Blvd & Bella Coola Ln

05/11/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	46	203	253	101	104	40
Future Volume (vph)	46	203	253	101	104	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	100			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	2314			1298	1923	
Travel Time (s)	52.6			29.5	43.7	
Confl. Peds. (#/hr)	5	5	5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	6.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	46	203	253	101	104	40
Future Vol, veh/h	46	203	253	101	104	40
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	100	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	50	221	275	110	113	43
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	805	145	161	0	-	0
Stage 1	140	-	-	-	-	-
Stage 2	665	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	350	900	1412	-	-	-
Stage 1	884	-	-	-	-	-
Stage 2	509	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	279	893	1406	-	-	-
Mov Cap-2 Maneuver	391	-	-	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	507	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	11.3	5.8		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1406	-	391	893	-	-
HCM Lane V/C Ratio	0.196	-	0.128	0.247	-	-
HCM Control Delay (s)	8.2	-	15.6	10.3	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.7	-	0.4	1	-	-

Lanes, Volumes, Timings
H: Gage Blvd & Unnamed E/W

05/11/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	30	21	26	315	259	34
Future Volume (vph)	30	21	26	315	259	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	100			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1643			520	1298	
Travel Time (s)	37.3			11.8	29.5	
Confl. Peds. (#/hr)	5	5	5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	21	26	315	259	34
Future Vol, veh/h	30	21	26	315	259	34
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	33	23	28	342	282	37
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	709	311	324	0	-	0
Stage 1	306	-	-	-	-	-
Stage 2	403	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	399	727	1230	-	-	-
Stage 1	745	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	387	721	1225	-	-	-
Mov Cap-2 Maneuver	494	-	-	-	-	-
Stage 1	725	-	-	-	-	-
Stage 2	670	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12	0.6		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1225	-	568	-	-	
HCM Lane V/C Ratio	0.023	-	0.098	-	-	
HCM Control Delay (s)	8	-	12	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-	

Lanes, Volumes, Timings

I: Gage Blvd & Morningside Pkwy

05/11/2021

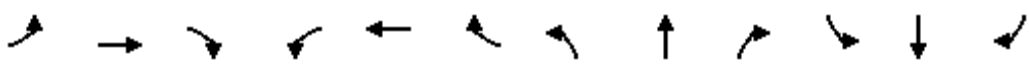
												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	12	18	18	6	81	28	239	34	76	186	19
Future Volume (vph)	20	12	18	18	6	81	28	239	34	76	186	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		194			115			1188			520	
Travel Time (s)		4.4			2.6			27.0			11.8	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	12	18	18	6	81	28	239	34	76	186	19
Future Vol, veh/h	20	12	18	18	6	81	28	239	34	76	186	19
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	22	13	20	20	7	88	30	260	37	83	202	21
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	775	746	223	744	738	289	228	0	0	302	0	0
Stage 1	384	384	-	344	344	-	-	-	-	-	-	-
Stage 2	391	362	-	400	394	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	314	341	814	329	344	748	1334	-	-	1253	-	-
Stage 1	637	610	-	669	635	-	-	-	-	-	-	-
Stage 2	631	623	-	624	603	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	253	308	807	290	311	742	1328	-	-	1248	-	-
Mov Cap-2 Maneuver	349	388	-	394	401	-	-	-	-	-	-	-
Stage 1	620	567	-	651	618	-	-	-	-	-	-	-
Stage 2	536	606	-	553	560	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	14.1		12.1		0.7		2.2					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1328	-	-	452	618	1248	-	-				
HCM Lane V/C Ratio	0.023	-	-	0.12	0.185	0.066	-	-				
HCM Control Delay (s)	7.8	-	-	14.1	12.1	8.1	-	-				
HCM Lane LOS	A	-	-	B	B	A	-	-				
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.7	0.2	-	-				

Lanes, Volumes, Timings

J: Unnamed N/S & Unnamed E/W

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	12	52	20	14	30	45	95	18	31	72	9
Future Volume (vph)	10	12	52	20	14	30	45	95	18	31	72	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		186			1643			1350			2600	
Travel Time (s)		4.2			37.3			30.7			59.1	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

Intersection												
Int Delay, s/veh	4.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	12	52	20	14	30	45	95	18	31	72	9
Future Vol, veh/h	10	12	52	20	14	30	45	95	18	31	72	9
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	11	13	57	22	15	33	49	103	20	34	78	10
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	396	382	93	407	377	123	93	0	0	128	0	0
Stage 1	156	156	-	216	216	-	-	-	-	-	-	-
Stage 2	240	226	-	191	161	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	562	549	961	553	553	925	1495	-	-	1452	-	-
Stage 1	844	767	-	784	722	-	-	-	-	-	-	-
Stage 2	761	715	-	808	763	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	504	514	953	485	518	917	1489	-	-	1446	-	-
Mov Cap-2 Maneuver	553	549	-	545	553	-	-	-	-	-	-	-
Stage 1	813	746	-	755	695	-	-	-	-	-	-	-
Stage 2	691	689	-	726	742	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10		10.7		2.1		2.1					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1489	-	-	553	837	545	758	1446	-	-		
HCM Lane V/C Ratio	0.033	-	-	0.02	0.083	0.04	0.063	0.023	-	-		
HCM Control Delay (s)	7.5	-	-	11.6	9.7	11.9	10.1	7.5	-	-		
HCM Lane LOS	A	-	-	B	A	B	B	A	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.3	0.1	0.2	0.1	-	-		

Lanes, Volumes, Timings

K: Unnamed N/S & Bella Coola Ln

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	132	46	18	171	187	51	75	21	215	107	79
Future Volume (vph)	63	132	46	18	171	187	51	75	21	215	107	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1666			2314			2600			733	
Travel Time (s)		37.9			52.6			59.1			16.7	
Confl. Peds. (#/hr)	5					5				5		5
Peak Hour Factor	0.92	0.92	0.90	0.90	0.92	0.92	0.90	0.90	0.90	0.92	0.90	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

HCM 6th AWSC

K: Unnamed N/S & Bella Coola Ln

05/11/2021

Intersection												
Intersection Delay, s/veh	17.9											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	63	132	46	18	171	187	51	75	21	215	107	79
Future Vol, veh/h	63	132	46	18	171	187	51	75	21	215	107	79
Peak Hour Factor	0.92	0.92	0.90	0.90	0.92	0.92	0.90	0.90	0.90	0.92	0.90	0.92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	68	143	51	20	186	203	57	83	23	234	119	86
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	13.9	24.6	12.5	16
HCM LOS	B	C	B	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	78%	0%	74%	0%	48%	0%	58%
Vol Right, %	0%	22%	0%	26%	0%	52%	0%	42%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	51	96	63	178	18	358	215	186
LT Vol	51	0	63	0	18	0	215	0
Through Vol	0	75	0	132	0	171	0	107
RT Vol	0	21	0	46	0	187	0	79
Lane Flow Rate	57	107	68	195	20	389	234	205
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.13	0.225	0.15	0.389	0.042	0.726	0.498	0.39
Departure Headway (Hd)	8.267	7.595	7.904	7.205	7.606	6.721	7.674	6.858
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	433	473	453	500	471	537	470	524
Service Time	6.023	5.35	5.654	4.954	5.347	4.462	5.42	4.604
HCM Lane V/C Ratio	0.132	0.226	0.15	0.39	0.042	0.724	0.498	0.391
HCM Control Delay	12.3	12.6	12.1	14.5	10.7	25.3	17.8	13.9
HCM Lane LOS	B	B	B	B	B	D	C	B
HCM 95th-tile Q	0.4	0.9	0.5	1.8	0.1	6	2.7	1.8

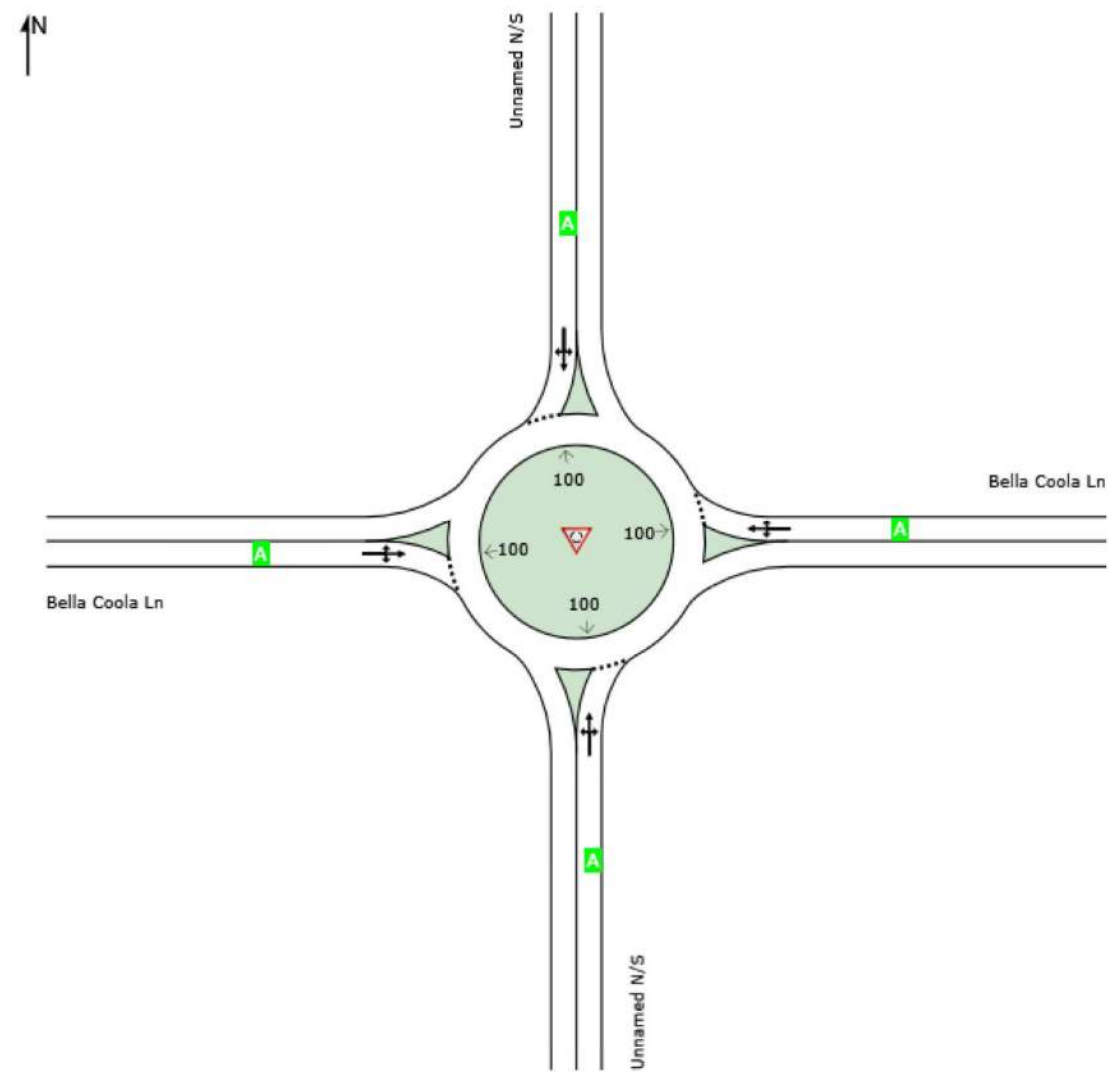
LANE LEVEL OF SERVICE

Lane Level of Service

Site: K: Jnnamed N/S / Bella Coola Ln (Site Folder: 2040 With Project - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: K: Unnamed N/S / Bella Coola Ln (Site Folder: 2040 With Project - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Unnamed N/S														
3	L2	51	3.0	55	3.0	0.191	6.3	LOS A	0.8	20.9	0.54	0.48	0.54	33.6
8	T1	75	3.0	82	3.0	0.191	6.3	LOS A	0.8	20.9	0.54	0.48	0.54	33.6
18	R2	21	3.0	23	3.0	0.191	6.3	LOS A	0.8	20.9	0.54	0.48	0.54	32.6
Approach		147	3.0	160	3.0	0.191	6.3	LOS A	0.8	20.9	0.54	0.48	0.54	33.4
East: Bella Coola Ln														
1	L2	18	3.0	20	3.0	0.379	7.3	LOS A	2.1	54.3	0.47	0.34	0.47	33.9
6	T1	171	3.0	186	3.0	0.379	7.3	LOS A	2.1	54.3	0.47	0.34	0.47	33.9
16	R2	187	3.0	203	3.0	0.379	7.3	LOS A	2.1	54.3	0.47	0.34	0.47	32.9
Approach		376	3.0	409	3.0	0.379	7.3	LOS A	2.1	54.3	0.47	0.34	0.47	33.4
North: Unnamed N/S														
7	L2	215	3.0	234	3.0	0.428	8.3	LOS A	2.4	62.6	0.55	0.43	0.55	32.1
4	T1	107	3.0	116	3.0	0.428	8.3	LOS A	2.4	62.6	0.55	0.43	0.55	32.1
14	R2	79	3.0	86	3.0	0.428	8.3	LOS A	2.4	62.6	0.55	0.43	0.55	31.2
Approach		401	3.0	436	3.0	0.428	8.3	LOS A	2.4	62.6	0.55	0.43	0.55	32.0
West: Bella Coola Ln														
5	L2	63	3.0	68	3.0	0.288	7.0	LOS A	1.4	35.0	0.55	0.47	0.55	33.5
2	T1	132	3.0	143	3.0	0.288	7.0	LOS A	1.4	35.0	0.55	0.47	0.55	33.4
12	R2	46	3.0	50	3.0	0.288	7.0	LOS A	1.4	35.0	0.55	0.47	0.55	32.5
Approach		241	3.0	262	3.0	0.288	7.0	LOS A	1.4	35.0	0.55	0.47	0.55	33.3
All Vehicles		1165	3.0	1266	3.0	0.428	7.4	LOS A	2.4	62.6	0.52	0.42	0.52	32.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings
L: Clark Ridge Dr & Bella Coola Ln

05/11/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	213	87	47	243	19	74	0	38	21	5	4
Future Volume (vph)	4	213	87	47	243	19	74	0	38	21	5	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		3007			1666			247			270	
Travel Time (s)		68.3			37.9			5.6			6.1	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											

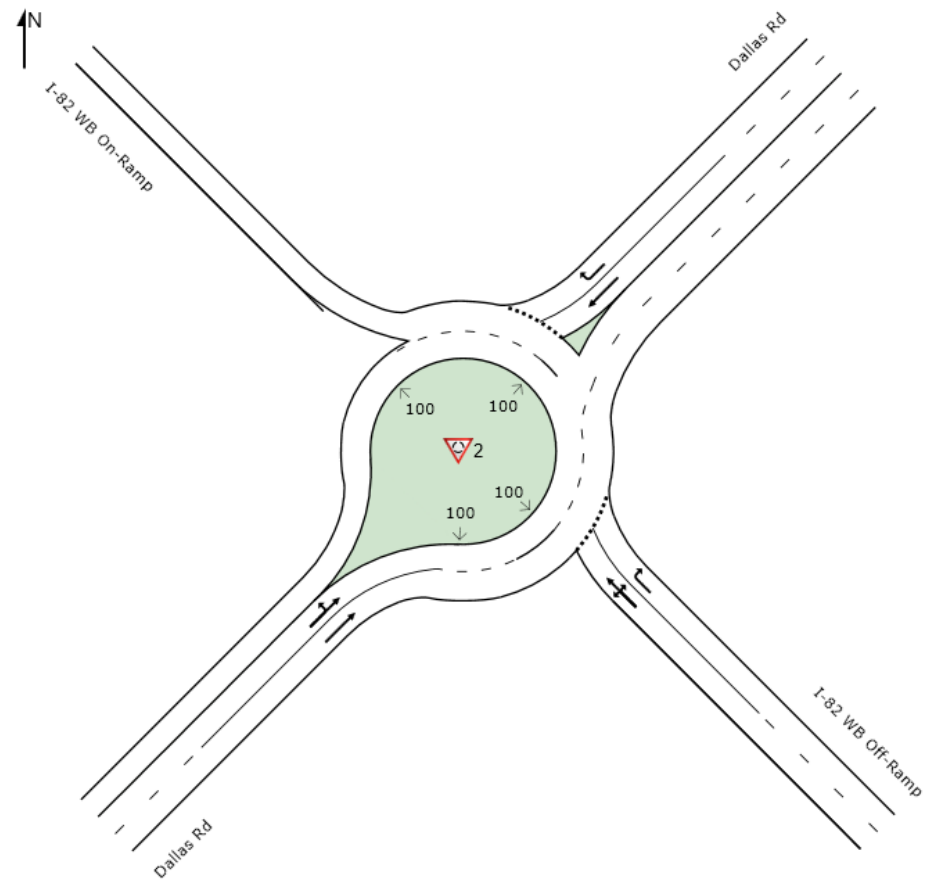
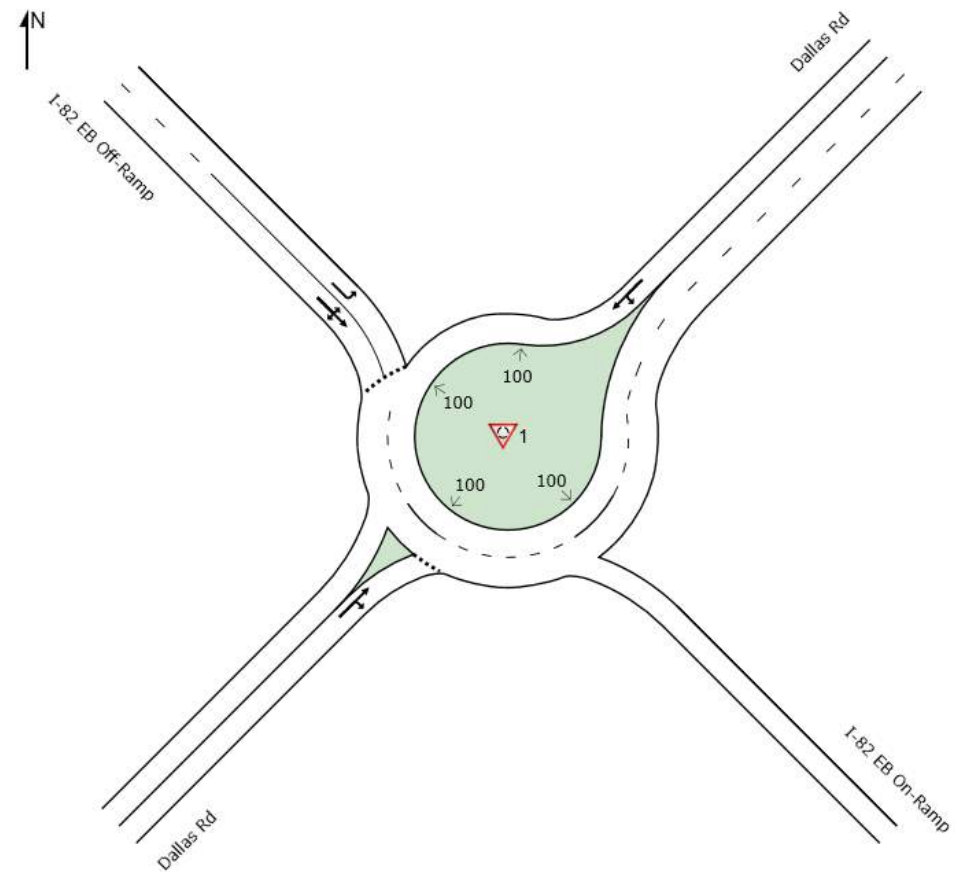
Intersection												
Int Delay, s/veh	3.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	213	87	47	243	19	74	0	38	21	5	4
Future Vol, veh/h	4	213	87	47	243	19	74	0	38	21	5	4
Conflicting Peds, #/hr	0	0	5	0	0	5	0	0	5	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	4	232	95	51	264	21	80	0	41	23	5	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	290	0	0	332	0	0	679	685	290	695	722	285
Stage 1	-	-	-	-	-	-	293	293	-	382	382	-
Stage 2	-	-	-	-	-	-	386	392	-	313	340	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	1266	-	-	1222	-	-	364	369	747	355	352	752
Stage 1	-	-	-	-	-	-	713	668	-	638	611	-
Stage 2	-	-	-	-	-	-	635	605	-	696	637	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1261	-	-	1217	-	-	340	346	741	319	331	746
Mov Cap-2 Maneuver	-	-	-	-	-	-	340	346	-	319	331	-
Stage 1	-	-	-	-	-	-	707	663	-	633	578	-
Stage 2	-	-	-	-	-	-	592	572	-	652	632	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			1.2			17.2			16.4		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	416	1261	-	-	1217	-	-	348				
HCM Lane V/C Ratio	0.293	0.003	-	-	0.042	-	-	0.094				
HCM Control Delay (s)	17.2	7.9	0	-	8.1	0	-	16.4				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1.2	0	-	-	0.1	-	-	0.3				

Appendix G

Intersection Control and Channelization Options for On-Site Study Intersections

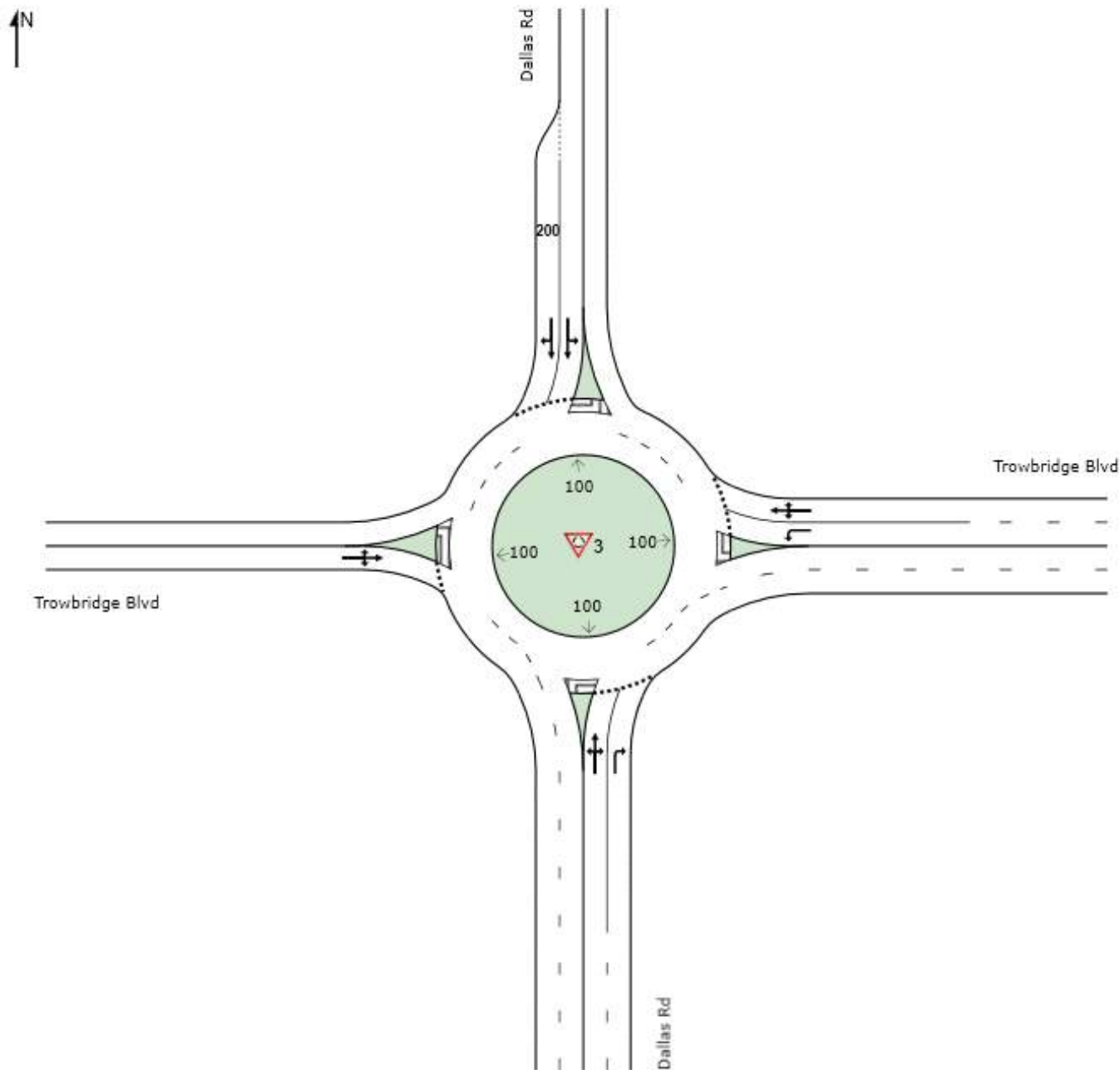
Channelization Improvements - Roundabout vs Signal

1. Dallas Rd/I-82 EB Ramps
2. Dallas Rd/I-82 EB Ramps



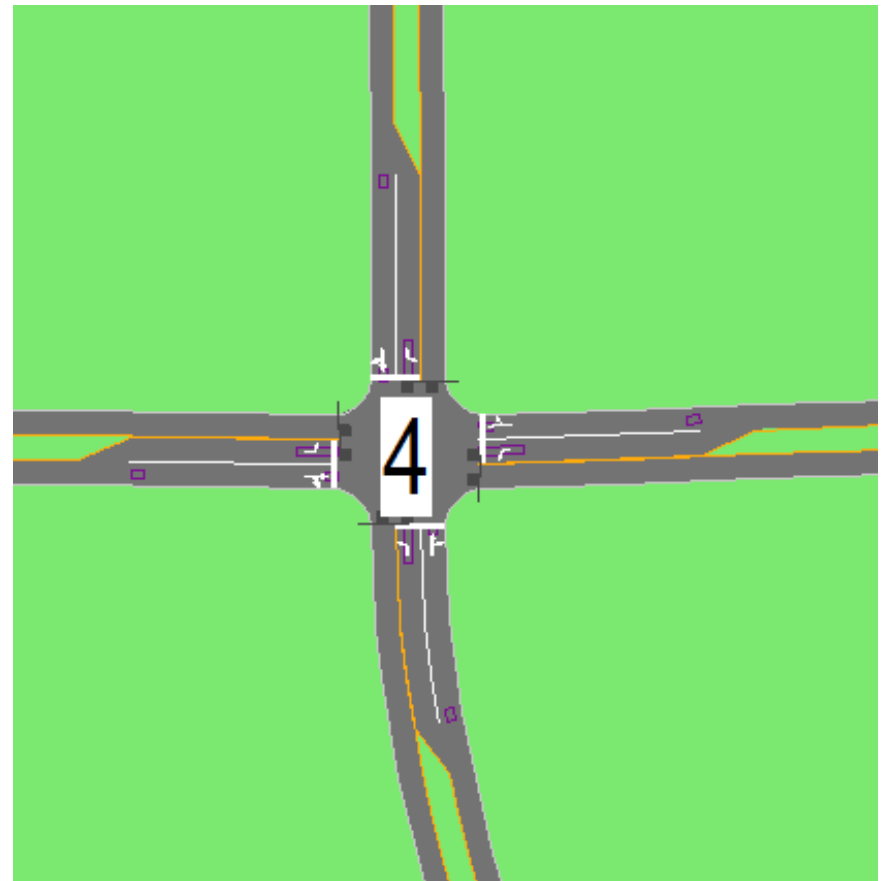
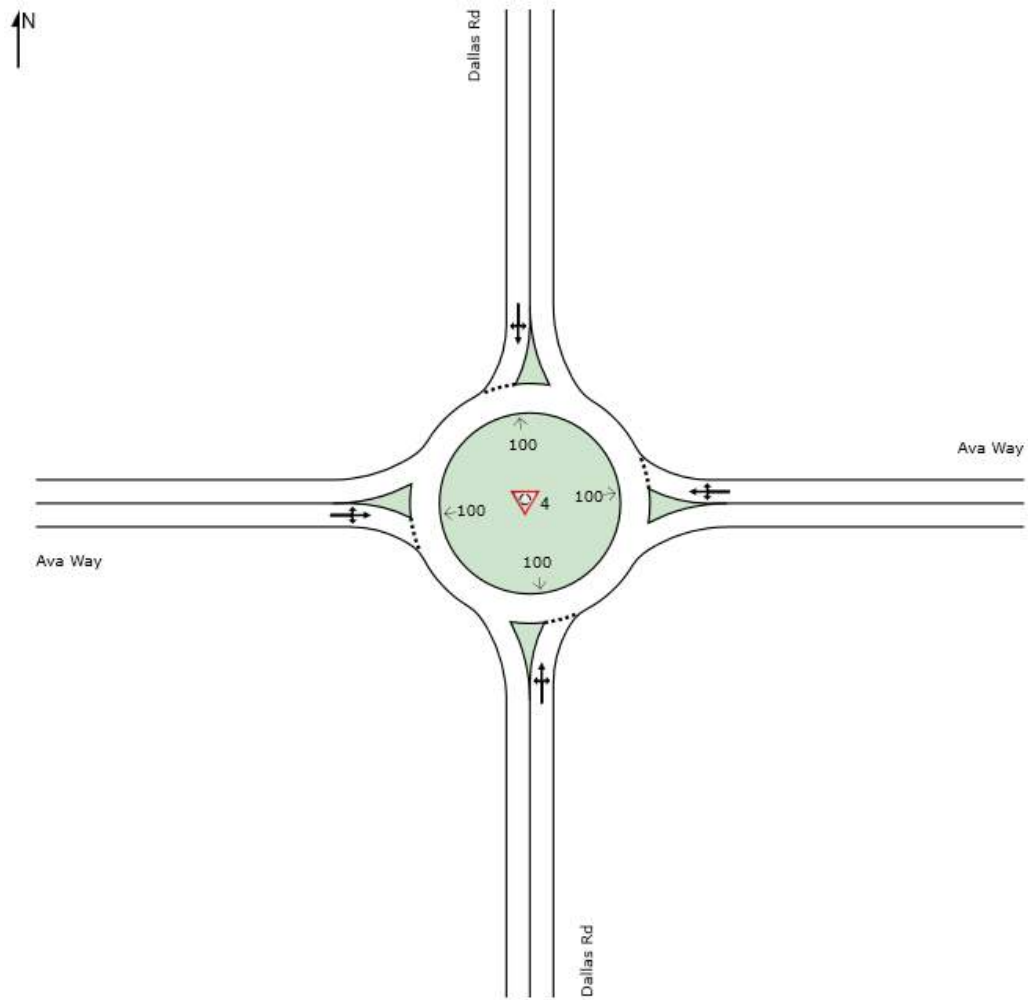
Channelization Improvements - Roundabout

3. Dallas Road/Trowbridge Blvd



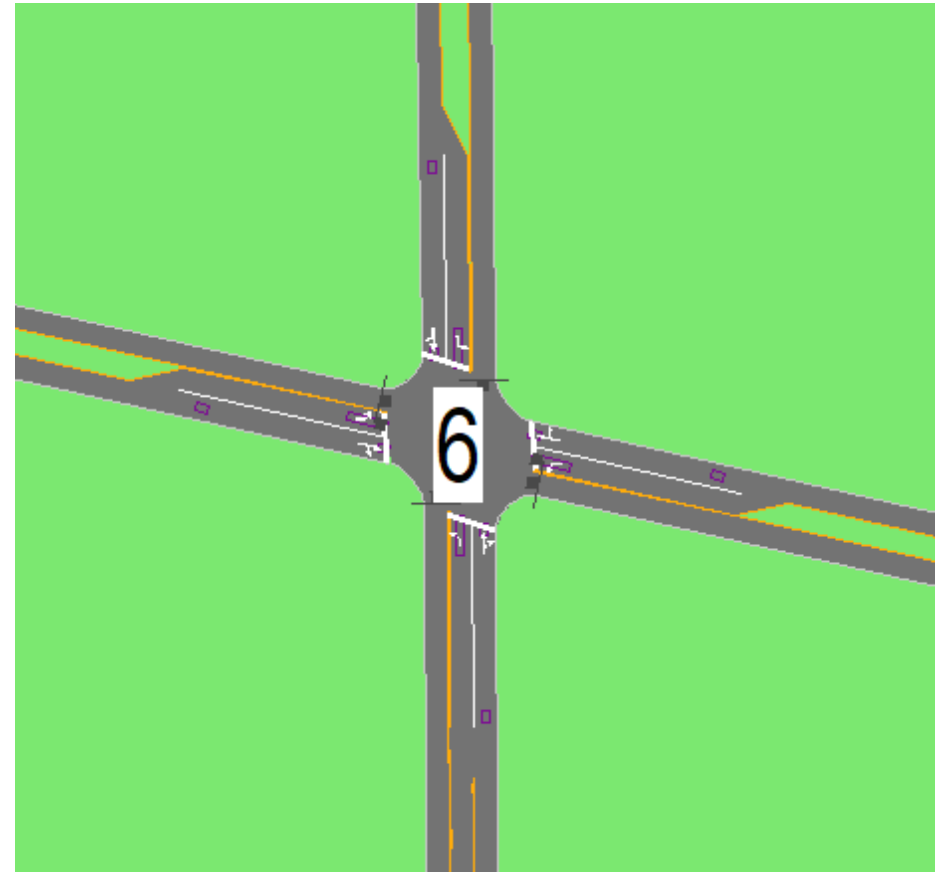
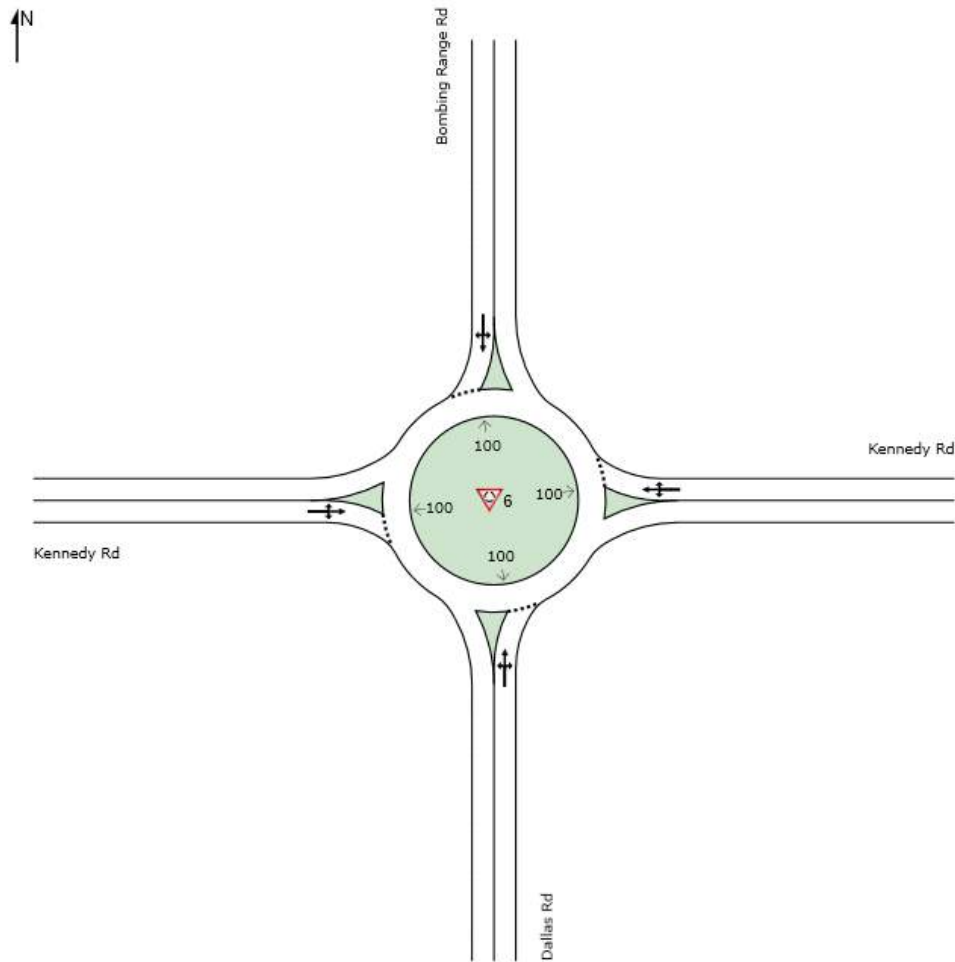
Channelization Improvements - Roundabout vs Signal

4. Dallas Road/Ava Way



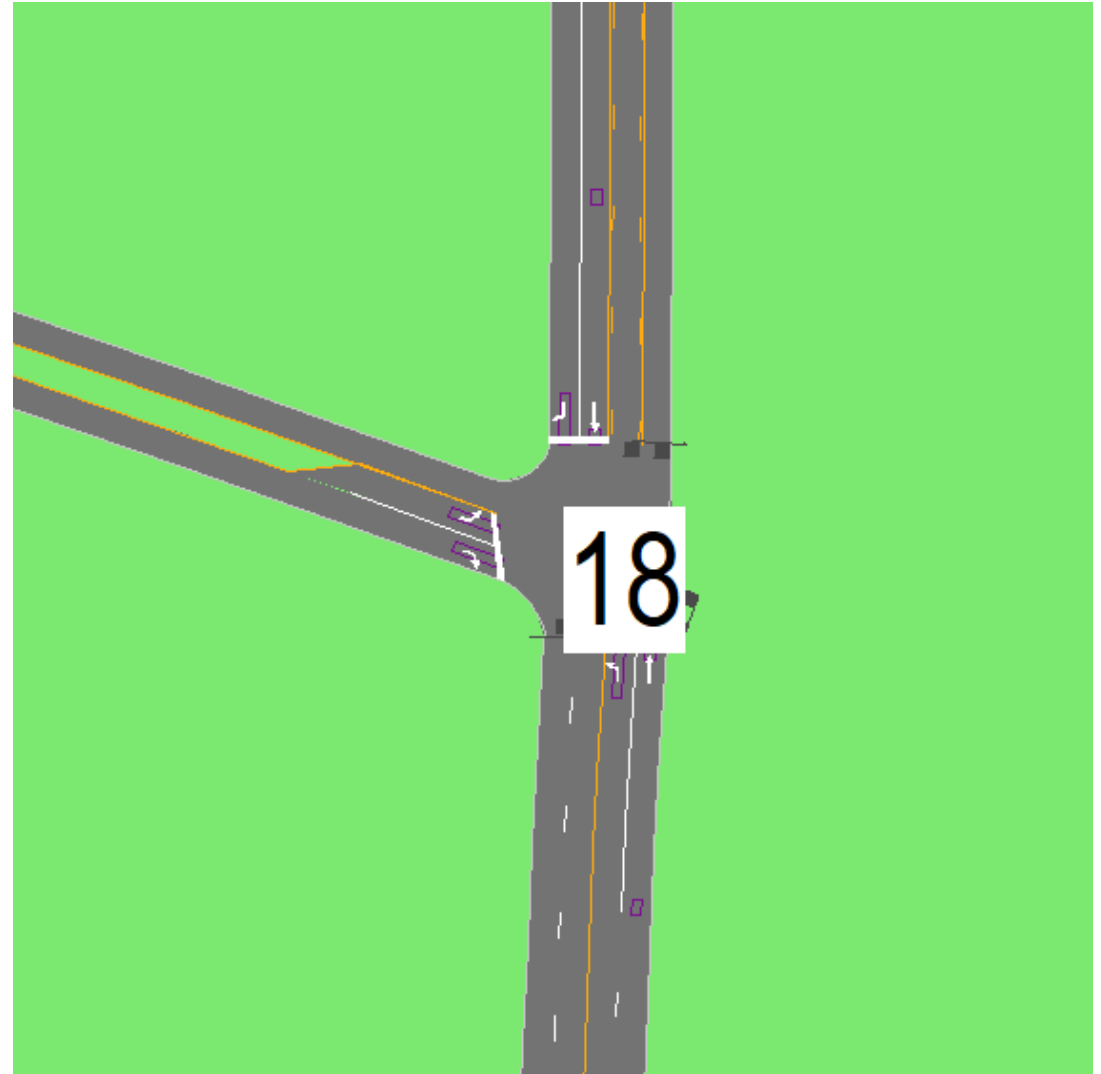
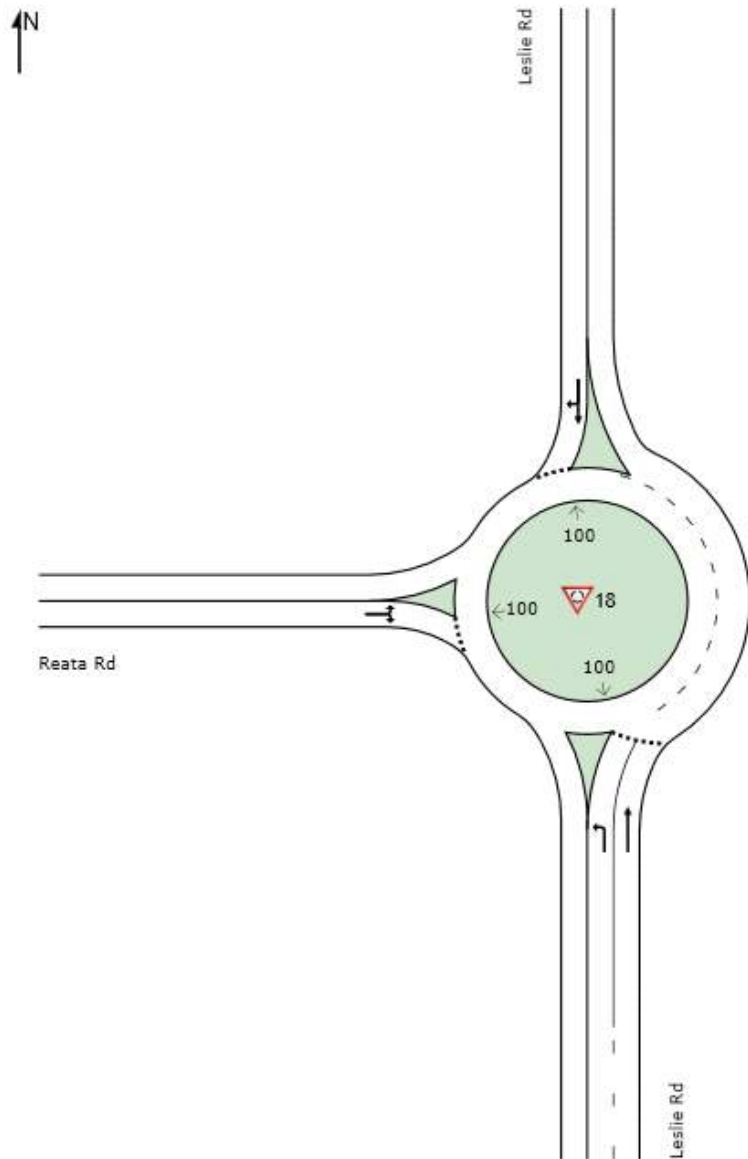
Channelization Improvements - Roundabout vs Signal

6. Bombing Range Rd/Kennedy Rd



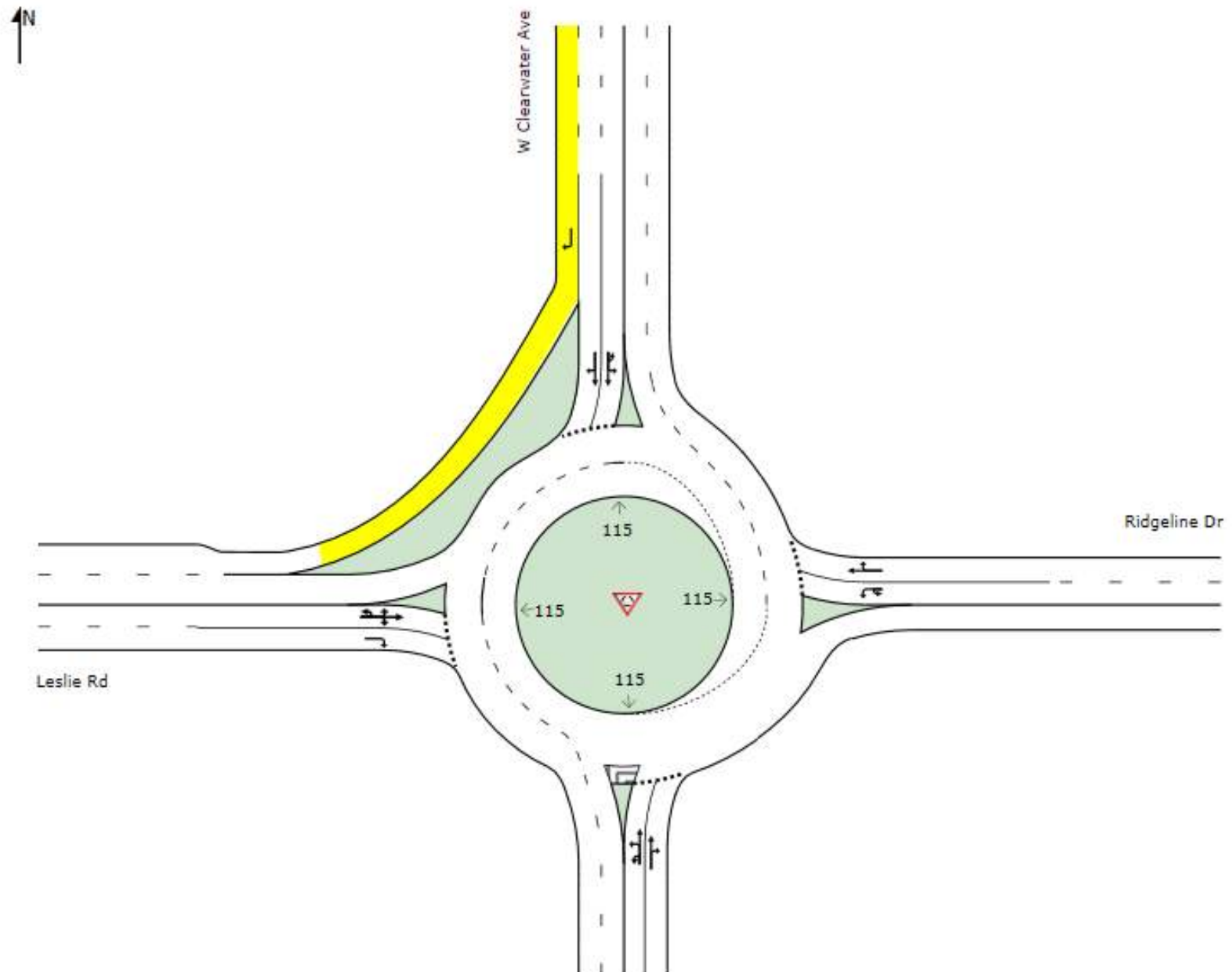
Channelization Improvements - Roundabout vs Signal

18. Leslie Rd/Reata Rd



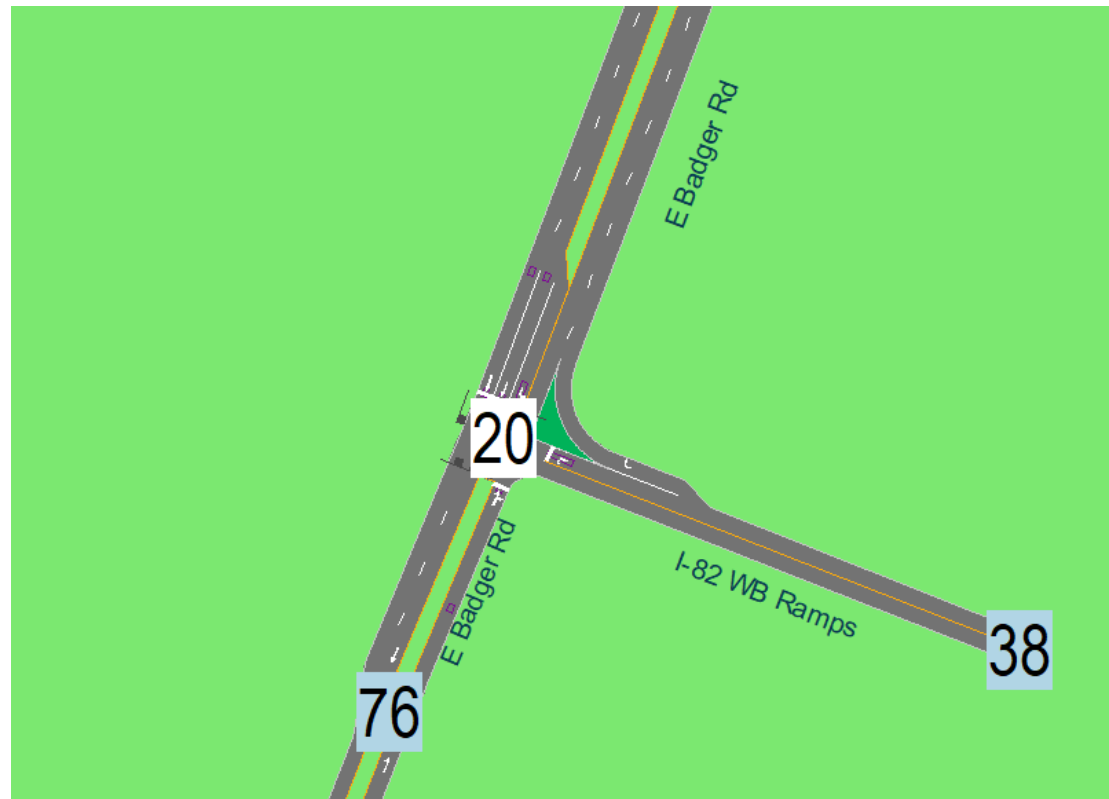
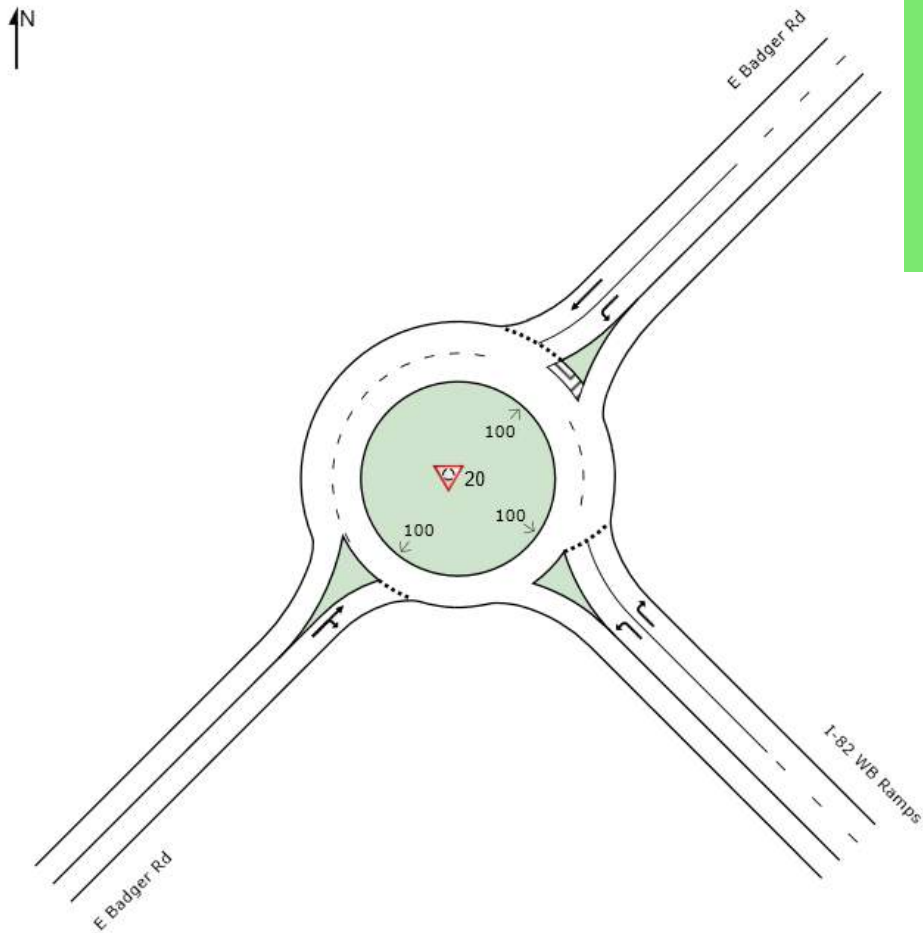
Channelization Improvements - Roundabout (Southbound Right-Turn Slip Lane)

19. Leslie Rd/Badger Rd/Clearwater Ave



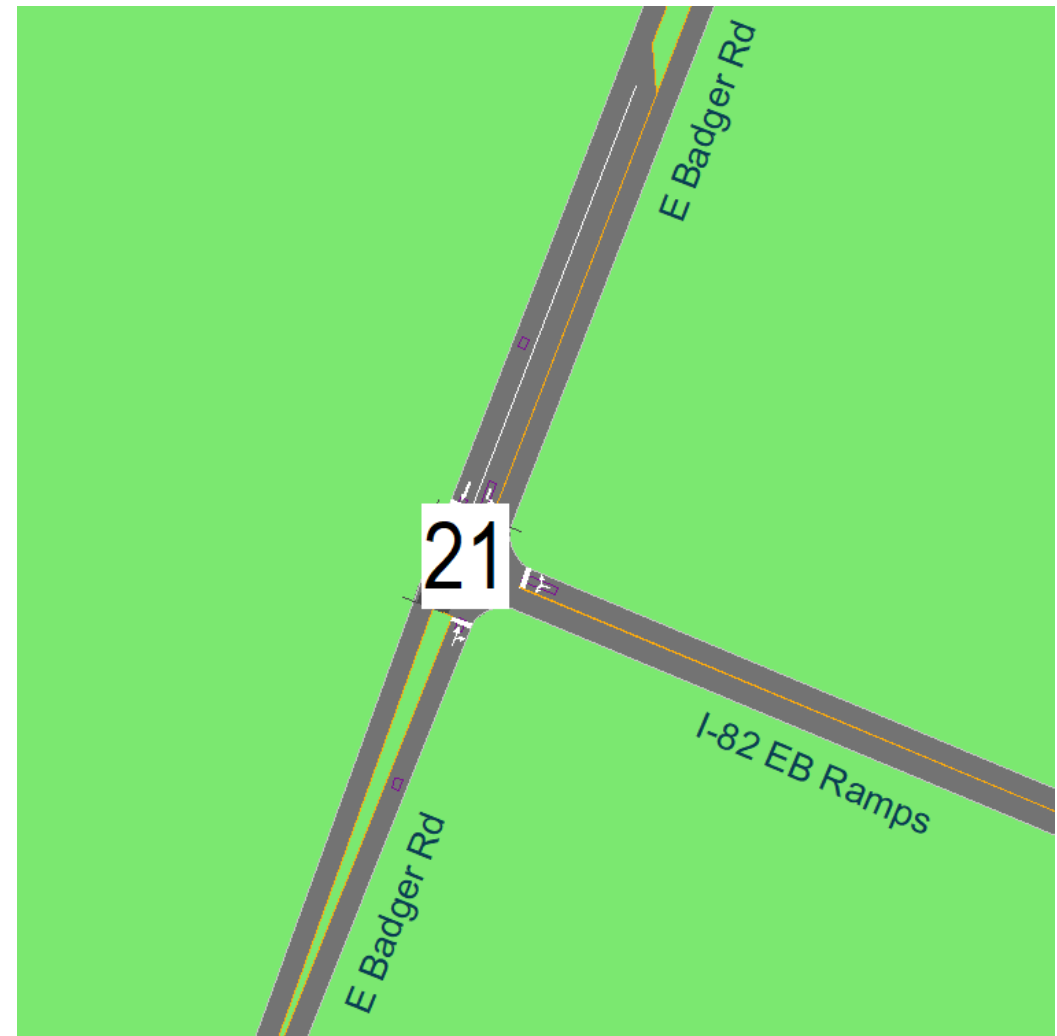
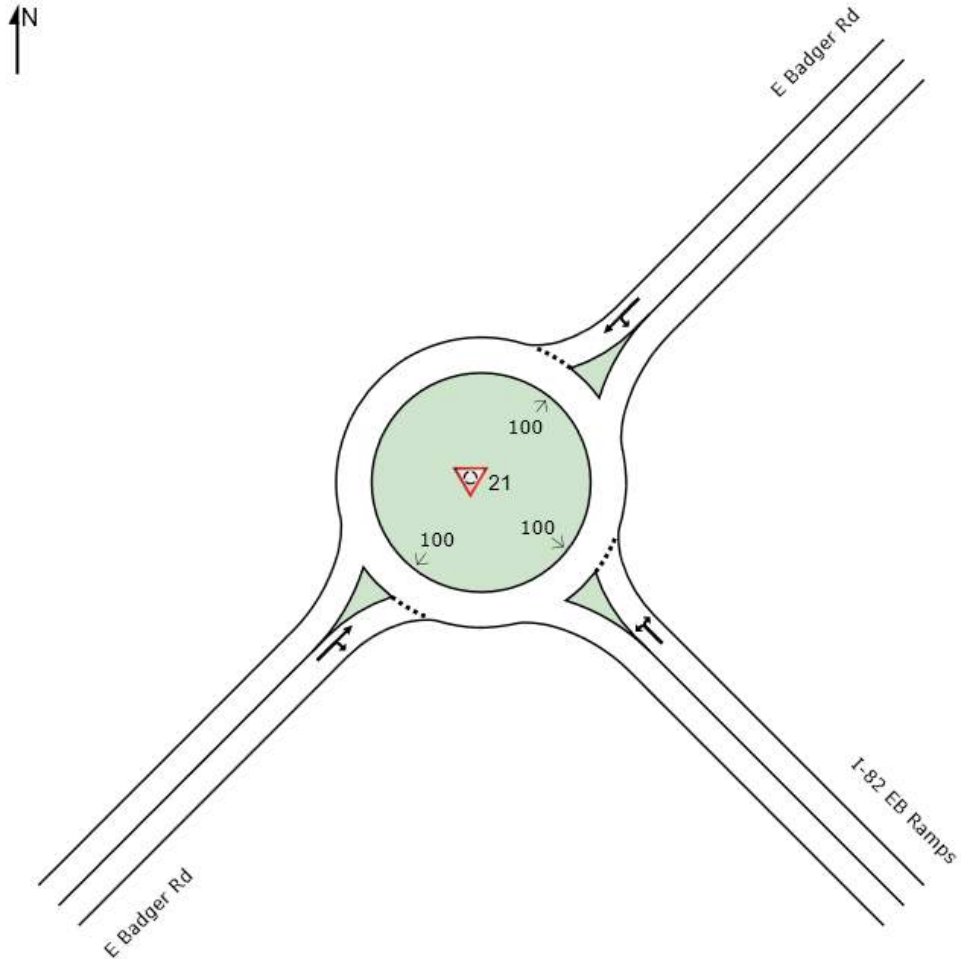
Channelization Improvements - Roundabout vs Signal

20. Badger Rd/I-82 WB Ramps



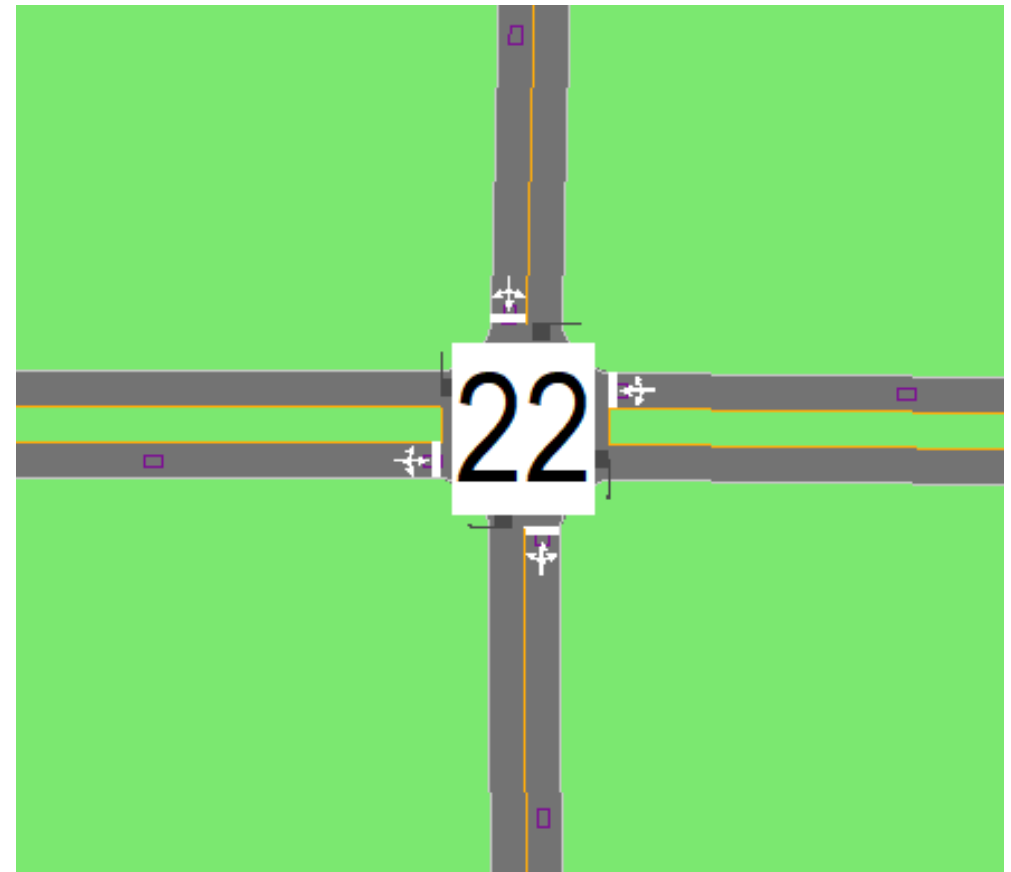
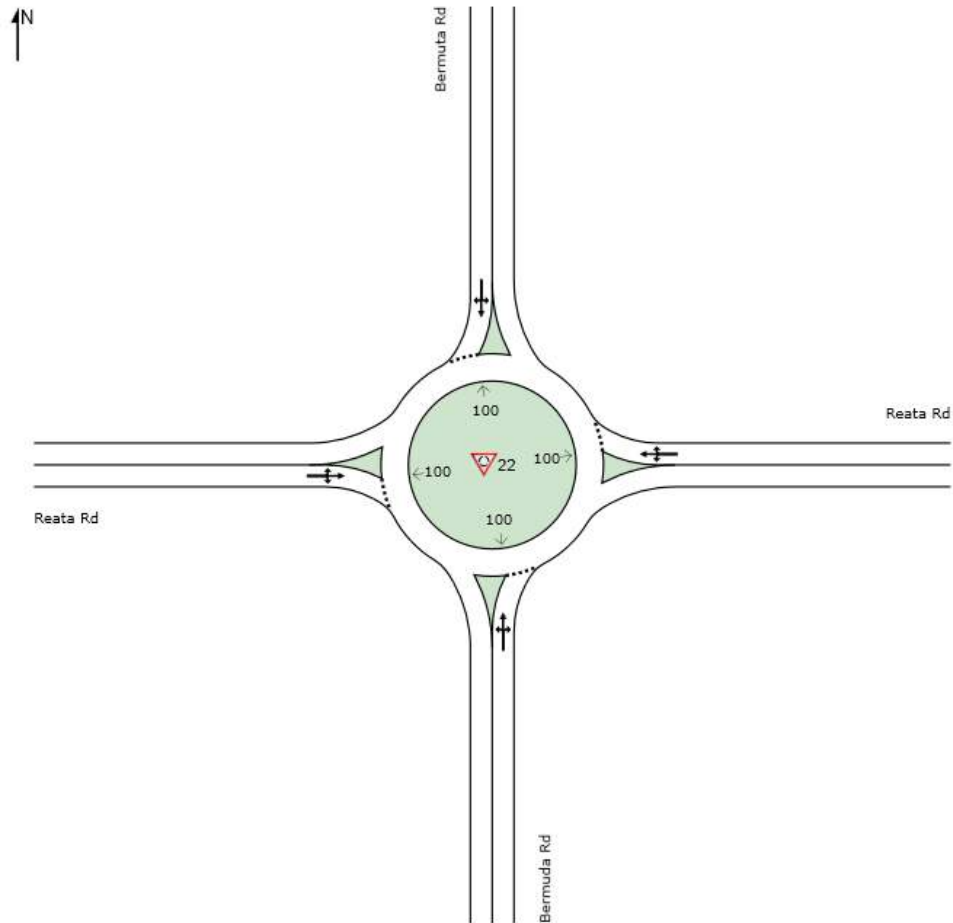
Channelization Improvements - Roundabout vs Signal

21. Badger Rd/I-82 EB Ramps



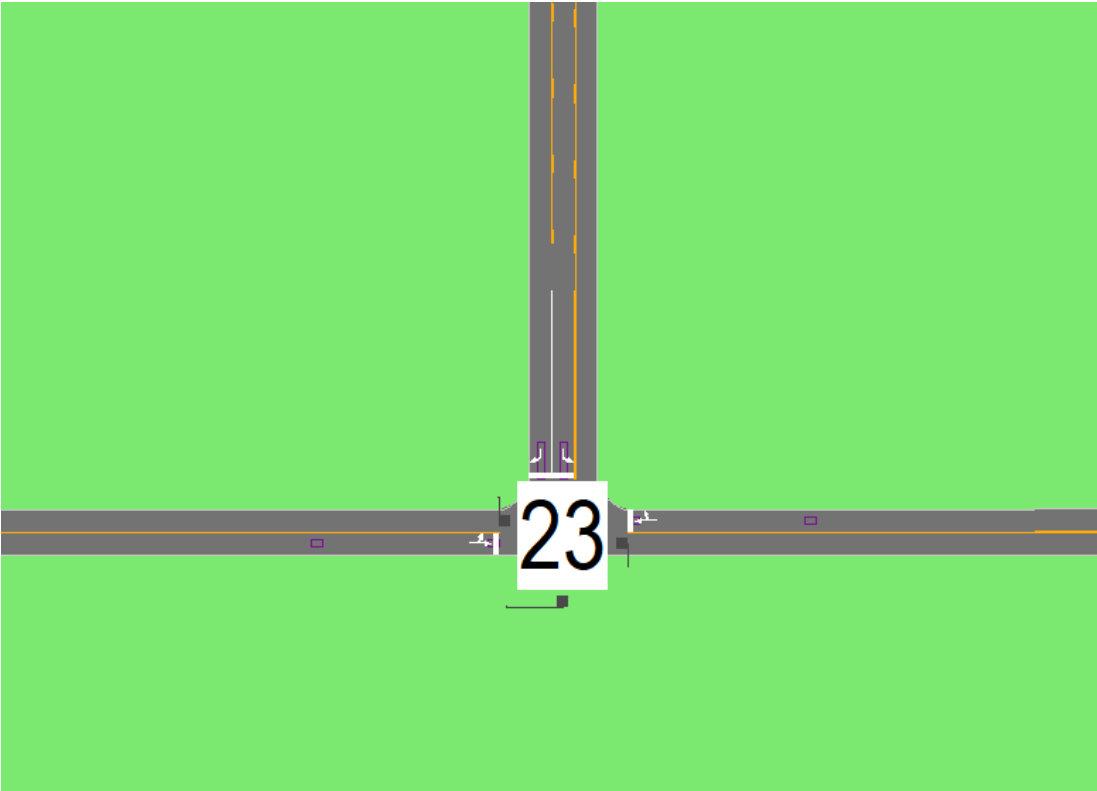
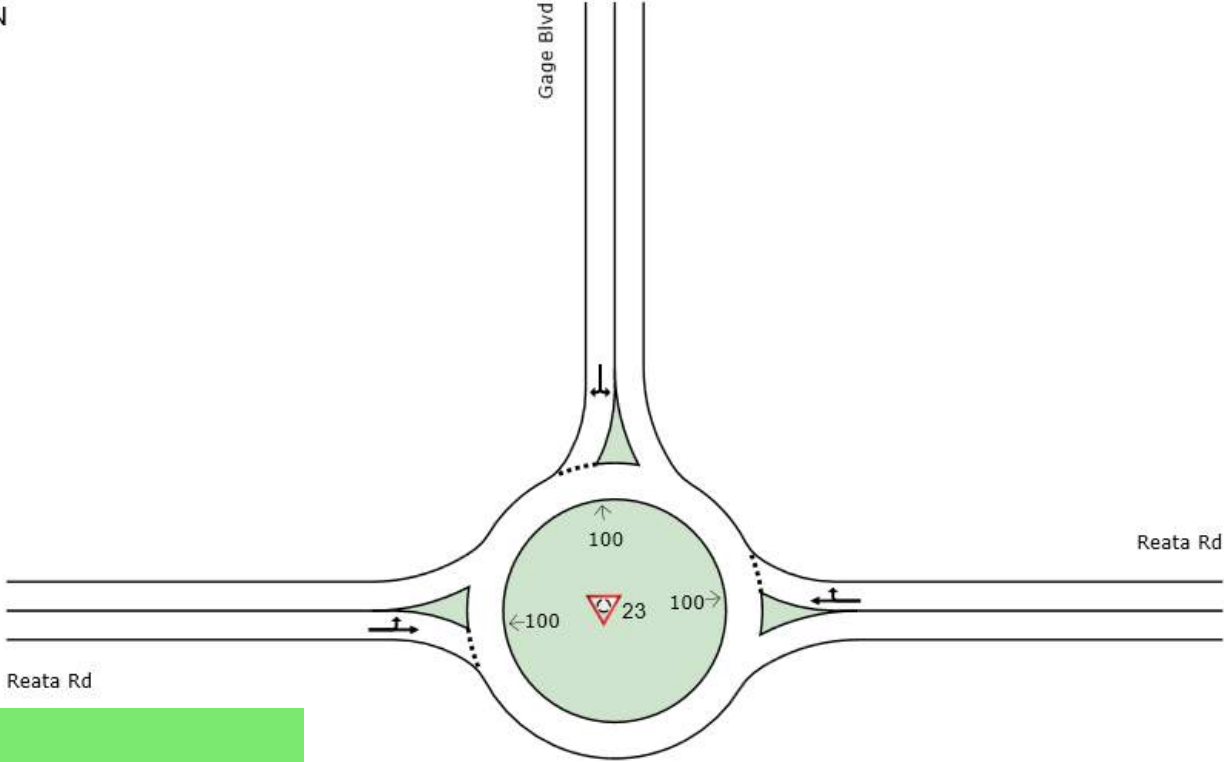
Channelization Improvements - Roundabout vs Signal

22. Bermuda Rd/Reata Rd



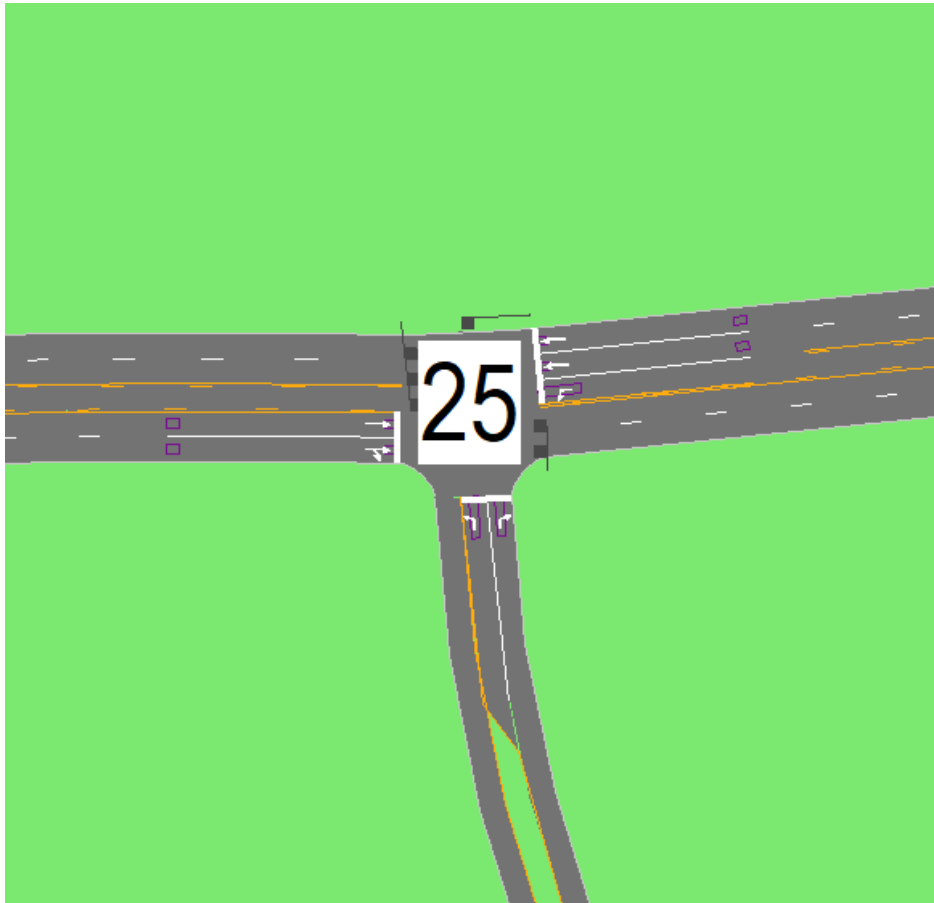
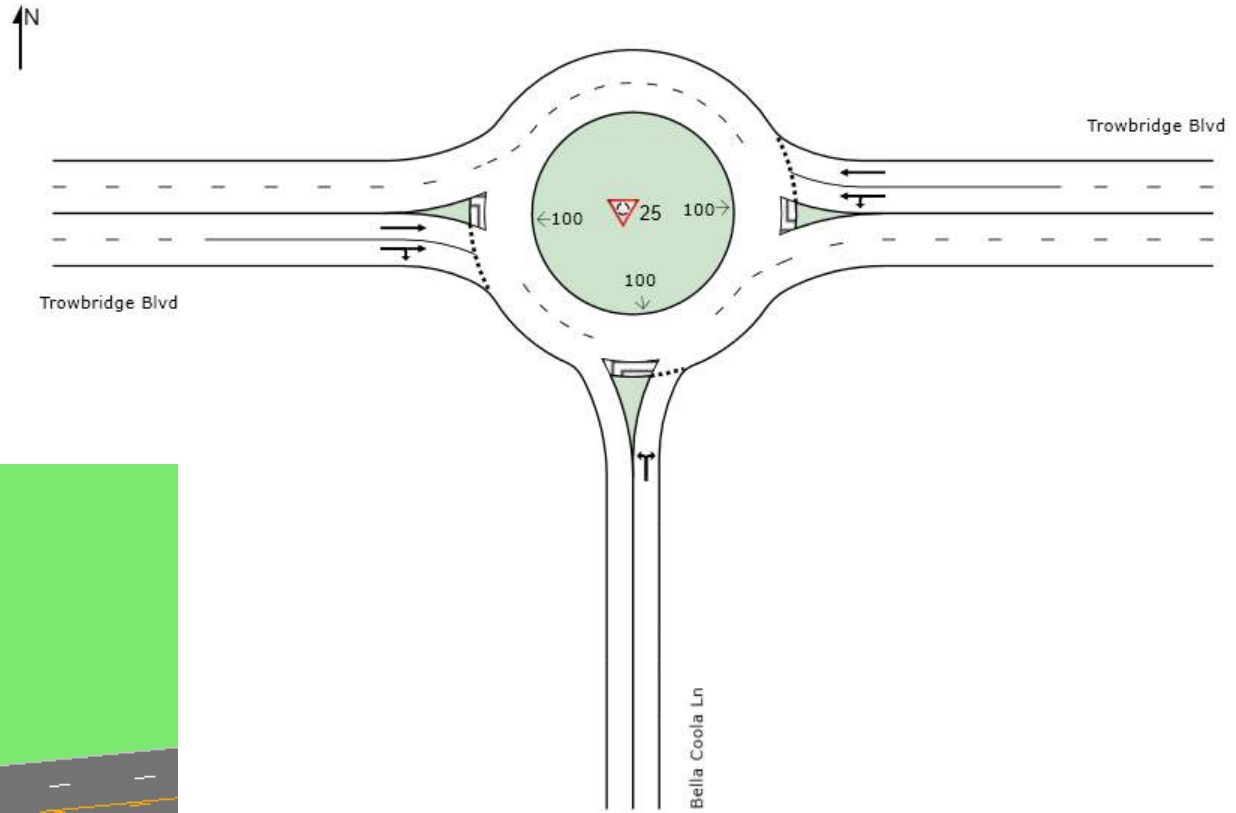
Channelization Improvements - Roundabout vs Signal

23. Gage Rd/Reata Rd



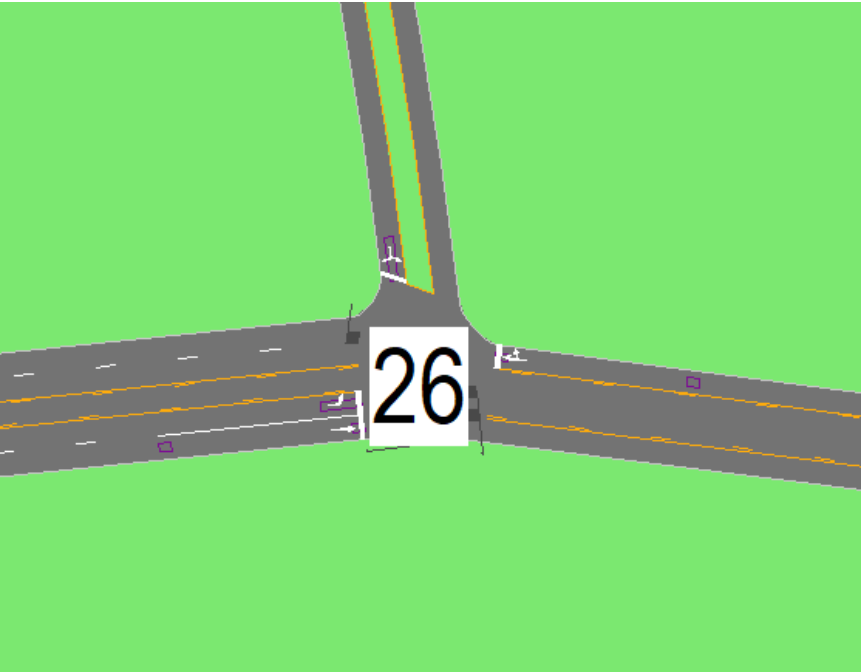
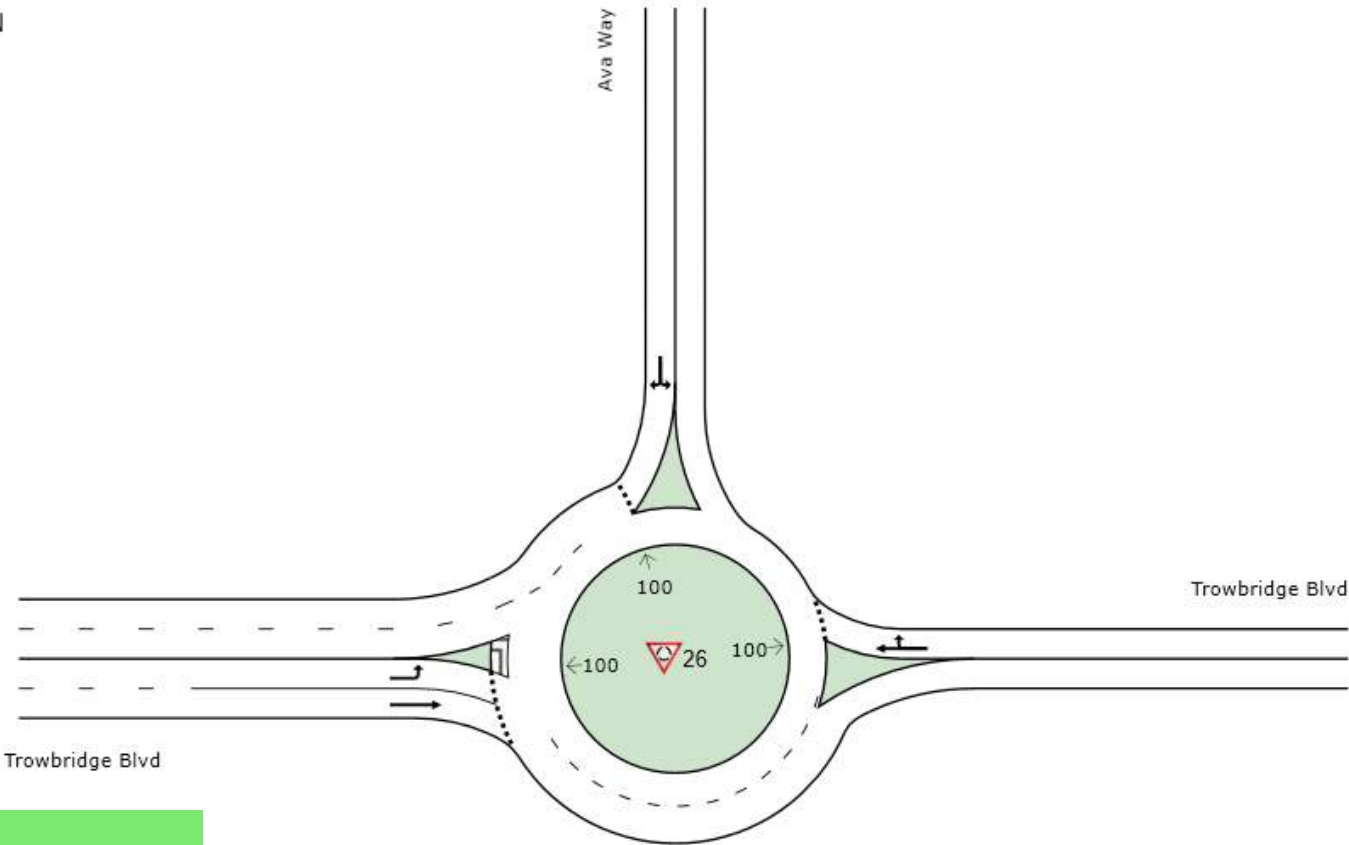
Channelization Improvements - Roundabout vs Signal

25. Bella Coola Ln/Trowbridge Blvd



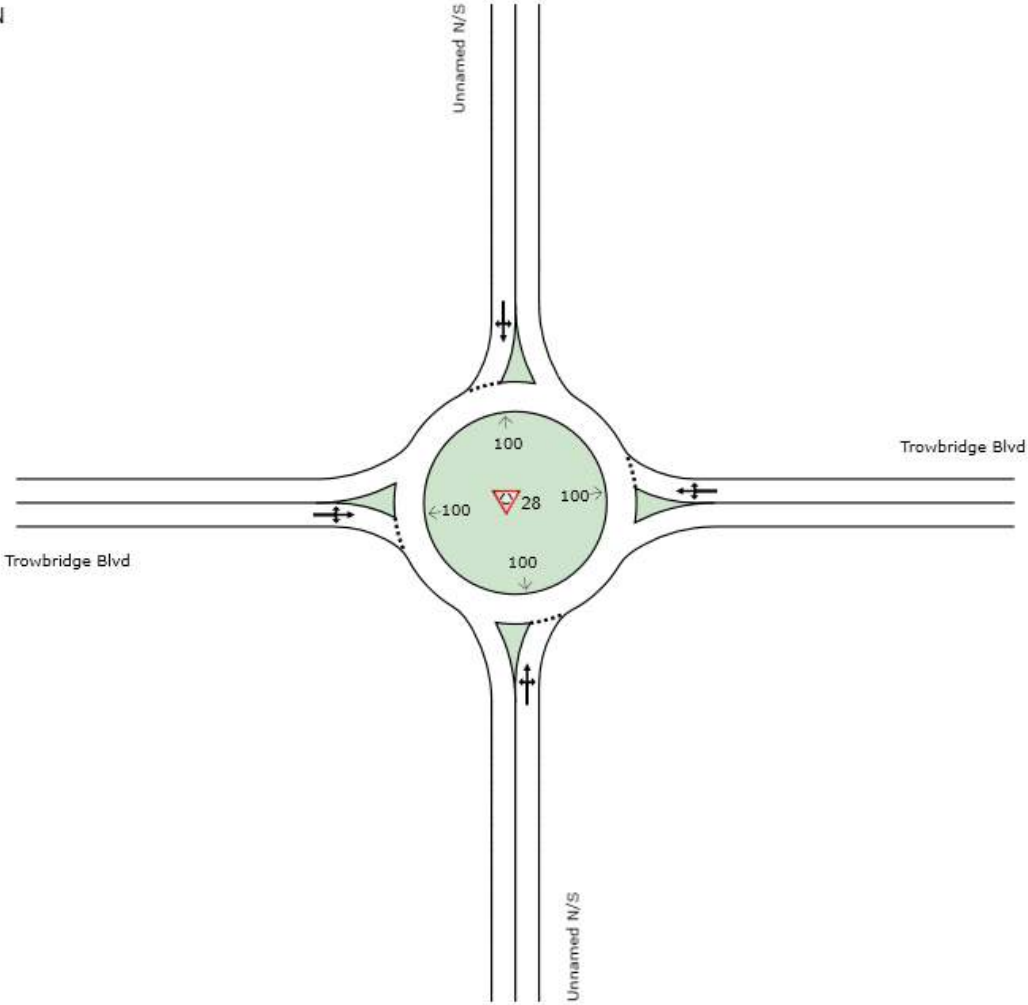
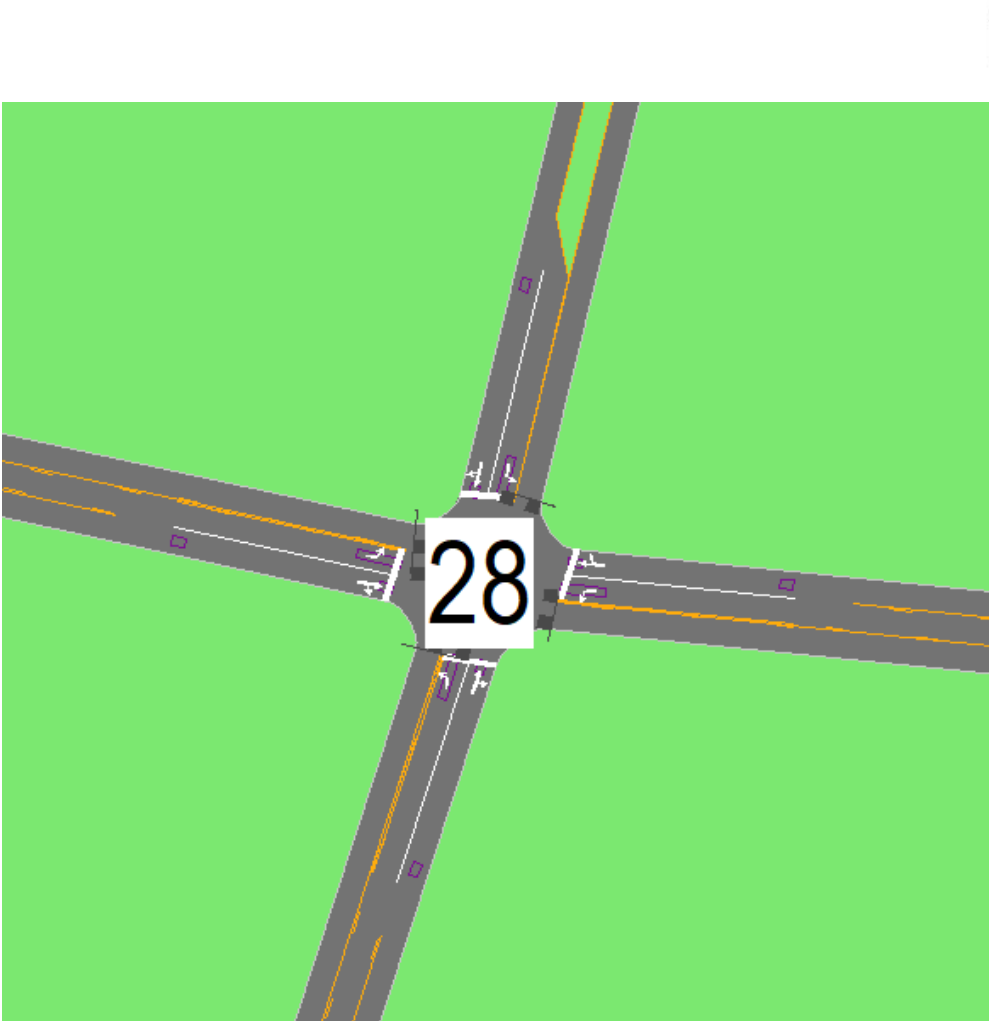
Channelization Improvements - Roundabout vs Signal

26. Ava Way /Trowbridge Blvd



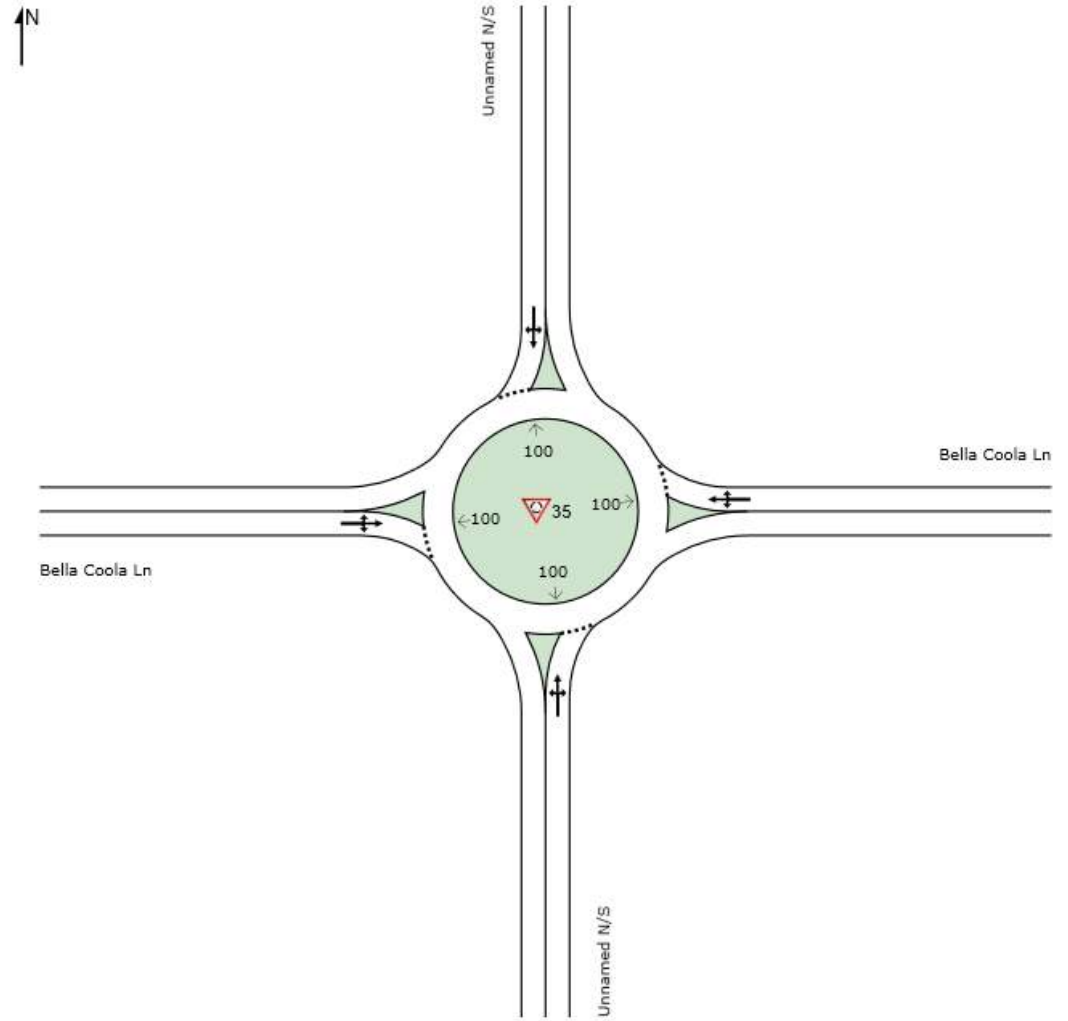
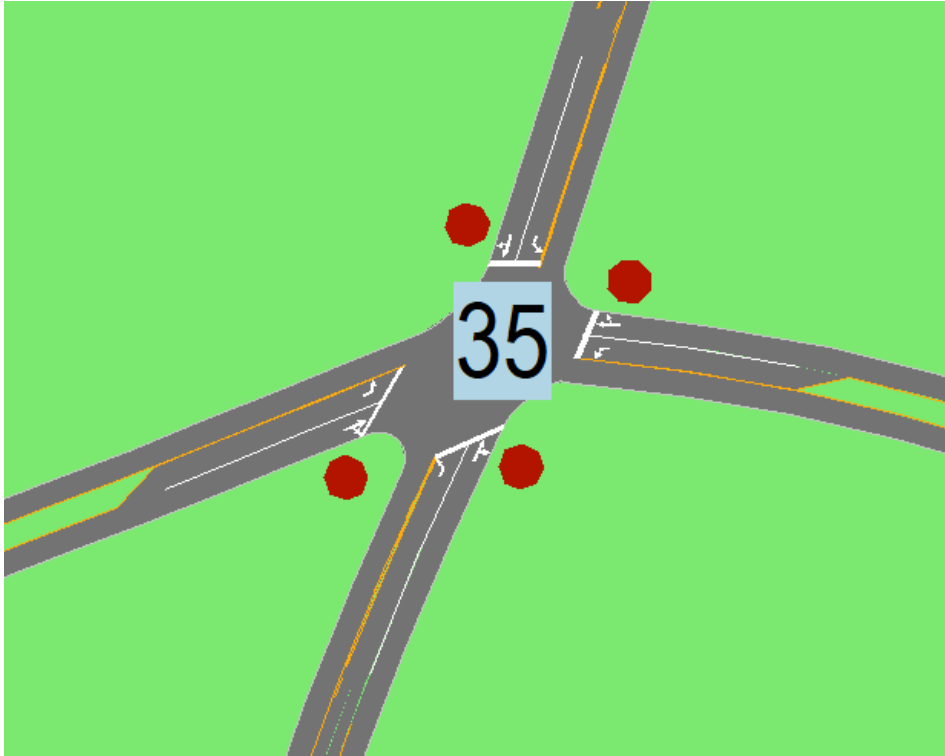
Channelization Improvements - Roundabout vs Signal

28. Unnamed N/S /Trowbridge Blvd



Channelization Improvements - Roundabout vs AWSC

35. Unnamed N/S / Bella Coola Ln



Appendix H

City of Richland Preliminary Functional Classification Recommendations

Functional Classification Preliminary Recommendations										
	Proposed ADT Range		Current Code ADT		Mobility vs. Access	Speeds		Percent of Urban System		Spacing
	Low	High	Low	High		Low	High	Low	High	
Principal Arterial	12000	40000	N/A	N/A	High Mobility	35	55	4%	6%	1 mile
Minor Arterial	5000	15000	2500	15000	Mobility/Access	30	45	7%	12%	< 1 mile
Major Collector	2000	8000	1000	4000	Access/Mobility	25	35	7%	13%	1/4 mile
Minor Collector	750	2500	400	1500	Medium Access	25	30	7%	13%	
Local Road	0	1500	0	1000	High Access	20	25	60%	75%	

Appendix I

Level of Service (LOS) Calculations for Mitigation Options at Off-Site Study
Intersections

Lanes, Volumes, Timings

1: Dallas Rd & I-82 EB Ramps

05/12/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	315	1	95	0	0	0	0	376	100	571	139	0
Future Volume (vph)	315	1	95	0	0	0	0	376	100	571	139	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			-3%			5%			-11%	
Storage Length (ft)	0		100	0		0	0		0	150		0
Storage Lanes	0		1	0		0	0		0	2		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		106			198			377			305	
Travel Time (s)		2.4			4.5			5.1			4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Perm	NA	Perm					NA		Prot	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4									
Detector Phase	4	4	4					6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0					20.0		9.5	20.0	
Total Split (s)	37.0	37.0	37.0					52.0		31.0	83.0	
Total Split (%)	30.8%	30.8%	30.8%					43.3%		25.8%	69.2%	
Yellow Time (s)	5.0	5.0	5.0					5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5	0.5					0.5		0.5	0.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?												
Recall Mode	None	None	None					Min		None	None	

Intersection Summary

Area Type: Other

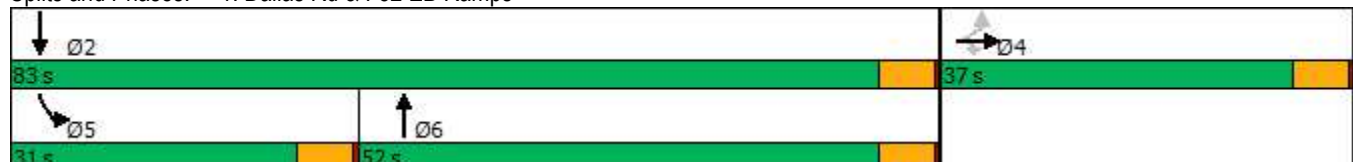
Cycle Length: 120

Actuated Cycle Length: 89.4

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Dallas Rd & I-82 EB Ramps



HCM 6th Signalized Intersection Summary

1: Dallas Rd & I-82 EB Ramps

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	315	1	95	0	0	0	0	376	100	571	139	0
Future Volume (veh/h)	315	1	95	0	0	0	0	376	100	571	139	0
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	1803	1803	1803				0	1708	1708	2288	2288	0
Adj Flow Rate, veh/h	342	1	103				0	409	109	621	151	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	394	1	352				0	443	118	740	1374	0
Arrive On Green	0.23	0.23	0.23				0.00	0.34	0.34	0.18	0.60	0.00
Sat Flow, veh/h	1712	5	1528				0	1300	346	4227	2288	0
Grp Volume(v), veh/h	343	0	103				0	0	518	621	151	0
Grp Sat Flow(s),veh/h/ln	1717	0	1528				0	0	1646	2113	2288	0
Q Serve(g_s), s	12.5	0.0	3.6				0.0	0.0	19.7	9.3	1.8	0.0
Cycle Q Clear(g_c), s	12.5	0.0	3.6				0.0	0.0	19.7	9.3	1.8	0.0
Prop In Lane	1.00		1.00				0.00		0.21	1.00		0.00
Lane Grp Cap(c), veh/h	395	0	352				0	0	562	740	1374	0
V/C Ratio(X)	0.87	0.00	0.29				0.00	0.00	0.92	0.84	0.11	0.00
Avail Cap(c_a), veh/h	830	0	739				0	0	1175	1655	2722	0
HCM Platoon Ratio	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	1.00	1.00	0.00
Uniform Delay (d), s/veh	24.1	0.0	20.7				0.0	0.0	20.6	26.0	5.6	0.0
Incr Delay (d2), s/veh	2.3	0.0	0.2				0.0	0.0	2.8	1.0	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
%ile BackOfQ(50%),veh/ln	5.0	0.0	0.0				0.0	0.0	6.6	4.2	0.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.4	0.0	20.9				0.0	0.0	23.4	27.0	5.6	0.0
LnGrp LOS	C	A	C				A	A	C	C	A	A
Approach Vol, veh/h		446						518			772	
Approach Delay, s/veh		25.1						23.4			22.8	
Approach LOS		C						C			C	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		44.6		20.5	16.9	27.7						
Change Period (Y+Rc), s		5.5		5.5	5.5	5.5						
Max Green Setting (Gmax), s		77.5		31.5	25.5	46.5						
Max Q Clear Time (g_c+I1), s		3.8		14.5	11.3	21.7						
Green Ext Time (p_c), s		0.1		0.5	0.2	0.5						
Intersection Summary												
HCM 6th Ctrl Delay			23.6									
HCM 6th LOS			C									

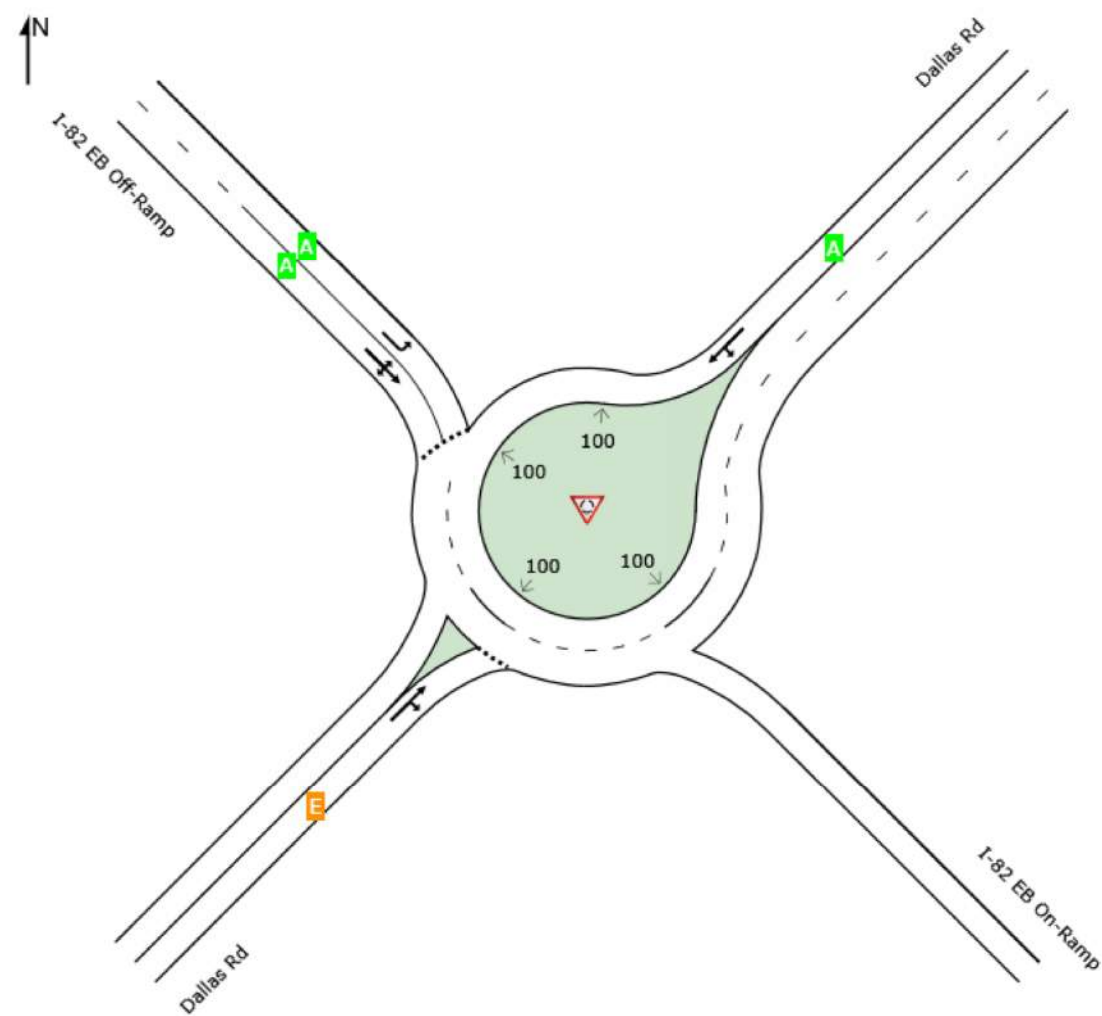
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [Dallas Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Northeast	Northwest	Southwest	
LOS	A	A	E	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 1 [Dallas Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] ft				mph
NorthEast: Dallas Rd														
1x	L2	571	3.0	621	3.0	0.576	9.2	LOS A	0.0	0.0	0.00	0.00	0.00	35.5
6x	T1	139	3.0	151	3.0	0.576	9.2	LOS A	0.0	0.0	0.00	0.00	0.00	35.5
Approach		710	3.0	772	3.0	0.576	9.2	LOS A	0.0	0.0	0.00	0.00	0.00	35.5
NorthWest: I-82 EB Off-Ramp														
7x	L2	315	3.0	342	3.0	0.334	9.7	LOS A	1.4	36.8	0.66	0.69	0.74	30.8
4x	T1	1	3.0	1	3.0	0.334	9.7	LOS A	1.4	36.8	0.66	0.69	0.74	31.4
14x	R2	95	3.0	103	3.0	0.334	9.7	LOS A	1.4	36.8	0.66	0.69	0.74	30.5
Approach		411	3.0	447	3.0	0.334	9.7	LOS A	1.4	36.8	0.66	0.69	0.74	30.7
SouthWest: Dallas Rd														
2x	T1	376	3.0	409	3.0	0.873	38.4	LOS E	10.6	272.4	0.91	1.47	2.78	23.2
12x	R2	100	3.0	109	3.0	0.873	38.4	LOS E	10.6	272.4	0.91	1.47	2.78	22.7
Approach		476	3.0	517	3.0	0.873	38.4	LOS E	10.6	272.4	0.91	1.47	2.78	23.1
All Vehicles		1597	3.0	1736	3.0	0.873	18.0	LOS C	10.6	272.4	0.44	0.62	1.02	29.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

2: Dallas Rd & I-82 WB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	38	1	318	265	418	0	0	674	630
Future Volume (vph)	0	0	0	38	1	318	265	418	0	0	674	630
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-5%			0%			0%	
Storage Length (ft)	0		0	0		200	100		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		233			450			305			1186	
Travel Time (s)		5.3			10.2			4.2			16.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8						2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	9.5	20.0			20.0	20.0
Total Split (s)				22.0	22.0	22.0	32.0	98.0			66.0	66.0
Total Split (%)				18.3%	18.3%	18.3%	26.7%	81.7%			55.0%	55.0%
Yellow Time (s)				5.0	5.0	5.0	5.0	5.0			5.0	5.0
All-Red Time (s)				0.5	0.5	0.5	0.5	0.5			0.5	0.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.5	5.5	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?												
Recall Mode				None	None	None	None	Min			Min	Min

Intersection Summary

Area Type: Other

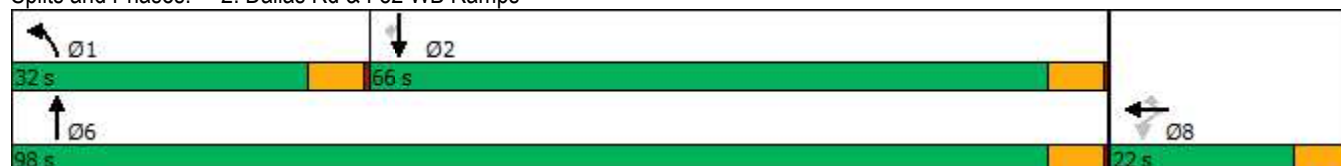
Cycle Length: 120

Actuated Cycle Length: 78.1

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Splits and Phases: 2: Dallas Rd & I-82 WB Ramps



HCM 6th Signalized Intersection Summary

2: Dallas Rd & I-82 WB Ramps

05/12/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↱
Traffic Volume (veh/h)	0	0	0	38	1	318	265	418	0	0	674	630
Future Volume (veh/h)	0	0	0	38	1	318	265	418	0	0	674	630
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				2052	2052	2052	1856	1856	0	0	1856	1856
Adj Flow Rate, veh/h				41	1	0	288	454	0	0	733	685
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				3	3	3	3	3	0	0	3	3
Cap, veh/h				66	2		341	1410	0	0	862	730
Arrive On Green				0.03	0.03	0.00	0.19	0.76	0.00	0.00	0.46	0.46
Sat Flow, veh/h				1910	47	1739	1767	1856	0	0	1856	1572
Grp Volume(v), veh/h				42	0	0	288	454	0	0	733	685
Grp Sat Flow(s),veh/h/ln				1956	0	1739	1767	1856	0	0	1856	1572
Q Serve(g_s), s				1.1	0.0	0.0	8.4	4.2	0.0	0.0	18.7	22.2
Cycle Q Clear(g_c), s				1.1	0.0	0.0	8.4	4.2	0.0	0.0	18.7	22.2
Prop In Lane				0.98		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				68	0		341	1410	0	0	862	730
V/C Ratio(X)				0.62	0.00		0.84	0.32	0.00	0.00	0.85	0.94
Avail Cap(c_a), veh/h				602	0		874	3202	0	0	2094	1775
HCM Platoon Ratio				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	0.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				25.5	0.0	0.0	20.9	2.0	0.0	0.0	12.7	13.6
Incr Delay (d2), s/veh				3.4	0.0	0.0	2.2	0.0	0.0	0.0	0.9	2.7
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.6	0.0	0.0	3.0	0.0	0.0	0.0	5.3	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				28.9	0.0	0.0	23.1	2.1	0.0	0.0	13.6	16.3
LnGrp LOS				C	A		C	A	A	A	B	B
Approach Vol, veh/h					42	A		742			1418	
Approach Delay, s/veh					28.9			10.2			14.9	
Approach LOS					C			B			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	15.8	30.4				46.2		7.4				
Change Period (Y+Rc), s	5.5	5.5				5.5		5.5				
Max Green Setting (Gmax), s	26.5	60.5				92.5		16.5				
Max Q Clear Time (g_c+I1), s	10.4	24.2				6.2		3.1				
Green Ext Time (p_c), s	0.1	0.7				0.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				13.6								
HCM 6th LOS				B								
Notes												
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.												

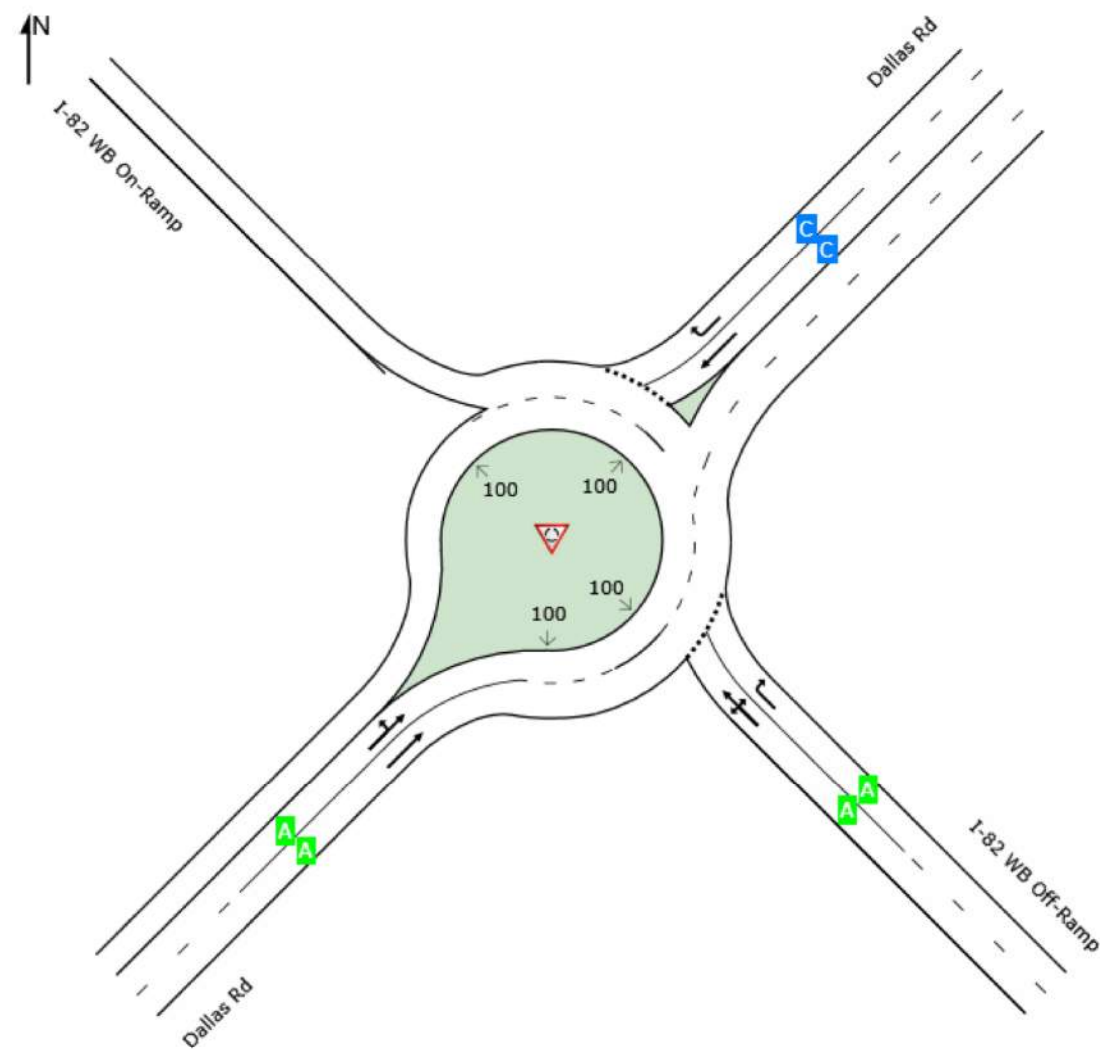
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 2 [Dallas Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Southwest	
LOS	A	C	A	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 2 [Dallas Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
SouthEast: I-82 WB Off-Ramp														
3x	L2	38	3.0	41	3.0	0.284	9.2	LOS A	1.1	27.9	0.63	0.63	0.63	32.4
8x	T1	1	3.0	1	3.0	0.284	9.2	LOS A	1.1	27.9	0.63	0.63	0.63	32.3
18x	R2	318	3.0	346	3.0	0.284	8.7	LOS A	1.1	27.9	0.62	0.62	0.62	31.9
Approach		357	3.0	388	3.0	0.284	8.7	LOS A	1.1	27.9	0.62	0.62	0.62	31.9
NorthEast: Dallas Rd														
6x	T1	674	3.0	733	3.0	0.710	15.1	LOS C	10.5	268.2	0.75	0.94	1.36	30.5
16x	R2	630	3.0	685	3.0	0.715	16.1	LOS C	10.6	270.5	0.77	0.99	1.43	29.0
Approach		1304	3.0	1417	3.0	0.715	15.6	LOS C	10.6	270.5	0.76	0.96	1.39	29.7
SouthWest: Dallas Rd														
5x	L2	265	3.0	288	3.0	0.269	4.9	LOS A	0.0	0.0	0.00	0.00	0.00	35.6
2x	T1	418	3.0	454	3.0	0.269	4.9	LOS A	0.0	0.0	0.00	0.00	0.00	37.7
Approach		683	3.0	742	3.0	0.269	4.9	LOS A	0.0	0.0	0.00	0.00	0.00	36.9
All Vehicles		2344	3.0	2548	3.0	0.715	11.4	LOS B	10.6	270.5	0.52	0.63	0.87	31.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

4: Dallas Rd & Ava Way

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	12	33	67	18	115	72	380	72	70	301	34
Future Volume (vph)	43	12	33	67	18	115	72	380	72	70	301	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			50			50	
Link Distance (ft)		233			2528			1047			11825	
Travel Time (s)		6.4			68.9			14.3			161.3	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	20.5		9.5	20.5		9.5	20.5		9.5	20.5	
Total Split (s)	13.0	23.0		14.0	24.0		13.0	69.0		14.0	70.0	
Total Split (%)	10.8%	19.2%		11.7%	20.0%		10.8%	57.5%		11.7%	58.3%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	Min		None	Min	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 54.3

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dallas Rd & Ava Way

 Ø1	 Ø2	 Ø3	 Ø4
13 s	70 s	14 s	23 s
 Ø5	 Ø6	 Ø7	 Ø8
14 s	69 s	13 s	24 s

HCM 6th Signalized Intersection Summary

4: Dallas Rd & Ava Way

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	12	33	67	18	115	72	380	72	70	301	34
Future Volume (veh/h)	43	12	33	67	18	115	72	380	72	70	301	34
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	0.98		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	47	13	36	73	20	125	78	413	78	76	327	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	284	55	151	374	31	192	382	470	89	290	506	57
Arrive On Green	0.04	0.13	0.13	0.05	0.14	0.14	0.05	0.31	0.31	0.05	0.31	0.31
Sat Flow, veh/h	1767	428	1186	1767	218	1363	1767	1515	286	1767	1635	185
Grp Volume(v), veh/h	47	0	49	73	0	145	78	0	491	76	0	364
Grp Sat Flow(s),veh/h/ln	1767	0	1614	1767	0	1581	1767	0	1801	1767	0	1820
Q Serve(g_s), s	1.1	0.0	1.3	1.7	0.0	4.2	1.4	0.0	12.4	1.4	0.0	8.3
Cycle Q Clear(g_c), s	1.1	0.0	1.3	1.7	0.0	4.2	1.4	0.0	12.4	1.4	0.0	8.3
Prop In Lane	1.00		0.73	1.00		0.86	1.00		0.16	1.00		0.10
Lane Grp Cap(c), veh/h	284	0	206	374	0	222	382	0	559	290	0	563
V/C Ratio(X)	0.17	0.00	0.24	0.20	0.00	0.65	0.20	0.00	0.88	0.26	0.00	0.65
Avail Cap(c_a), veh/h	491	0	587	595	0	608	563	0	2378	508	0	2441
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.3	0.0	18.9	16.9	0.0	19.6	11.0	0.0	15.7	12.0	0.0	14.3
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.1	0.0	1.2	0.1	0.0	1.8	0.2	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.5	0.6	0.0	1.5	0.4	0.0	3.9	0.4	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.4	0.0	19.1	17.0	0.0	20.8	11.1	0.0	17.5	12.1	0.0	14.8
LnGrp LOS	B	A	B	B	A	C	B	A	B	B	A	B
Approach Vol, veh/h	96			218			569			440		
Approach Delay, s/veh	18.3			19.5			16.7			14.3		
Approach LOS	B			B			B			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.1	20.4	8.0	11.6	8.1	20.4	7.4	12.3				
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5				
Max Green Setting (Gmax), s	7.5	64.5	8.5	17.5	8.5	63.5	7.5	18.5				
Max Q Clear Time (g_c+I1), s	3.4	10.3	3.7	3.3	3.4	14.4	3.1	6.2				
Green Ext Time (p_c), s	0.0	0.3	0.0	0.0	0.0	0.5	0.0	0.2				
Intersection Summary												
HCM 6th Ctrl Delay	16.5											
HCM 6th LOS	B											

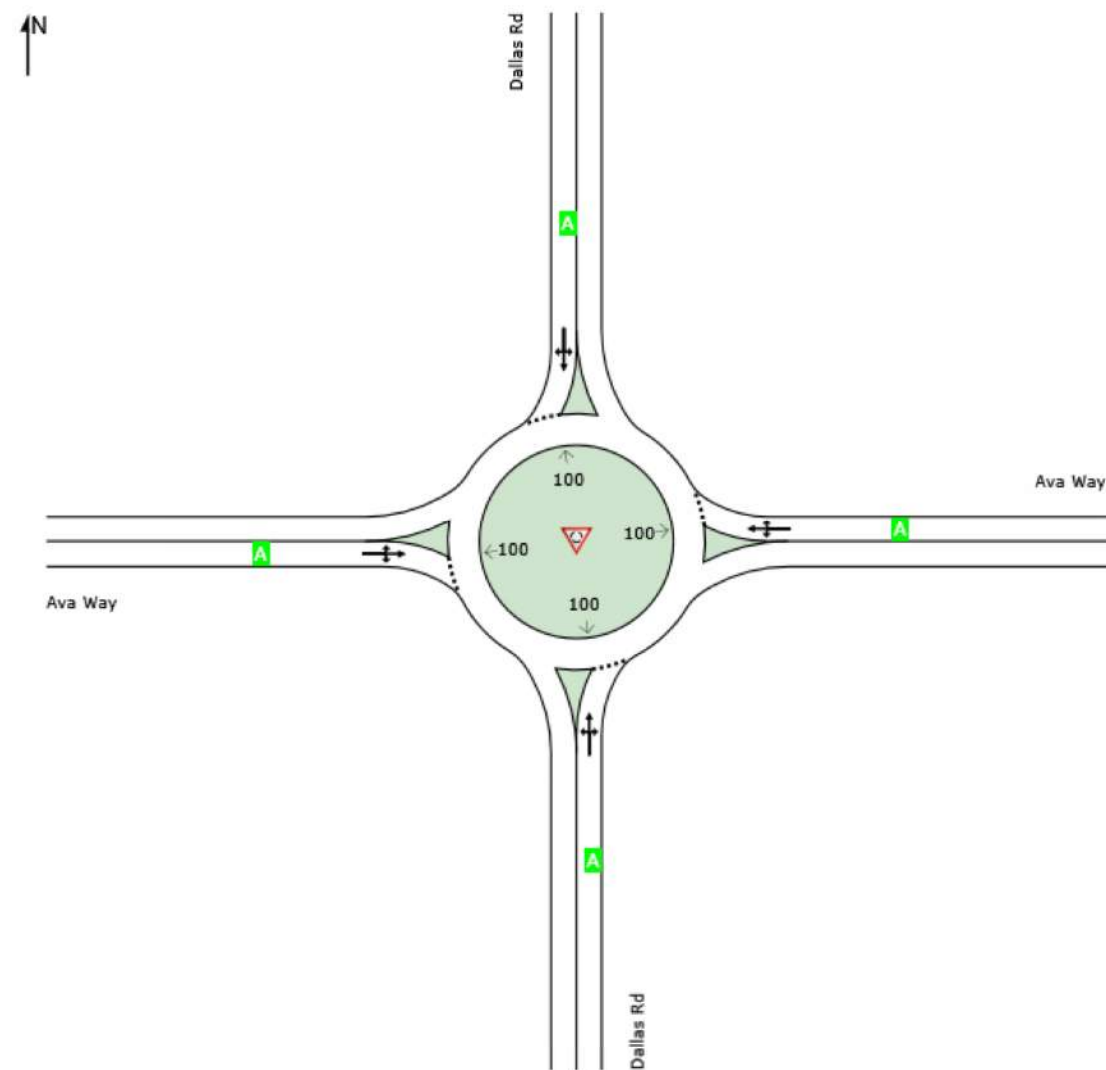
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 4 [Dallas Rd / Ava Way (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 4 [Dallas Rd / Ava Way (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Dallas Rd														
3	L2	72	3.0	78	3.0	0.491	8.5	LOS A	3.3	85.3	0.45	0.28	0.45	33.1
8	T1	380	3.0	413	3.0	0.491	8.5	LOS A	3.3	85.3	0.45	0.28	0.45	33.0
18	R2	72	3.0	78	3.0	0.491	8.5	LOS A	3.3	85.3	0.45	0.28	0.45	32.1
Approach		524	3.0	570	3.0	0.491	8.5	LOS A	3.3	85.3	0.45	0.28	0.45	32.9
East: Ava Way														
1	L2	67	3.0	73	3.0	0.286	8.0	LOS A	1.3	32.4	0.62	0.61	0.62	32.7
6	T1	18	3.0	20	3.0	0.286	8.0	LOS A	1.3	32.4	0.62	0.61	0.62	32.7
16	R2	115	3.0	125	3.0	0.286	8.0	LOS A	1.3	32.4	0.62	0.61	0.62	31.8
Approach		200	3.0	217	3.0	0.286	8.0	LOS A	1.3	32.4	0.62	0.61	0.62	32.2
North: Dallas Rd														
7	L2	70	3.0	76	3.0	0.393	7.3	LOS A	2.3	58.6	0.44	0.29	0.44	33.6
4	T1	301	3.0	327	3.0	0.393	7.3	LOS A	2.3	58.6	0.44	0.29	0.44	33.6
14	R2	34	3.0	37	3.0	0.393	7.3	LOS A	2.3	58.6	0.44	0.29	0.44	32.6
Approach		405	3.0	440	3.0	0.393	7.3	LOS A	2.3	58.6	0.44	0.29	0.44	33.5
West: Ava Way														
5	L2	43	3.0	47	3.0	0.118	5.6	LOS A	0.5	12.2	0.53	0.46	0.53	33.5
2	T1	12	3.0	13	3.0	0.118	5.6	LOS A	0.5	12.2	0.53	0.46	0.53	33.5
12	R2	33	3.0	36	3.0	0.118	5.6	LOS A	0.5	12.2	0.53	0.46	0.53	32.5
Approach		88	3.0	96	3.0	0.118	5.6	LOS A	0.5	12.2	0.53	0.46	0.53	33.1
All Vehicles		1217	3.0	1323	3.0	0.491	7.8	LOS A	3.3	85.3	0.48	0.35	0.48	33.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	122	24	93	71	28	25	190	251	31	192	28
Future Volume (vph)	20	122	24	93	71	28	25	190	251	31	192	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		896			1478			569			1455	
Travel Time (s)		15.3			25.2			11.1			28.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	20.5		9.5	20.5		20.5	20.5		20.5	20.5	
Total Split (s)	9.6	20.6		9.8	20.8		29.6	29.6		29.6	29.6	
Total Split (%)	16.0%	34.3%		16.3%	34.7%		49.3%	49.3%		49.3%	49.3%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 37.4

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Splits and Phases: 6: Dallas Rd/Bombing Range Rd & Kennedy Rd

 Ø2	 Ø3	 Ø4
29.6 s	9.8 s	20.6 s
 Ø6	 Ø7	 Ø8
29.6 s	9.6 s	20.8 s

HCM 6th Signalized Intersection Summary

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	122	24	93	71	28	25	190	251	31	192	28
Future Volume (veh/h)	20	122	24	93	71	28	25	190	251	31	192	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	21	126	25	96	73	29	26	196	259	32	198	29
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	401	195	39	384	224	89	483	247	326	290	538	79
Arrive On Green	0.02	0.13	0.13	0.07	0.18	0.18	0.34	0.34	0.34	0.34	0.34	0.34
Sat Flow, veh/h	1767	1504	298	1767	1263	502	1145	725	958	929	1582	232
Grp Volume(v), veh/h	21	0	151	96	0	102	26	0	455	32	0	227
Grp Sat Flow(s),veh/h/ln	1767	0	1802	1767	0	1765	1145	0	1683	929	0	1814
Q Serve(g_s), s	0.4	0.0	2.8	1.6	0.0	1.8	0.6	0.0	8.7	1.2	0.0	3.4
Cycle Q Clear(g_c), s	0.4	0.0	2.8	1.6	0.0	1.8	4.0	0.0	8.7	9.9	0.0	3.4
Prop In Lane	1.00		0.17	1.00		0.28	1.00		0.57	1.00		0.13
Lane Grp Cap(c), veh/h	401	0	233	384	0	313	483	0	572	290	0	617
V/C Ratio(X)	0.05	0.00	0.65	0.25	0.00	0.33	0.05	0.00	0.80	0.11	0.00	0.37
Avail Cap(c_a), veh/h	567	0	761	475	0	756	865	0	1135	601	0	1223
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.0	0.0	14.8	12.3	0.0	12.8	10.4	0.0	10.7	15.1	0.0	8.9
Incr Delay (d2), s/veh	0.0	0.0	1.1	0.1	0.0	0.2	0.0	0.0	1.0	0.1	0.0	0.1
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	0.1	0.0	0.9	0.5	0.0	0.5	0.1	0.0	2.3	0.2	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.1	0.0	15.9	12.4	0.0	13.1	10.4	0.0	11.6	15.2	0.0	9.0
LnGrp LOS	B	A	B	B	A	B	B	A	B	B	A	A
Approach Vol, veh/h	172			198			481			259		
Approach Delay, s/veh	15.6			12.7			11.6			9.8		
Approach LOS	B			B			B			A		
Timer - Assigned Phs	2		3	4	6		7	8				
Phs Duration (G+Y+Rc), s	17.7		8.0	10.1	17.7		6.3	11.8				
Change Period (Y+Rc), s	5.5		5.5	5.5	5.5		5.5	5.5				
Max Green Setting (Gmax), s	24.1		4.3	15.1	24.1		4.1	15.3				
Max Q Clear Time (g_c+I1), s	11.9		3.6	4.8	10.7		2.4	3.8				
Green Ext Time (p_c), s	0.3		0.0	0.1	0.6		0.0	0.1				
Intersection Summary												
HCM 6th Ctrl Delay	12.0											
HCM 6th LOS	B											

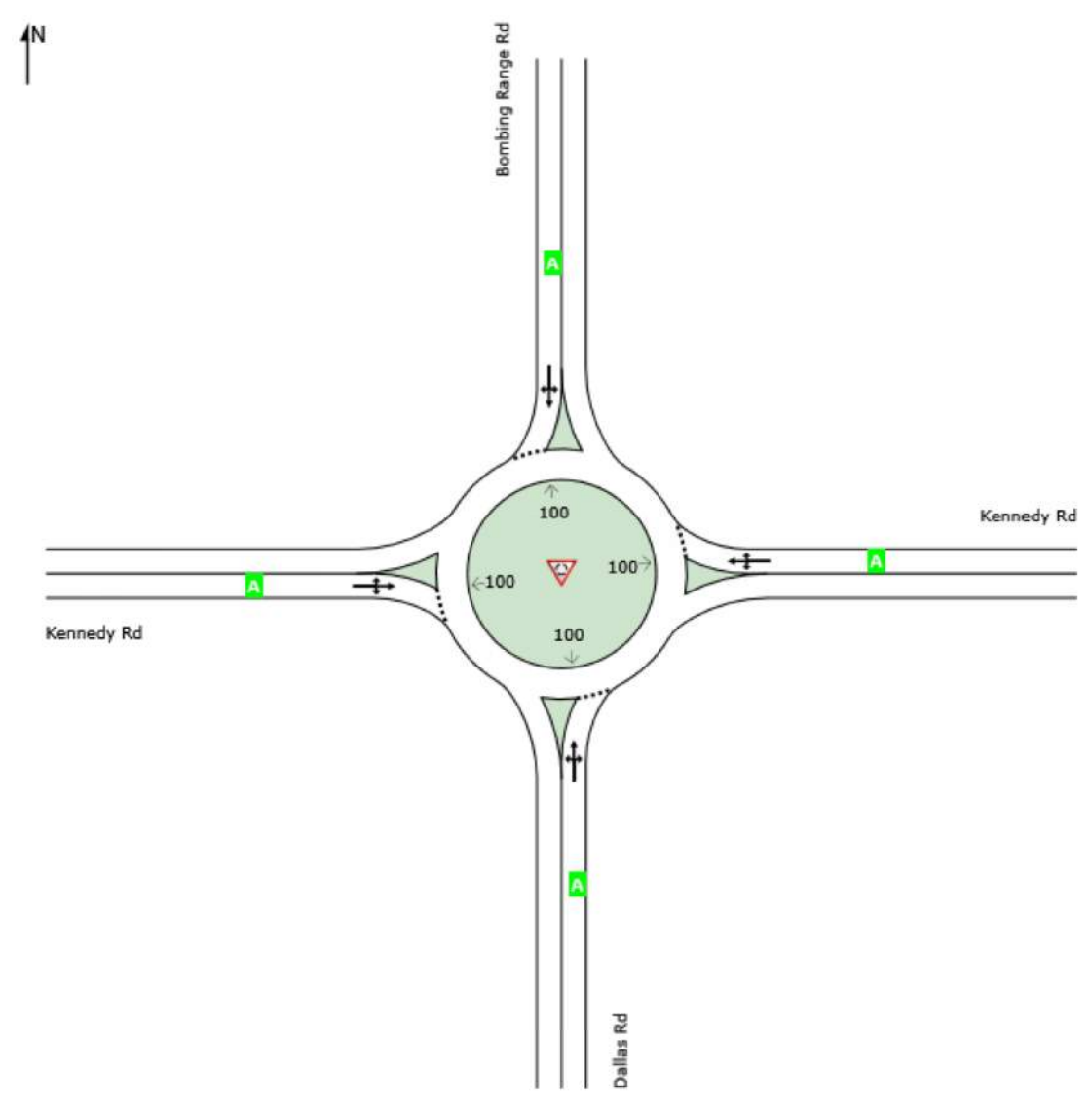
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 6 [Dallas Rd / Bombing Range Rd / Kennedy Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 6 [Dallas Rd / Bombing Range Rd / Kennedy Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Dallas Rd														
3	L2	25	3.0	26	3.0	0.433	7.9	LOS A	2.6	67.3	0.47	0.32	0.47	33.6
8	T1	190	3.0	196	3.0	0.433	7.9	LOS A	2.6	67.3	0.47	0.32	0.47	33.5
18	R2	251	3.0	259	3.0	0.433	7.9	LOS A	2.6	67.3	0.47	0.32	0.47	32.6
Approach		466	3.0	480	3.0	0.433	7.9	LOS A	2.6	67.3	0.47	0.32	0.47	33.0
East: Kennedy Rd														
1	L2	93	3.0	96	3.0	0.191	5.2	LOS A	0.9	22.3	0.42	0.30	0.42	33.7
6	T1	71	3.0	73	3.0	0.191	5.2	LOS A	0.9	22.3	0.42	0.30	0.42	33.7
16	R2	28	3.0	29	3.0	0.191	5.2	LOS A	0.9	22.3	0.42	0.30	0.42	32.7
Approach		192	3.0	198	3.0	0.191	5.2	LOS A	0.9	22.3	0.42	0.30	0.42	33.6
North: Bombing Range Rd														
7	L2	31	3.0	32	3.0	0.237	5.5	LOS A	1.2	29.5	0.40	0.26	0.40	34.7
4	T1	192	3.0	198	3.0	0.237	5.5	LOS A	1.2	29.5	0.40	0.26	0.40	34.6
14	R2	28	3.0	29	3.0	0.237	5.5	LOS A	1.2	29.5	0.40	0.26	0.40	33.6
Approach		251	3.0	259	3.0	0.237	5.5	LOS A	1.2	29.5	0.40	0.26	0.40	34.5
West: Kennedy Rd														
5	L2	20	3.0	21	3.0	0.180	5.5	LOS A	0.8	20.3	0.48	0.37	0.48	34.7
2	T1	122	3.0	126	3.0	0.180	5.5	LOS A	0.8	20.3	0.48	0.37	0.48	34.6
12	R2	24	3.0	25	3.0	0.180	5.5	LOS A	0.8	20.3	0.48	0.37	0.48	33.6
Approach		166	3.0	171	3.0	0.180	5.5	LOS A	0.8	20.3	0.48	0.37	0.48	34.5
All Vehicles		1075	3.0	1108	3.0	0.433	6.5	LOS A	2.6	67.3	0.44	0.31	0.44	33.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings

9: Kennedy Rd & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	838	15	582	911	44	9	220	486	19	300	324
Future Volume (vph)	143	838	15	582	911	44	9	220	486	19	300	324
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	260		0	375		0	160		0	0		330
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			40			40	
Link Distance (ft)		3222			2930			1363			832	
Travel Time (s)		48.8			44.4			23.2			14.2	
Confl. Peds. (#/hr)			1			10	1		7	7		1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	7	4		3	8			6	3		2	7
Permitted Phases							6		6	2		2
Detector Phase	7	4		3	8		6	6	3	2	2	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	9.0
Total Split (s)	22.0	40.0		50.0	68.0		30.0	30.0	50.0	30.0	30.0	22.0
Total Split (%)	18.3%	33.3%		41.7%	56.7%		25.0%	25.0%	41.7%	25.0%	25.0%	18.3%
Yellow Time (s)	5.0	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	5.0
All-Red Time (s)	0.0	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.0
Lost Time Adjust (s)	-1.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			Lead
Lead-Lag Optimize?		Yes		Yes	Yes				Yes			
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

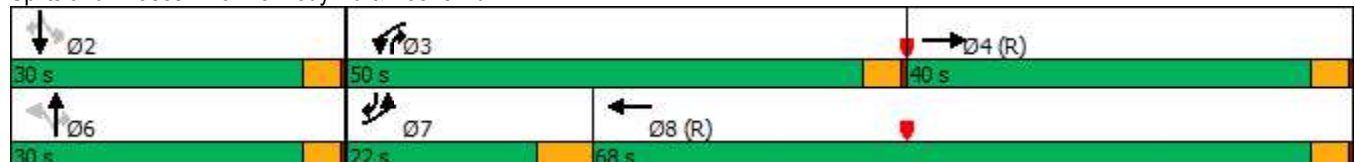
Actuated Cycle Length: 120

Offset: 2 (2%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Splits and Phases: 9: Kennedy Rd & Keene Rd



HCM 6th Signalized Intersection Summary

9: Kennedy Rd & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 				 			 
Traffic Volume (veh/h)	143	838	15	582	911	44	9	220	486	19	300	324
Future Volume (veh/h)	143	838	15	582	911	44	9	220	486	19	300	324
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	144	846	15	588	920	44	9	222	491	19	303	327
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	184	1212	21	603	1984	95	31	246	874	32	182	488
Arrive On Green	0.10	0.34	0.34	0.68	1.00	1.00	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1767	3544	63	1767	3423	164	0	1136	1557	0	840	1557
Grp Volume(v), veh/h	144	421	440	588	474	490	231	0	491	322	0	327
Grp Sat Flow(s),veh/h/ln	1767	1763	1844	1767	1763	1824	1136	0	1557	840	0	1557
Q Serve(g_s), s	9.5	24.8	24.8	37.8	0.0	0.0	0.0	0.0	24.4	0.0	0.0	21.9
Cycle Q Clear(g_c), s	9.5	24.8	24.8	37.8	0.0	0.0	26.0	0.0	24.4	26.0	0.0	21.9
Prop In Lane	1.00		0.03	1.00		0.09	0.04		1.00	0.06		1.00
Lane Grp Cap(c), veh/h	184	603	630	603	1021	1057	277	0	874	214	0	488
V/C Ratio(X)	0.78	0.70	0.70	0.97	0.46	0.46	0.83	0.00	0.56	1.51	0.00	0.67
Avail Cap(c_a), veh/h	265	603	630	677	1021	1057	277	0	874	214	0	488
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	0.79	0.57	0.57	0.57	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.5	34.1	34.1	18.5	0.0	0.0	42.5	0.0	17.1	42.9	0.0	35.9
Incr Delay (d2), s/veh	4.3	5.3	5.0	19.2	0.9	0.8	19.0	0.0	0.8	250.7	0.0	3.5
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	4.3	11.0	11.5	9.4	0.2	0.2	7.5	0.0	8.2	20.4	0.0	8.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.8	39.4	39.2	37.8	0.9	0.8	61.5	0.0	17.9	293.5	0.0	39.5
LnGrp LOS	E	D	D	D	A	A	E	A	B	F	A	D
Approach Vol, veh/h	1005			1552			722			649		
Approach Delay, s/veh	41.8			14.8			31.9			165.5		
Approach LOS	D			B			C			F		
Timer - Assigned Phs	2		3	4		6	7	8				
Phs Duration (G+Y+Rc), s	30.0		45.0	45.0		30.0	16.5	73.5				
Change Period (Y+Rc), s	4.0		4.0	4.0		4.0	5.0	4.0				
Max Green Setting (Gmax), s	26.0		46.0	36.0		26.0	17.0	64.0				
Max Q Clear Time (g_c+I1), s	28.0		39.8	26.8		28.0	11.5	2.0				
Green Ext Time (p_c), s	0.0		1.1	3.3		0.0	0.0	6.7				
Intersection Summary												
HCM 6th Ctrl Delay	49.8											
HCM 6th LOS	D											

Lanes, Volumes, Timings

18: Leslie Rd & Reata Rd

05/12/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	206	517	375	300	394	123
Future Volume (vph)	206	517	375	300	394	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	0			285
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	40			40	40	
Link Distance (ft)	5360			1600	7773	
Travel Time (s)	91.4			27.3	132.5	
Confl. Peds. (#/hr)		1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	1	1	6	2	4
Permitted Phases		4	6			2
Detector Phase	4	1	1	6	2	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.5	9.5	9.5	20.5	20.5	20.5
Total Split (s)	20.5	19.0	19.0	44.5	25.5	20.5
Total Split (%)	31.5%	29.2%	29.2%	68.5%	39.2%	31.5%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?						
Recall Mode	None	None	None	Min	Min	None

Intersection Summary

Area Type: Other

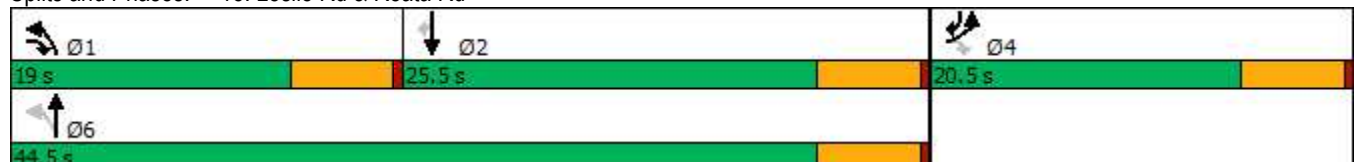
Cycle Length: 65

Actuated Cycle Length: 52.2

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Splits and Phases: 18: Leslie Rd & Reata Rd



HCM 6th Signalized Intersection Summary

18: Leslie Rd & Reata Rd

05/12/2021



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	206	517	375	300	394	123
Future Volume (veh/h)	206	517	375	300	394	123
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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	224	562	408	326	428	134
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	462	709	495	1015	486	823
Arrive On Green	0.26	0.26	0.19	0.55	0.26	0.26
Sat Flow, veh/h	1767	1572	1767	1856	1856	1572
Grp Volume(v), veh/h	224	562	408	326	428	134
Grp Sat Flow(s),veh/h/ln	1767	1572	1767	1856	1856	1572
Q Serve(g_s), s	6.2	15.0	8.9	5.5	12.7	2.6
Cycle Q Clear(g_c), s	6.2	15.0	8.9	5.5	12.7	2.6
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	462	709	495	1015	486	823
V/C Ratio(X)	0.49	0.79	0.83	0.32	0.88	0.16
Avail Cap(c_a), veh/h	462	709	575	1260	646	958
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	13.5	12.3	7.1	20.3	7.1
Incr Delay (d2), s/veh	0.3	5.7	7.3	0.1	8.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	1.1	3.6	1.5	5.9	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.2	19.1	19.6	7.2	29.2	7.2
LnGrp LOS	B	B	B	A	C	A
Approach Vol, veh/h	786			734	562	
Approach Delay, s/veh	18.9			14.1	24.0	
Approach LOS	B			B	C	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	16.4	20.5		20.5		36.9
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	13.5	20.0		15.0		39.0
Max Q Clear Time (g_c+I1), s	10.9	14.7		17.0		7.5
Green Ext Time (p_c), s	0.0	0.3		0.0		0.4
Intersection Summary						
HCM 6th Ctrl Delay			18.6			
HCM 6th LOS			B			

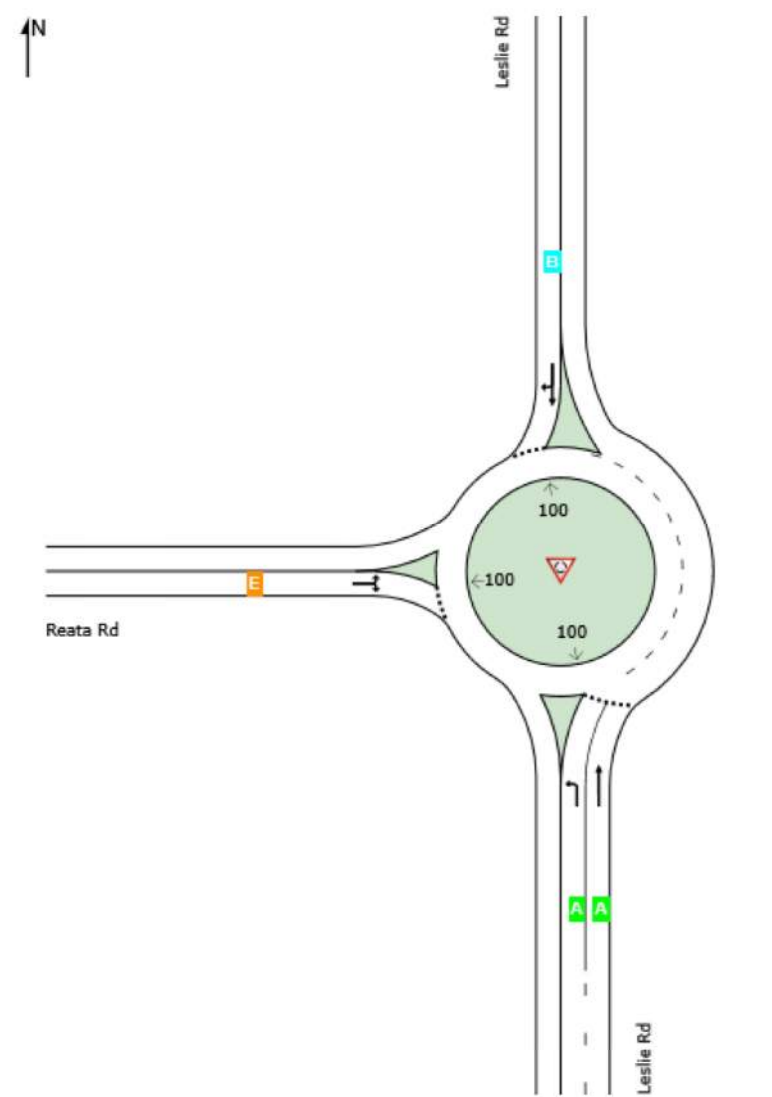
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 18 [Leslie Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	North	West	
LOS	A	B	E	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 18 [Leslie Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Leslie Rd														
3	L2	375	3.0	408	3.0	0.367	6.9	LOS A	1.9	47.8	0.44	0.32	0.44	31.7
8	T1	300	3.0	326	3.0	0.293	6.0	LOS A	1.4	35.4	0.41	0.29	0.41	34.7
Approach		675	3.0	734	3.0	0.367	6.5	LOS A	1.9	47.8	0.43	0.31	0.43	32.9
North: Leslie Rd														
4	T1	394	3.0	428	3.0	0.644	14.5	LOS B	7.1	182.4	0.78	0.96	1.30	30.7
14	R2	123	3.0	134	3.0	0.644	14.5	LOS B	7.1	182.4	0.78	0.96	1.30	29.9
Approach		517	3.0	562	3.0	0.644	14.5	LOS B	7.1	182.4	0.78	0.96	1.30	30.5
West: Reata Rd														
5	L2	206	3.0	224	3.0	0.921	36.4	LOS E	25.7	657.7	1.00	1.80	3.04	23.2
12	R2	517	3.0	562	3.0	0.921	36.4	LOS E	25.7	657.7	1.00	1.80	3.04	22.7
Approach		723	3.0	786	3.0	0.921	36.4	LOS E	25.7	657.7	1.00	1.80	3.04	22.9
All Vehicles		1915	3.0	2082	3.0	0.921	20.0	LOS C	25.7	657.7	0.74	1.05	1.65	27.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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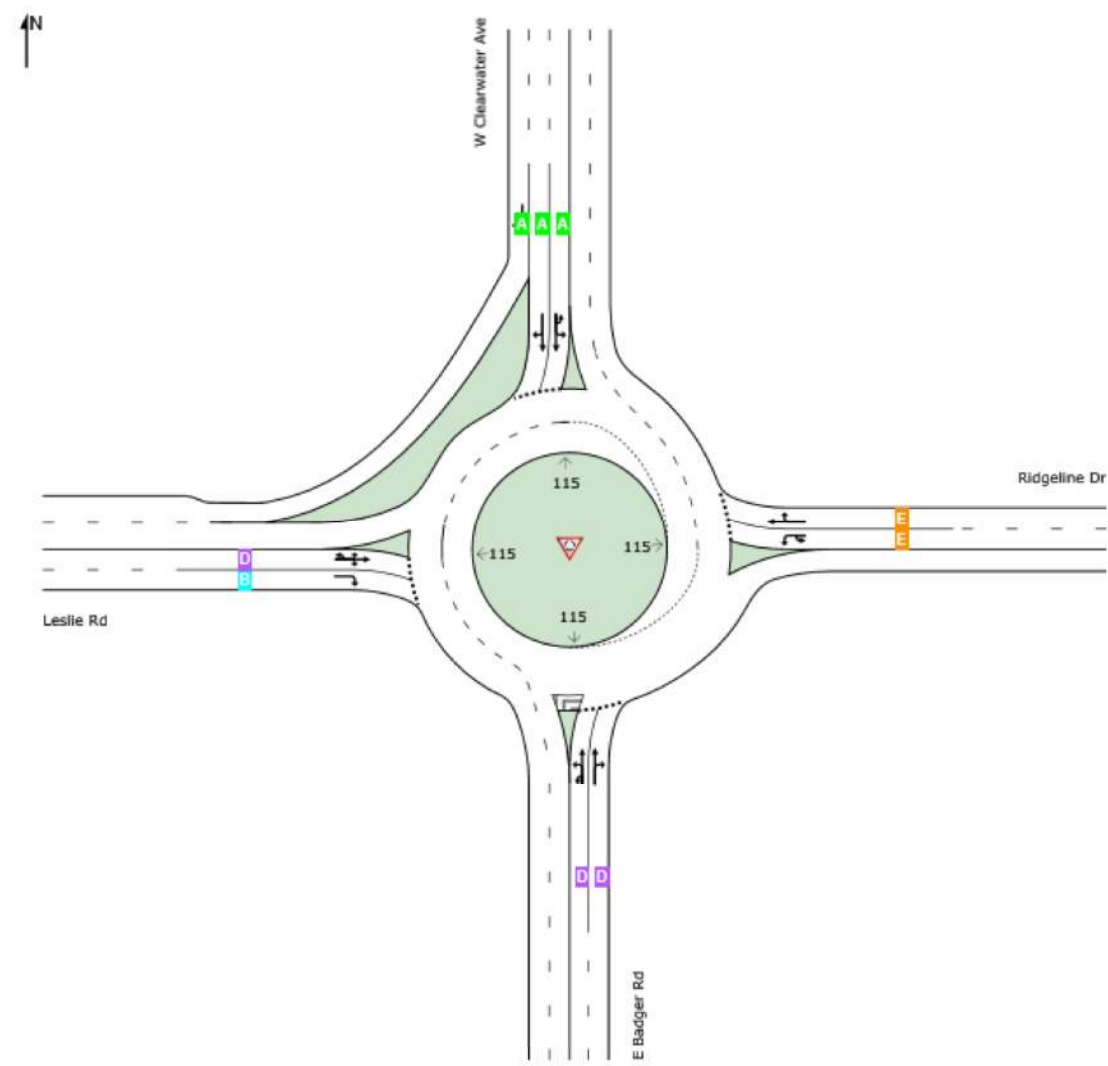
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	E	A	C	D



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] ft				mph
South: E Badger Rd														
3u	U	8	3.0	9	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.6
3	L2	257	3.0	289	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.2
8	T1	751	3.0	844	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.5
18	R2	93	3.0	104	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.1
Approach		1109	3.0	1246	3.0	0.872	33.6	LOS D	13.9	355.9	0.96	1.56	2.75	24.4
East: Ridgeline Dr														
1u	U	1	3.0	1	3.0	0.699	42.4	LOS E	3.4	87.8	0.92	1.15	1.85	22.0
1	L2	169	3.0	190	3.0	0.699	42.4	LOS E	3.4	87.8	0.92	1.15	1.85	21.6
6	T1	123	3.0	138	3.0	0.753	42.1	LOS E	4.2	107.5	0.92	1.21	2.05	22.4
16	R2	94	3.0	106	3.0	0.753	42.1	LOS E	4.2	107.5	0.92	1.21	2.05	22.0
Approach		387	3.0	435	3.0	0.753	42.3	LOS E	4.2	107.5	0.92	1.19	1.96	21.9
North: W Clearwater Ave														
7u	U	5	3.0	6	3.0	0.298	8.6	LOS A	1.2	30.4	0.61	0.61	0.61	34.3
7	L2	30	3.0	34	3.0	0.298	8.6	LOS A	1.2	30.4	0.61	0.61	0.61	33.3
4	T1	367	3.0	412	3.0	0.298	8.2	LOS A	1.2	30.4	0.60	0.60	0.60	33.6
14	R2	254	3.0	285	3.0	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	37.2
Approach		656	3.0	737	3.0	0.298	5.1	LOS A	1.2	30.4	0.37	0.37	0.37	34.9
West: Leslie Rd														
5u	U	1	3.0	1	3.0	0.848	28.8	LOS D	13.2	339.0	0.93	1.47	2.52	25.5
5	L2	451	3.0	507	3.0	0.848	28.8	LOS D	13.2	339.0	0.93	1.47	2.52	25.1
2	T1	136	3.0	153	3.0	0.848	28.8	LOS D	13.2	339.0	0.93	1.47	2.52	24.9
12	R2	354	3.0	398	3.0	0.563	14.3	LOS B	3.9	100.4	0.74	0.90	1.21	30.0
Approach		942	3.0	1058	3.0	0.848	23.4	LOS C	13.2	339.0	0.86	1.26	2.03	26.6
All Vehicles		3094	3.0	3476	3.0	0.872	25.5	LOS D	13.9	355.9	0.80	1.17	1.93	26.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings

20: E Badger Rd & I-82 WB Ramps

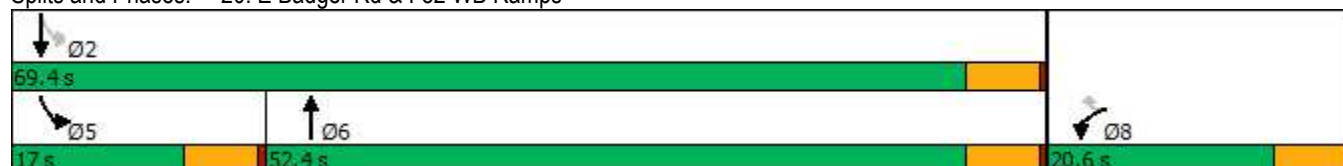
05/12/2021

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖		↖	↑↑
Traffic Volume (vph)	50	261	862	25	256	649
Future Volume (vph)	50	261	862	25	256	649
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%		-3%			3%
Storage Length (ft)	0	100		0	95	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25				25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		50			50
Link Distance (ft)	405		216			508
Travel Time (s)	9.2		2.9			6.9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		6		5	2
Permitted Phases		8			2	
Detector Phase	8	8	6		5	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	20.5	20.5	20.5		9.5	20.5
Total Split (s)	20.6	20.6	52.4		17.0	69.4
Total Split (%)	22.9%	22.9%	58.2%		18.9%	77.1%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5		5.5	5.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Recall Mode	None	None	Min		None	Min

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 79.9
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated

Splits and Phases: 20: E Badger Rd & I-82 WB Ramps



HCM 6th Signalized Intersection Summary 20: E Badger Rd & I-82 WB Ramps

05/12/2021



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	50	261	862	25	256	649
Future Volume (veh/h)	50	261	862	25	256	649
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	1973	1973	1973	1973	1803	1803
Adj Flow Rate, veh/h	54	0	937	27	278	705
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	79		997	29	357	2522
Arrive On Green	0.04	0.00	0.52	0.52	0.10	0.74
Sat Flow, veh/h	1879	1672	1908	55	1717	3515
Grp Volume(v), veh/h	54	0	0	964	278	705
Grp Sat Flow(s),veh/h/ln	1879	1672	0	1963	1717	1712
Q Serve(g_s), s	1.4	0.0	0.0	22.9	3.2	3.4
Cycle Q Clear(g_c), s	1.4	0.0	0.0	22.9	3.2	3.4
Prop In Lane	1.00	1.00		0.03	1.00	
Lane Grp Cap(c), veh/h	79		0	1026	357	2522
V/C Ratio(X)	0.68		0.00	0.94	0.78	0.28
Avail Cap(c_a), veh/h	571		0	1852	577	4401
HCM Platoon Ratio	1.00	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	23.5	0.0	0.0	11.1	11.0	2.2
Incr Delay (d2), s/veh	3.7	0.0	0.0	2.9	1.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	6.2	1.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	27.2	0.0	0.0	14.1	12.4	2.2
LnGrp LOS	C		A	B	B	A
Approach Vol, veh/h	54	A	964			983
Approach Delay, s/veh	27.2		14.1			5.1
Approach LOS	C		B			A
Timer - Assigned Phs	2		5		6	8
Phs Duration (G+Y+Rc), s	42.1		10.6		31.5	7.6
Change Period (Y+Rc), s	5.5		5.5		5.5	5.5
Max Green Setting (Gmax), s	63.9		11.5		46.9	15.1
Max Q Clear Time (g_c+I1), s	5.4		5.2		24.9	3.4
Green Ext Time (p_c), s	0.9		0.0		1.1	0.0

Intersection Summary

HCM 6th Ctrl Delay	10.0
HCM 6th LOS	B

Notes

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

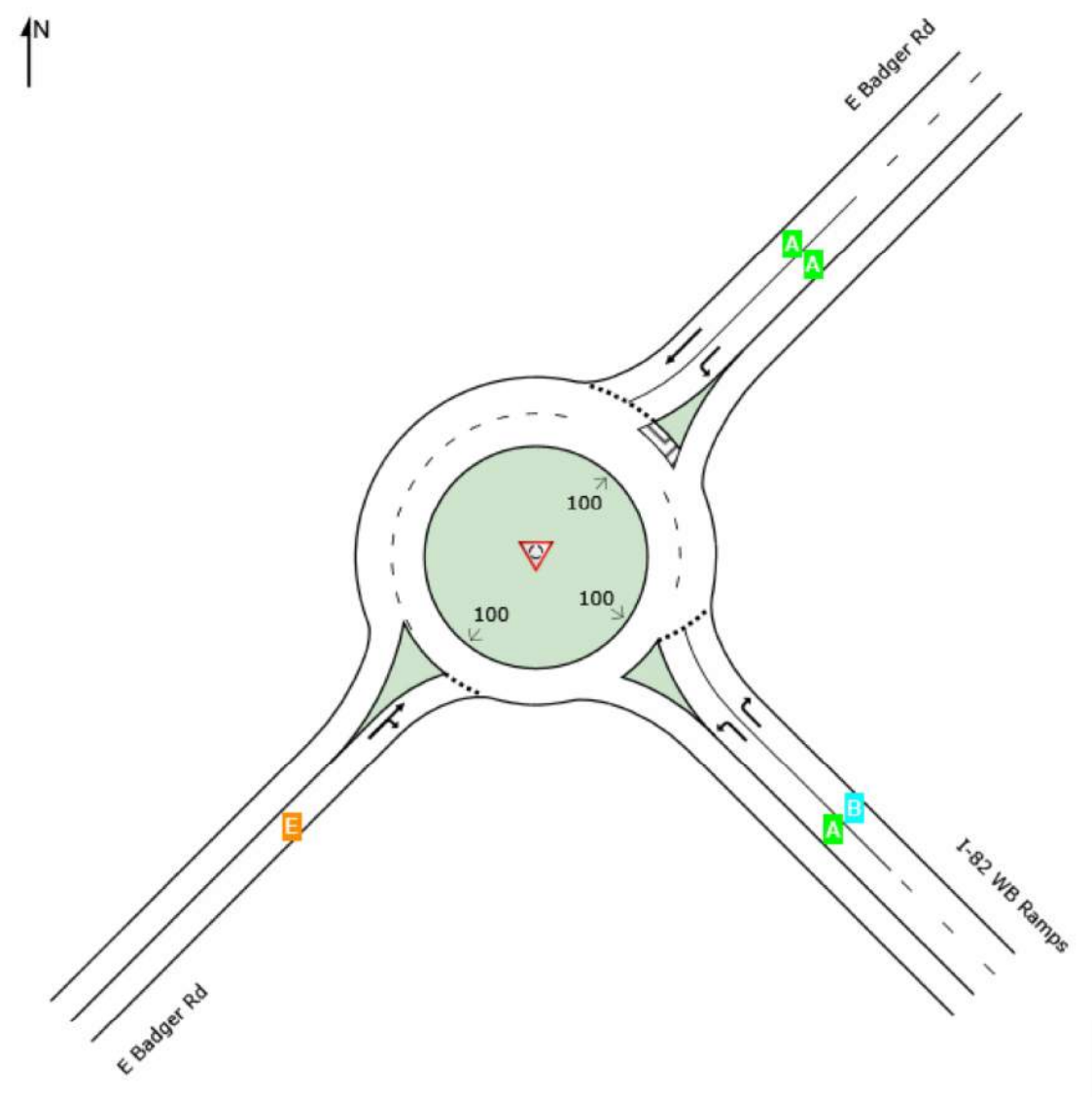
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 20 [E Badger Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Southwest	
LOS	B	A	E	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 20 [E Badger Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
SouthEast: I-82 WB Ramps														
3x	L2	50	3.0	54	3.0	0.095	7.4	LOS A	0.3	8.4	0.62	0.62	0.62	31.4
18x	R2	261	3.0	284	3.0	0.495	14.8	LOS B	2.7	68.1	0.75	0.87	1.15	29.5
Approach		311	3.0	338	3.0	0.495	13.6	LOS B	2.7	68.1	0.73	0.83	1.07	29.8
NorthEast: E Badger Rd														
1x	L2	256	3.0	278	3.0	0.212	4.5	LOS A	1.0	25.2	0.18	0.07	0.18	32.7
6x	T1	649	3.0	705	3.0	0.538	8.6	LOS A	4.0	101.9	0.28	0.12	0.28	33.4
Approach		905	3.0	984	3.0	0.538	7.5	LOS A	4.0	101.9	0.25	0.11	0.25	33.2
SouthWest: E Badger Rd														
2x	T1	862	3.0	937	3.0	0.964	40.6	LOS E	43.6	1115.0	1.00	1.87	3.14	22.7
12x	R2	25	3.0	27	3.0	0.964	40.6	LOS E	43.6	1115.0	1.00	1.87	3.14	22.3
Approach		887	3.0	964	3.0	0.964	40.6	LOS E	43.6	1115.0	1.00	1.87	3.14	22.7
All Vehicles		2103	3.0	2286	3.0	0.964	22.4	LOS C	43.6	1115.0	0.64	0.96	1.59	27.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings

21: E Badger Rd & I-82 EB Ramps

05/12/2021

	↙	↘	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘		↗		↘	↗
Traffic Volume (vph)	28	373	513	77	359	341
Future Volume (vph)	28	373	513	77	359	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%		3%			-3%
Storage Length (ft)	0	0		0	250	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		50			50
Link Distance (ft)	410		360			542
Travel Time (s)	9.3		4.9			7.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Prot		NA		pm+pt	NA
Protected Phases	8		6		5	2
Permitted Phases					2	
Detector Phase	8		6		5	2
Switch Phase						
Minimum Initial (s)	4.0		4.0		4.0	4.0
Minimum Split (s)	20.5		20.5		9.5	20.5
Total Split (s)	21.0		45.0		24.0	69.0
Total Split (%)	23.3%		50.0%		26.7%	76.7%
Yellow Time (s)	5.0		5.0		5.0	5.0
All-Red Time (s)	0.5		0.5		0.5	0.5
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.5		5.5	5.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Recall Mode	None		Min		None	Min

Intersection Summary

Area Type: Other

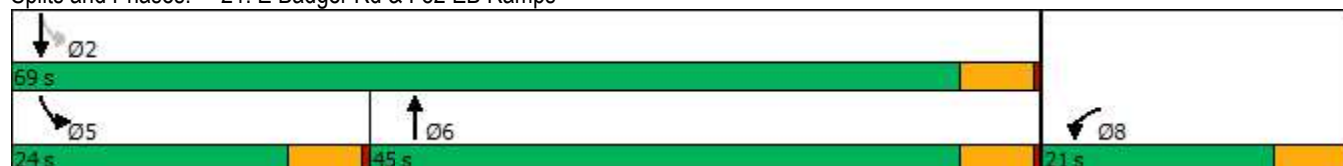
Cycle Length: 90

Actuated Cycle Length: 66.7

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Splits and Phases: 21: E Badger Rd & I-82 EB Ramps



HCM 6th Signalized Intersection Summary

21: E Badger Rd & I-82 EB Ramps

05/12/2021



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	R
Traffic Volume (veh/h)	28	373	513	77	359	341
Future Volume (veh/h)	28	373	513	77	359	341
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	2052	2052	1803	1803	1973	1973
Adj Flow Rate, veh/h	30	405	558	84	390	371
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	26	356	594	89	433	1235
Arrive On Green	0.22	0.22	0.39	0.39	0.16	0.63
Sat Flow, veh/h	121	1628	1531	230	1879	1973
Grp Volume(v), veh/h	436	0	0	642	390	371
Grp Sat Flow(s),veh/h/ln	1753	0	0	1761	1879	1973
Q Serve(g_s), s	15.5	0.0	0.0	24.9	9.3	6.1
Cycle Q Clear(g_c), s	15.5	0.0	0.0	24.9	9.3	6.1
Prop In Lane	0.07	0.93		0.13	1.00	
Lane Grp Cap(c), veh/h	383	0	0	683	433	1235
V/C Ratio(X)	1.14	0.00	0.00	0.94	0.90	0.30
Avail Cap(c_a), veh/h	383	0	0	982	623	1768
HCM Platoon Ratio	1.00	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	27.7	0.0	0.0	20.9	17.0	6.1
Incr Delay (d2), s/veh	88.7	0.0	0.0	10.7	9.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.6	0.0	0.0	10.4	4.1	1.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	116.4	0.0	0.0	31.6	26.6	6.2
LnGrp LOS	F	A	A	C	C	A
Approach Vol, veh/h	436		642			761
Approach Delay, s/veh	116.4		31.6			16.6
Approach LOS	F		C			B
Timer - Assigned Phs	2		5		6	8
Phs Duration (G+Y+Rc), s	49.8		16.9		33.0	21.0
Change Period (Y+Rc), s	5.5		5.5		5.5	5.5
Max Green Setting (Gmax), s	63.5		18.5		39.5	15.5
Max Q Clear Time (g_c+I1), s	8.1		11.3		26.9	17.5
Green Ext Time (p_c), s	0.3		0.1		0.6	0.0

Intersection Summary

HCM 6th Ctrl Delay	45.5
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

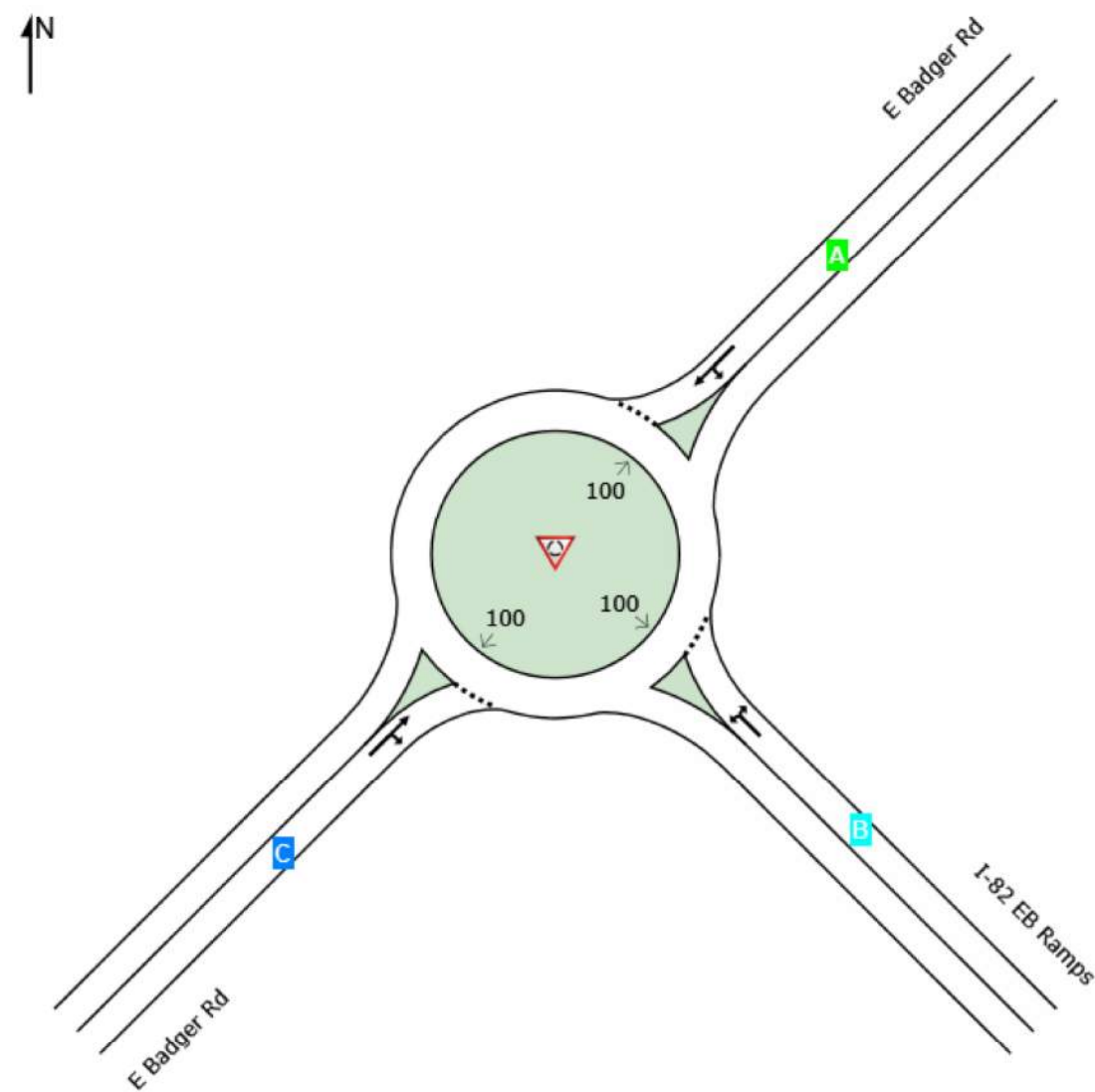
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 21 [E Badger Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Southwest	
LOS	B	A	C	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 21 [E Badger Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] ft				mph
SouthEast: I-82 EB Ramps														
3x	L2	28	3.0	30	3.0	0.584	14.3	LOS B	4.8	122.6	0.77	0.94	1.25	30.5
18x	R2	373	3.0	405	3.0	0.584	14.3	LOS B	4.8	122.6	0.77	0.94	1.25	29.7
Approach		401	3.0	436	3.0	0.584	14.3	LOS B	4.8	122.6	0.77	0.94	1.25	29.7
NorthEast: E Badger Rd														
1x	L2	359	3.0	390	3.0	0.586	9.6	LOS A	5.3	135.7	0.25	0.09	0.25	31.7
6x	T1	341	3.0	371	3.0	0.586	9.6	LOS A	5.3	135.7	0.25	0.09	0.25	31.6
Approach		700	3.0	761	3.0	0.586	9.6	LOS A	5.3	135.7	0.25	0.09	0.25	31.7
SouthWest: E Badger Rd														
2x	T1	513	3.0	558	3.0	0.721	17.4	LOS C	10.4	265.6	0.85	1.12	1.58	29.6
12x	R2	77	3.0	84	3.0	0.721	17.4	LOS C	10.4	265.6	0.85	1.12	1.58	28.8
Approach		590	3.0	641	3.0	0.721	17.4	LOS C	10.4	265.6	0.85	1.12	1.58	29.5
All Vehicles		1691	3.0	1838	3.0	0.721	13.4	LOS B	10.4	265.6	0.58	0.65	0.95	30.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

22: Bermuda Rd & Reata Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	562	46	38	480	45	93	1	49	73	6	29
Future Volume (vph)	21	562	46	38	480	45	93	1	49	73	6	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		6954			5360			569			542	
Travel Time (s)		118.5			91.4			11.1			10.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.5	20.5		20.5	20.5		20.5	20.5		20.5	20.5	
Total Split (s)	39.0	39.0		39.0	39.0		21.0	21.0		21.0	21.0	
Total Split (%)	65.0%	65.0%		65.0%	65.0%		35.0%	35.0%		35.0%	35.0%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	

Intersection Summary

Area Type: Other

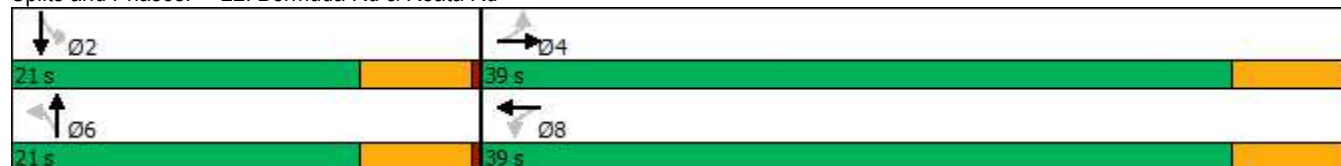
Cycle Length: 60

Actuated Cycle Length: 36.8

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Splits and Phases: 22: Bermuda Rd & Reata Rd



HCM 6th Signalized Intersection Summary

22: Bermuda Rd & Reata Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	562	46	38	480	45	93	1	49	73	6	29
Future Volume (veh/h)	21	562	46	38	480	45	93	1	49	73	6	29
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	23	611	50	41	522	49	101	1	53	79	7	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	145	728	58	165	703	63	373	8	87	375	33	71
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	25	1650	132	60	1594	144	975	51	533	975	201	438
Grp Volume(v), veh/h	684	0	0	612	0	0	155	0	0	118	0	0
Grp Sat Flow(s),veh/h/ln	1806	0	0	1797	0	0	1560	0	0	1614	0	0
Q Serve(g_s), s	1.6	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	9.3	0.0	0.0	7.8	0.0	0.0	2.4	0.0	0.0	1.6	0.0	0.0
Prop In Lane	0.03		0.07	0.07		0.08	0.65		0.34	0.67		0.27
Lane Grp Cap(c), veh/h	931	0	0	931	0	0	468	0	0	479	0	0
V/C Ratio(X)	0.73	0.00	0.00	0.66	0.00	0.00	0.33	0.00	0.00	0.25	0.00	0.00
Avail Cap(c_a), veh/h	2280	0	0	2213	0	0	1033	0	0	1041	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	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.9	0.0	0.0	6.5	0.0	0.0	10.7	0.0	0.0	10.4	0.0	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.3	0.0	0.0	0.2	0.0	0.0	0.1	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	1.2	0.0	0.0	1.0	0.0	0.0	0.6	0.0	0.0	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.3	0.0	0.0	6.8	0.0	0.0	10.8	0.0	0.0	10.5	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h	684			612			155			118		
Approach Delay, s/veh	7.3			6.8			10.8			10.5		
Approach LOS	A			A			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	10.0			17.7			10.0			17.7		
Change Period (Y+Rc), s	5.5			5.5			5.5			5.5		
Max Green Setting (Gmax), s	15.5			33.5			15.5			33.5		
Max Q Clear Time (g_c+I1), s	3.6			11.3			4.4			9.8		
Green Ext Time (p_c), s	0.1			0.9			0.1			0.9		
Intersection Summary												
HCM 6th Ctrl Delay	7.7											
HCM 6th LOS	A											

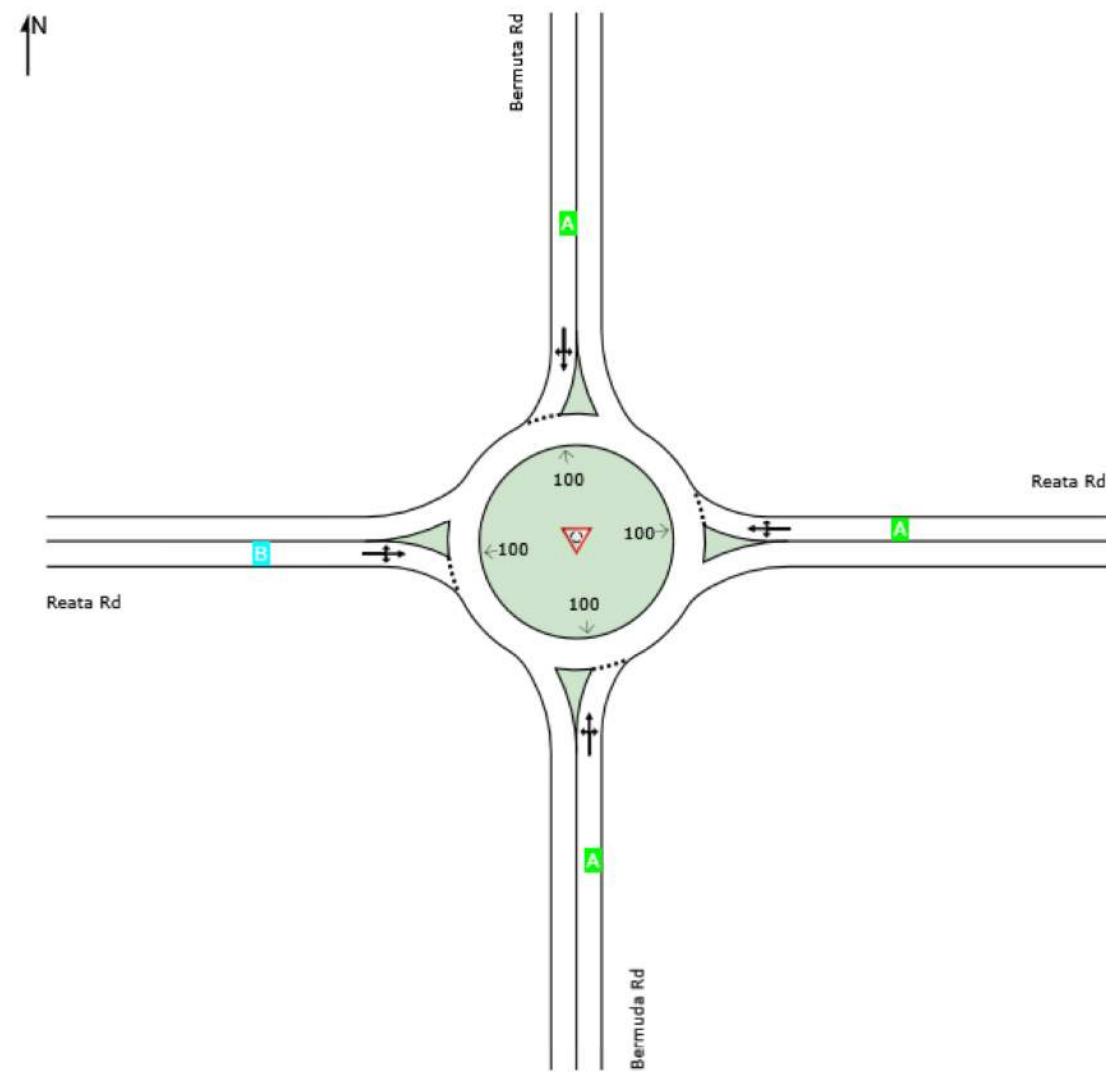
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 22 [Bermuda Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	B	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 22 [Bermuda Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] ft				
South: Bermuda Rd														
3	L2	93	3.0	101	3.0	0.246	8.8	LOS A	1.0	25.7	0.66	0.66	0.66	31.6
8	T1	1	3.0	1	3.0	0.246	8.8	LOS A	1.0	25.7	0.66	0.66	0.66	31.6
18	R2	49	3.0	53	3.0	0.246	8.8	LOS A	1.0	25.7	0.66	0.66	0.66	30.8
Approach		143	3.0	155	3.0	0.246	8.8	LOS A	1.0	25.7	0.66	0.66	0.66	31.3
East: Reata Rd														
1	L2	38	3.0	41	3.0	0.521	9.0	LOS A	3.7	95.8	0.45	0.28	0.45	33.1
6	T1	480	3.0	522	3.0	0.521	9.0	LOS A	3.7	95.8	0.45	0.28	0.45	33.0
16	R2	45	3.0	49	3.0	0.521	9.0	LOS A	3.7	95.8	0.45	0.28	0.45	32.1
Approach		563	3.0	612	3.0	0.521	9.0	LOS A	3.7	95.8	0.45	0.28	0.45	32.9
North: Bermuta Rd														
7	L2	73	3.0	79	3.0	0.176	7.4	LOS A	0.7	18.0	0.62	0.62	0.62	32.2
4	T1	6	3.0	7	3.0	0.176	7.4	LOS A	0.7	18.0	0.62	0.62	0.62	32.1
14	R2	29	3.0	32	3.0	0.176	7.4	LOS A	0.7	18.0	0.62	0.62	0.62	31.3
Approach		108	3.0	117	3.0	0.176	7.4	LOS A	0.7	18.0	0.62	0.62	0.62	31.9
West: Reata Rd														
5	L2	21	3.0	23	3.0	0.584	10.2	LOS B	4.6	118.3	0.51	0.32	0.51	32.6
2	T1	562	3.0	611	3.0	0.584	10.2	LOS B	4.6	118.3	0.51	0.32	0.51	32.5
12	R2	46	3.0	50	3.0	0.584	10.2	LOS B	4.6	118.3	0.51	0.32	0.51	31.6
Approach		629	3.0	684	3.0	0.584	10.2	LOS B	4.6	118.3	0.51	0.32	0.51	32.5
All Vehicles		1443	3.0	1568	3.0	0.584	9.4	LOS A	4.6	118.3	0.51	0.36	0.51	32.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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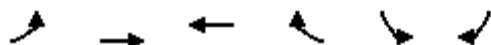
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Lanes, Volumes, Timings

23: Reata Rd & Gage Blvd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Traffic Volume (vph)	19	271	412	103	251	58
Future Volume (vph)	19	271	412	103	251	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	0			0	1	1
Taper Length (ft)	25				25	
Right Turn on Red				Yes		Yes
Link Speed (mph)		40	40		30	
Link Distance (ft)		1666	6954		1188	
Travel Time (s)		28.4	118.5		27.0	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		2	
Permitted Phases	4					2
Detector Phase	4	4	8		2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	20.5	20.5	20.5		20.5	20.5
Total Split (s)	24.0	24.0	24.0		21.0	21.0
Total Split (%)	53.3%	53.3%	53.3%		46.7%	46.7%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.5	5.5		5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None		Min	Min

Intersection Summary

Area Type: Other

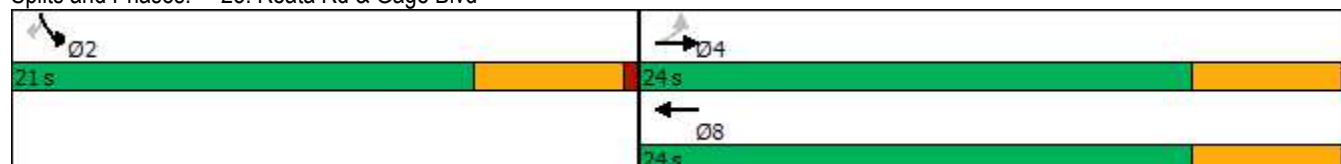
Cycle Length: 45

Actuated Cycle Length: 33.2

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

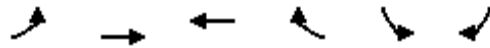
Splits and Phases: 23: Reata Rd & Gage Blvd



HCM 6th Signalized Intersection Summary

23: Reata Rd & Gage Blvd

05/12/2021



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Traffic Volume (veh/h)	19	271	412	103	251	58
Future Volume (veh/h)	19	271	412	103	251	58
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.99	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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	21	295	448	112	273	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	151	572	549	137	385	343
Arrive On Green	0.38	0.38	0.38	0.38	0.22	0.22
Sat Flow, veh/h	30	1491	1431	358	1767	1572
Grp Volume(v), veh/h	316	0	0	560	273	63
Grp Sat Flow(s),veh/h/ln	1521	0	0	1788	1767	1572
Q Serve(g_s), s	0.4	0.0	0.0	7.8	3.9	0.9
Cycle Q Clear(g_c), s	8.1	0.0	0.0	7.8	3.9	0.9
Prop In Lane	0.07			0.20	1.00	1.00
Lane Grp Cap(c), veh/h	722	0	0	686	385	343
V/C Ratio(X)	0.44	0.00	0.00	0.82	0.71	0.18
Avail Cap(c_a), veh/h	1215	0	0	1199	993	883
HCM Platoon Ratio	1.00	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	6.4	0.0	0.0	7.6	10.0	8.8
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.9	0.9	0.1
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	1.3	1.1	0.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.5	0.0	0.0	8.6	10.9	8.9
LnGrp LOS	A	A	A	A	B	A
Approach Vol, veh/h		316	560		336	
Approach Delay, s/veh		6.5	8.6		10.5	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		8
Phs Duration (G+Y+Rc), s		11.5		16.1		16.1
Change Period (Y+Rc), s		5.5		5.5		5.5
Max Green Setting (Gmax), s		15.5		18.5		18.5
Max Q Clear Time (g_c+I1), s		5.9		10.1		9.8
Green Ext Time (p_c), s		0.1		0.3		0.6
Intersection Summary						
HCM 6th Ctrl Delay			8.6			
HCM 6th LOS			A			

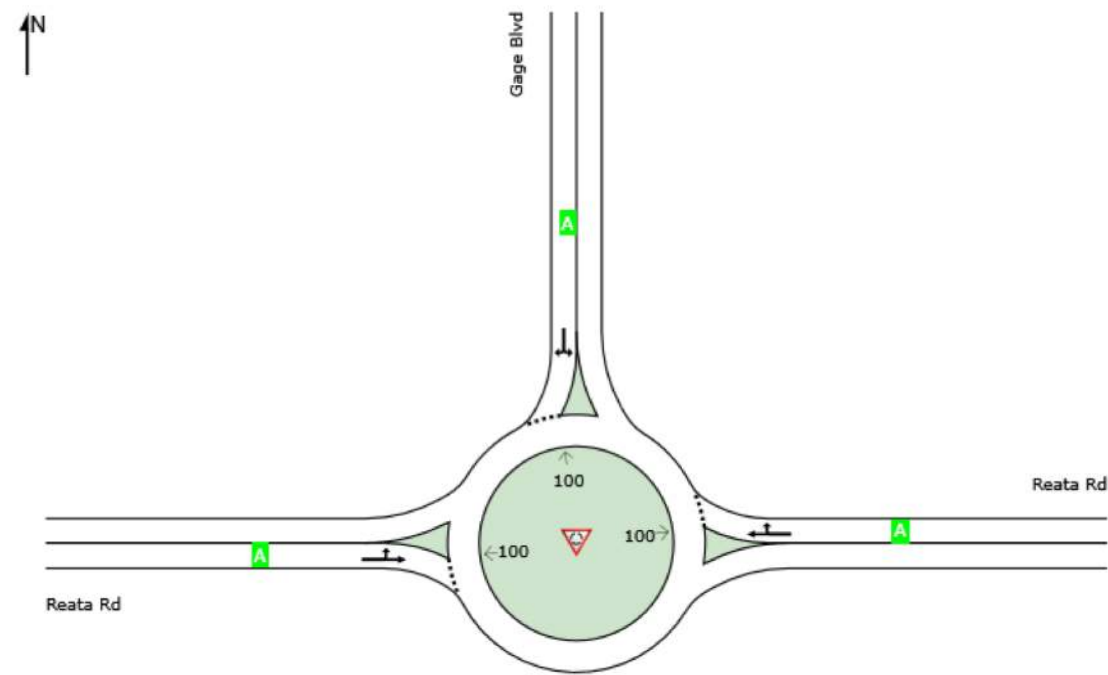
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 23 [Gage Blvd / Reata Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 23 [Gage Blvd / Reata Rd (Site Folder: 2040 With Project Mitigation - AM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
East: Reata Rd														
6	T1	412	3.0	448	3.0	0.427	6.9	LOS A	2.9	74.7	0.15	0.04	0.15	34.2
16	R2	103	3.0	112	3.0	0.427	6.9	LOS A	2.9	74.7	0.15	0.04	0.15	33.2
Approach		515	3.0	560	3.0	0.427	6.9	LOS A	2.9	74.7	0.15	0.04	0.15	34.0
North: Gage Blvd														
7	L2	251	3.0	273	3.0	0.402	9.2	LOS A	2.1	54.4	0.64	0.62	0.68	31.1
14	R2	58	3.0	63	3.0	0.402	9.2	LOS A	2.1	54.4	0.64	0.62	0.68	30.3
Approach		309	3.0	336	3.0	0.402	9.2	LOS A	2.1	54.4	0.64	0.62	0.68	30.9
West: Reata Rd														
5	L2	19	3.0	21	3.0	0.314	6.8	LOS A	1.6	40.6	0.49	0.39	0.49	34.2
2	T1	271	3.0	295	3.0	0.314	6.8	LOS A	1.6	40.6	0.49	0.39	0.49	34.1
Approach		290	3.0	315	3.0	0.314	6.8	LOS A	1.6	40.6	0.49	0.39	0.49	34.1
All Vehicles		1114	3.0	1211	3.0	0.427	7.5	LOS A	2.9	74.7	0.38	0.29	0.39	33.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

1: Dallas Rd & I-82 EB Ramps

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	676	0	311	0	0	0	0	353	67	467	332	0
Future Volume (vph)	676	0	311	0	0	0	0	353	67	467	332	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			-3%			5%			-11%	
Storage Length (ft)	0		100	0		0	0		0	150		0
Storage Lanes	0		1	0		0	0		0	2		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		106			198			377			305	
Travel Time (s)		2.4			4.5			5.1			4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Perm	NA	Perm					NA		Prot	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4									
Detector Phase	4	4	4					6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0					20.0		9.5	20.0	
Total Split (s)	59.0	59.0	59.0					38.0		23.0	61.0	
Total Split (%)	49.2%	49.2%	49.2%					31.7%		19.2%	50.8%	
Yellow Time (s)	5.0	5.0	5.0					5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5	0.5					0.5		0.5	0.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?												
Recall Mode	None	None	None					Min		None	None	

Intersection Summary

Area Type: Other

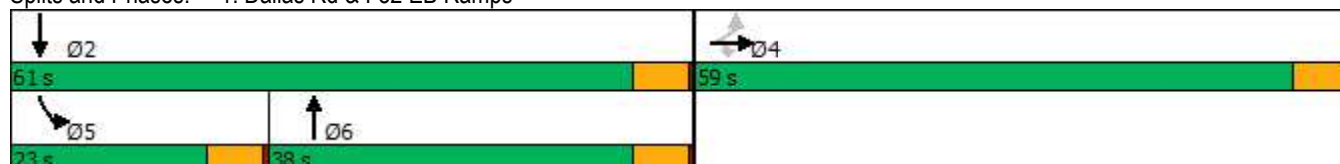
Cycle Length: 120

Actuated Cycle Length: 115.7

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Dallas Rd & I-82 EB Ramps



HCM 6th Signalized Intersection Summary

1: Dallas Rd & I-82 EB Ramps

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	676	0	311	0	0	0	0	353	67	467	332	0
Future Volume (veh/h)	676	0	311	0	0	0	0	353	67	467	332	0
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	1803	1803	1803				0	1708	1708	2288	2288	0
Adj Flow Rate, veh/h	735	0	338				0	384	73	508	361	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	757	0	674				0	391	74	574	1061	0
Arrive On Green	0.44	0.00	0.44				0.00	0.28	0.28	0.14	0.46	0.00
Sat Flow, veh/h	1717	0	1528				0	1395	265	4227	2288	0
Grp Volume(v), veh/h	735	0	338				0	0	457	508	361	0
Grp Sat Flow(s),veh/h/ln	1717	0	1528				0	0	1661	2113	2288	0
Q Serve(g_s), s	48.5	0.0	18.4				0.0	0.0	31.6	13.7	11.6	0.0
Cycle Q Clear(g_c), s	48.5	0.0	18.4				0.0	0.0	31.6	13.7	11.6	0.0
Prop In Lane	1.00		1.00				0.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	757	0	674				0	0	466	574	1061	0
V/C Ratio(X)	0.97	0.00	0.50				0.00	0.00	0.98	0.89	0.34	0.00
Avail Cap(c_a), veh/h	793	0	706				0	0	466	639	1096	0
HCM Platoon Ratio	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	1.00	1.00	0.00
Uniform Delay (d), s/veh	31.6	0.0	23.2				0.0	0.0	41.4	49.2	19.8	0.0
Incr Delay (d2), s/veh	24.1	0.0	0.2				0.0	0.0	36.5	12.2	0.1	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	24.5	0.0	0.0				0.0	0.0	16.9	7.9	5.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.7	0.0	23.4				0.0	0.0	77.8	61.4	19.8	0.0
LnGrp LOS	E	A	C				A	A	E	E	B	A
Approach Vol, veh/h	1073						457			869		
Approach Delay, s/veh	45.5						77.8			44.1		
Approach LOS	D						E			D		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	59.2			56.6			21.2			38.0		
Change Period (Y+Rc), s	5.5			5.5			5.5			5.5		
Max Green Setting (Gmax), s	55.5			53.5			17.5			32.5		
Max Q Clear Time (g_c+I1), s	13.6			50.5			15.7			33.6		
Green Ext Time (p_c), s	0.3			0.6			0.1			0.0		
Intersection Summary												
HCM 6th Ctrl Delay	51.2											
HCM 6th LOS	D											

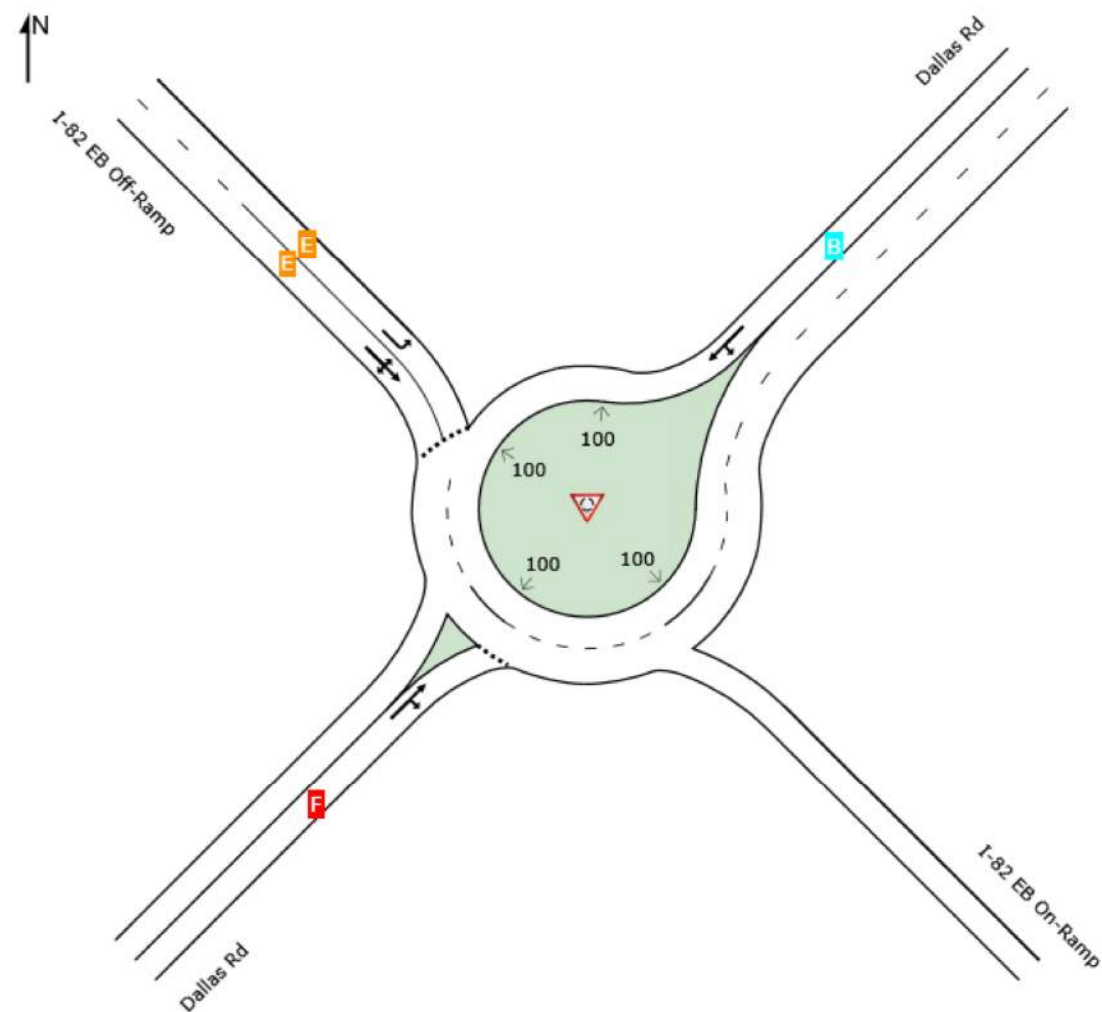
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [Dallas Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Northeast	Northwest	Southwest	
LOS	B	E	F	D



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 1 [Dallas Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] ft				mph
NorthEast: Dallas Rd														
1x	L2	467	3.0	508	3.0	0.648	10.7	LOS B	0.0	0.0	0.00	0.00	0.00	36.2
6x	T1	332	3.0	361	3.0	0.648	10.7	LOS B	0.0	0.0	0.00	0.00	0.00	36.2
Approach		799	3.0	868	3.0	0.648	10.7	LOS B	0.0	0.0	0.00	0.00	0.00	36.2
NorthWest: I-82 EB Off-Ramp														
7x	L2	676	3.0	735	3.0	0.879	38.5	LOS E	11.9	304.4	0.94	1.53	2.84	22.3
4x	T1	1	3.0	1	3.0	0.879	38.5	LOS E	11.9	304.4	0.94	1.53	2.84	22.6
14x	R2	311	3.0	338	3.0	0.879	38.5	LOS E	11.9	304.4	0.94	1.53	2.84	22.1
Approach		988	3.0	1074	3.0	0.879	38.5	LOS E	11.9	304.4	0.94	1.53	2.84	22.2
SouthWest: Dallas Rd														
2x	T1	353	3.0	384	3.0	0.984	67.7	LOS F	14.8	379.9	0.98	1.88	4.24	17.8
12x	R2	67	3.0	73	3.0	0.984	67.7	LOS F	14.8	379.9	0.98	1.88	4.24	17.6
Approach		420	3.0	457	3.0	0.984	67.7	LOS F	14.8	379.9	0.98	1.88	4.24	17.8
All Vehicles		2207	3.0	2399	3.0	0.984	34.0	LOS D	14.8	379.9	0.61	1.04	2.08	24.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings

2: Dallas Rd & I-82 WB Ramps

05/12/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	103	1	732	162	868	0	0	701	559
Future Volume (vph)	0	0	0	103	1	732	162	868	0	0	701	559
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-5%			0%			0%	
Storage Length (ft)	0		0	0		200	100		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		233			450			305			1186	
Travel Time (s)		5.3			10.2			4.2			16.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8						2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	9.5	20.0			20.0	20.0
Total Split (s)				52.0	52.0	52.0	16.0	68.0			52.0	52.0
Total Split (%)				43.3%	43.3%	43.3%	13.3%	56.7%			43.3%	43.3%
Yellow Time (s)				5.0	5.0	5.0	5.0	5.0			5.0	5.0
All-Red Time (s)				0.5	0.5	0.5	0.5	0.5			0.5	0.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.5	5.5	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?												
Recall Mode				None	None	None	None	Min			Min	Min

Intersection Summary

Area Type: Other

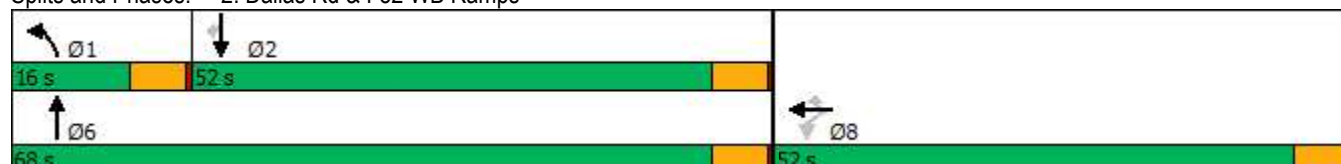
Cycle Length: 120

Actuated Cycle Length: 120

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Splits and Phases: 2: Dallas Rd & I-82 WB Ramps



HCM 6th Signalized Intersection Summary

2: Dallas Rd & I-82 WB Ramps

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↰	↰	↰			↰	↰
Traffic Volume (veh/h)	0	0	0	103	1	732	162	868	0	0	701	559
Future Volume (veh/h)	0	0	0	103	1	732	162	868	0	0	701	559
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				2052	2052	2052	1856	1856	0	0	1856	1856
Adj Flow Rate, veh/h				112	1	0	176	943	0	0	762	608
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				3	3	3	3	3	0	0	3	3
Cap, veh/h				153	1		222	1276	0	0	826	700
Arrive On Green				0.08	0.08	0.00	0.13	0.69	0.00	0.00	0.45	0.45
Sat Flow, veh/h				1937	17	1739	1767	1856	0	0	1856	1572
Grp Volume(v), veh/h				113	0	0	176	943	0	0	762	608
Grp Sat Flow(s),veh/h/ln				1955	0	1739	1767	1856	0	0	1856	1572
Q Serve(g_s), s				2.7	0.0	0.0	4.6	15.2	0.0	0.0	18.2	16.5
Cycle Q Clear(g_c), s				2.7	0.0	0.0	4.6	15.2	0.0	0.0	18.2	16.5
Prop In Lane				0.99		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				154	0		222	1276	0	0	826	700
V/C Ratio(X)				0.73	0.00		0.79	0.74	0.00	0.00	0.92	0.87
Avail Cap(c_a), veh/h				1929	0		394	2461	0	0	1831	1551
HCM Platoon Ratio				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	0.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				21.2	0.0	0.0	20.0	4.7	0.0	0.0	12.3	11.8
Incr Delay (d2), s/veh				2.5	0.0	0.0	2.4	0.3	0.0	0.0	2.0	1.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.2	0.0	0.0	1.6	0.7	0.0	0.0	4.9	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				23.7	0.0	0.0	22.4	5.0	0.0	0.0	14.3	13.1
LnGrp LOS				C	A		C	A	A	A	B	B
Approach Vol, veh/h					113	A		1119			1370	
Approach Delay, s/veh					23.7			7.7			13.8	
Approach LOS					C			A			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	11.4	26.5				37.9		9.2				
Change Period (Y+Rc), s	5.5	5.5				5.5		5.5				
Max Green Setting (Gmax), s	10.5	46.5				62.5		46.5				
Max Q Clear Time (g_c+I1), s	6.6	20.2				17.2		4.7				
Green Ext Time (p_c), s	0.0	0.8				1.0		0.2				

Intersection Summary

HCM 6th Ctrl Delay 11.6

HCM 6th LOS B

Notes

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

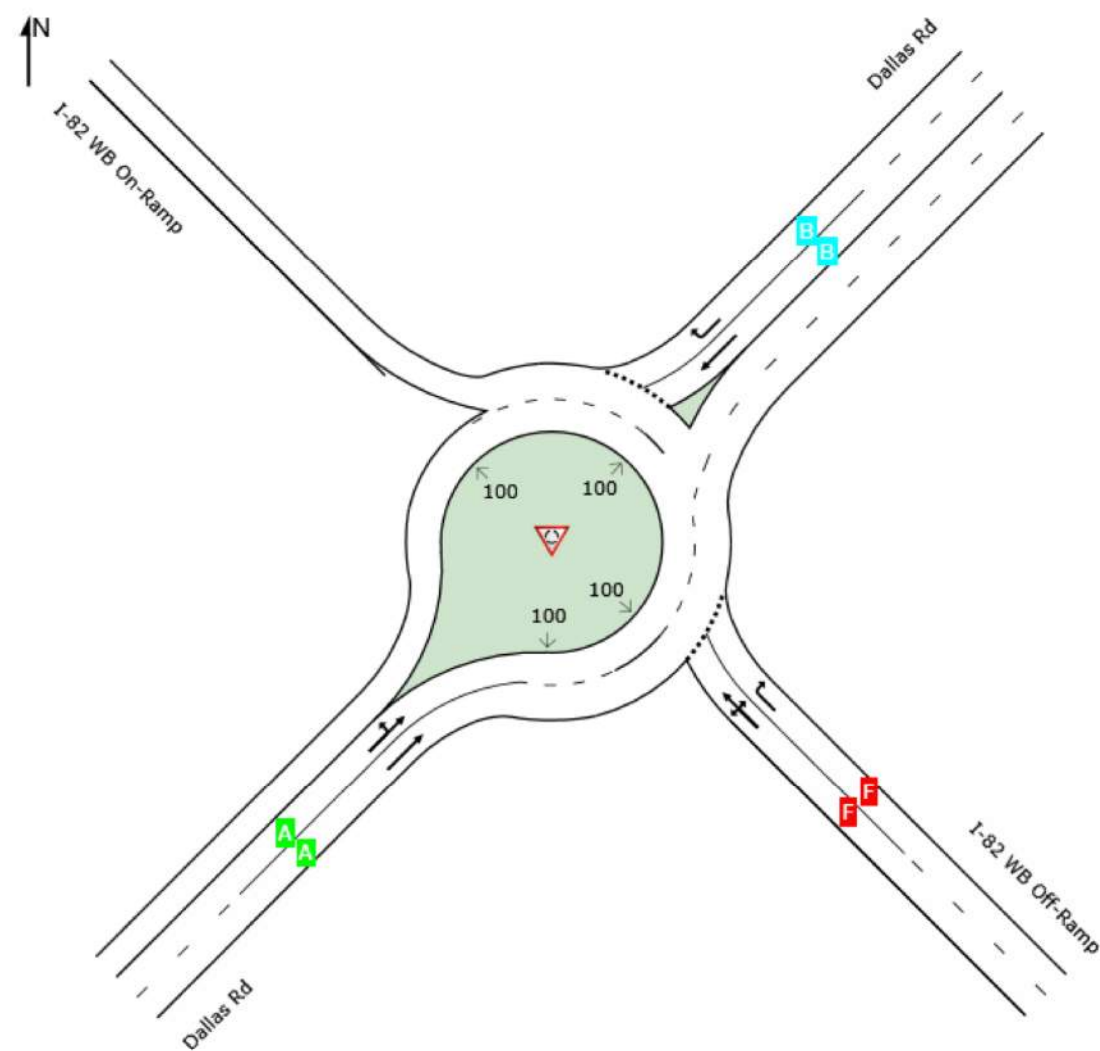
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 2 [Dallas Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Southwest	
LOS	F	B	A	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 2 [Dallas Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
SouthEast: I-82 WB Off-Ramp														
3x	L2	103	3.0	112	3.0	0.936	57.8	LOS F	11.9	303.5	0.95	1.66	3.46	19.0
8x	T1	1	3.0	1	3.0	0.936	57.8	LOS F	11.9	303.5	0.95	1.66	3.46	19.0
18x	R2	732	3.0	796	3.0	0.936	55.0	LOS F	12.7	325.5	0.95	1.68	3.50	19.2
Approach		836	3.0	909	3.0	0.936	55.3	LOS F	12.7	325.5	0.95	1.67	3.50	19.2
NorthEast: Dallas Rd														
6x	T1	701	3.0	762	3.0	0.712	14.8	LOS B	11.1	283.1	0.73	0.88	1.28	30.6
16x	R2	559	3.0	608	3.0	0.610	12.1	LOS B	6.2	159.4	0.65	0.69	0.94	30.6
Approach		1260	3.0	1370	3.0	0.712	13.6	LOS B	11.1	283.1	0.69	0.79	1.13	30.6
SouthWest: Dallas Rd														
5x	L2	162	3.0	176	3.0	0.406	6.4	LOS A	0.0	0.0	0.00	0.00	0.00	37.1
2x	T1	868	3.0	943	3.0	0.406	6.4	LOS A	0.0	0.0	0.00	0.00	0.00	37.7
Approach		1030	3.0	1120	3.0	0.406	6.4	LOS A	0.0	0.0	0.00	0.00	0.00	37.6
All Vehicles		3126	3.0	3398	3.0	0.936	22.4	LOS C	12.7	325.5	0.53	0.77	1.39	27.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

4: Dallas Rd & Ava Way

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	49	135	168	94	121	115	337	92	167	571	72
Future Volume (vph)	154	49	135	168	94	121	115	337	92	167	571	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			50			50	
Link Distance (ft)		233			2642			1047			11825	
Travel Time (s)		6.4			72.1			14.3			161.3	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	20.5		9.5	20.5		9.5	20.5		9.5	20.5	
Total Split (s)	17.0	26.0		17.0	26.0		14.0	58.9		18.1	63.0	
Total Split (%)	14.2%	21.7%		14.2%	21.7%		11.7%	49.1%		15.1%	52.5%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	Min		None	Min	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 92

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dallas Rd & Ava Way

			
14 s	63 s	17 s	26 s
			
18.1 s	58.9 s	17 s	26 s

HCM 6th Signalized Intersection Summary

4: Dallas Rd & Ava Way

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	154	49	135	168	94	121	115	337	92	167	571	72
Future Volume (veh/h)	154	49	135	168	94	121	115	337	92	167	571	72
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	0.99		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	167	53	147	183	102	132	125	366	100	182	621	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	297	68	187	323	120	156	223	537	147	388	654	82
Arrive On Green	0.10	0.16	0.16	0.11	0.17	0.17	0.06	0.38	0.38	0.08	0.40	0.40
Sat Flow, veh/h	1767	429	1190	1767	728	942	1767	1401	383	1767	1615	203
Grp Volume(v), veh/h	167	0	200	183	0	234	125	0	466	182	0	699
Grp Sat Flow(s),veh/h/ln	1767	0	1619	1767	0	1669	1767	0	1784	1767	0	1818
Q Serve(g_s), s	6.4	0.0	9.8	7.0	0.0	11.2	3.5	0.0	18.0	5.0	0.0	30.6
Cycle Q Clear(g_c), s	6.4	0.0	9.8	7.0	0.0	11.2	3.5	0.0	18.0	5.0	0.0	30.6
Prop In Lane	1.00		0.74	1.00		0.56	1.00		0.21	1.00		0.11
Lane Grp Cap(c), veh/h	297	0	255	323	0	276	223	0	684	388	0	736
V/C Ratio(X)	0.56	0.00	0.78	0.57	0.00	0.85	0.56	0.00	0.68	0.47	0.00	0.95
Avail Cap(c_a), veh/h	367	0	403	379	0	415	294	0	1157	510	0	1269
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.9	0.0	33.3	25.5	0.0	33.4	19.4	0.0	21.2	15.5	0.0	23.7
Incr Delay (d2), s/veh	0.6	0.0	2.0	0.6	0.0	6.5	0.8	0.0	0.4	0.3	0.0	6.3
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	2.7	0.0	3.9	2.9	0.0	5.0	1.2	0.0	6.6	1.7	0.0	12.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.5	0.0	35.4	26.1	0.0	39.8	20.2	0.0	21.7	15.8	0.0	30.0
LnGrp LOS	C	A	D	C	A	D	C	A	C	B	A	C
Approach Vol, veh/h	367			417			591			881		
Approach Delay, s/veh	31.3			33.8			21.3			27.1		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.7	38.8	14.4	18.5	12.4	37.1	13.7	19.1				
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5				
Max Green Setting (Gmax), s	8.5	57.5	11.5	20.5	12.6	53.4	11.5	20.5				
Max Q Clear Time (g_c+I1), s	5.5	32.6	9.0	11.8	7.0	20.0	8.4	13.2				
Green Ext Time (p_c), s	0.0	0.7	0.0	0.2	0.0	0.5	0.0	0.3				
Intersection Summary												
HCM 6th Ctrl Delay	27.5											
HCM 6th LOS	C											

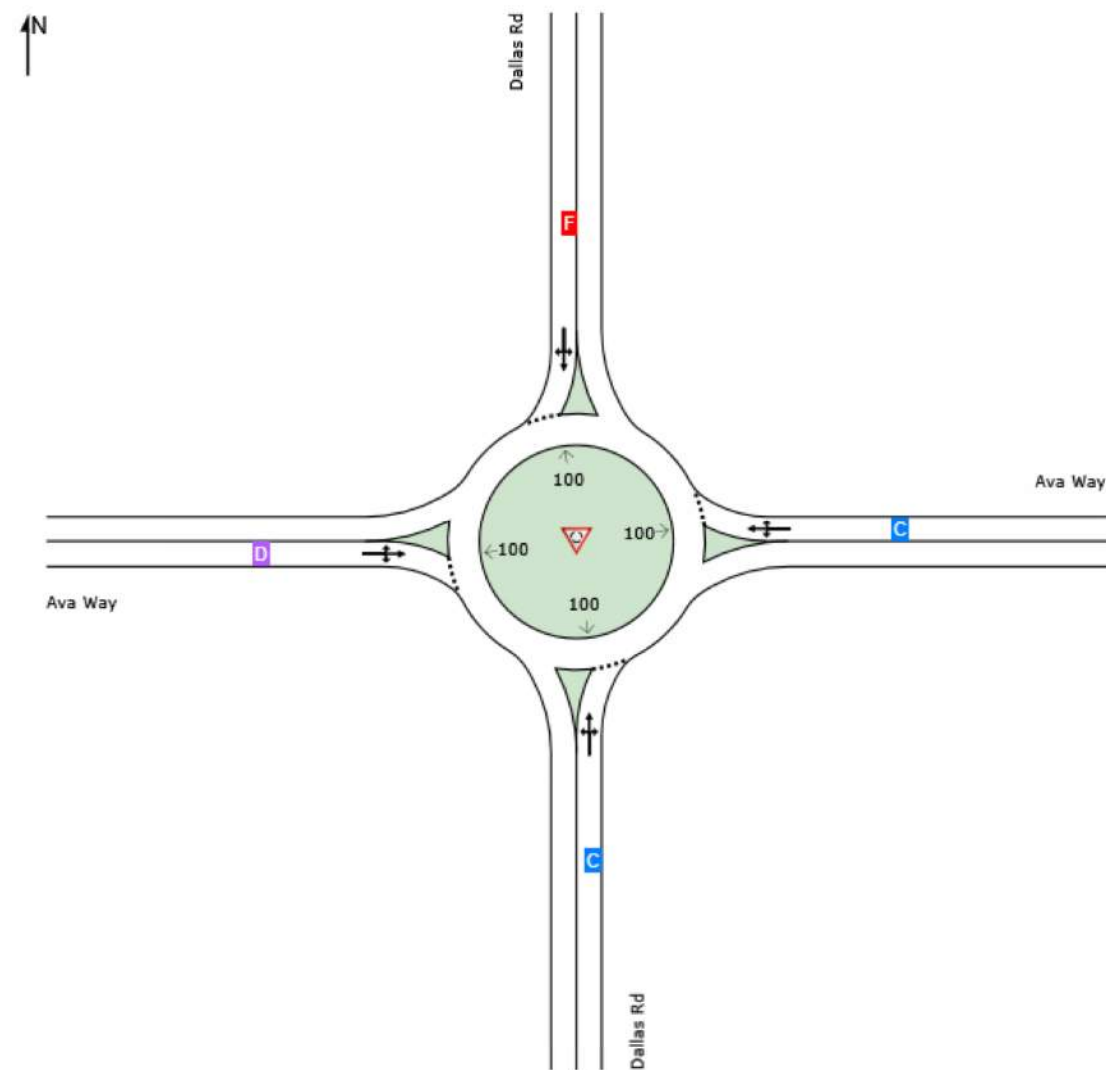
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 4 [Dallas Rd / Ava Way (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	F	D	D



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 4 [Dallas Rd / Ava Way (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Dallas Rd														
3	L2	115	3.0	125	3.0	0.673	15.5	LOS C	8.2	209.8	0.80	1.01	1.40	29.9
8	T1	337	3.0	366	3.0	0.673	15.5	LOS C	8.2	209.8	0.80	1.01	1.40	29.8
18	R2	92	3.0	100	3.0	0.673	15.5	LOS C	8.2	209.8	0.80	1.01	1.40	29.1
Approach		544	3.0	591	3.0	0.673	15.5	LOS C	8.2	209.8	0.80	1.01	1.40	29.7
East: Ava Way														
1	L2	168	3.0	183	3.0	0.621	16.9	LOS C	5.0	129.3	0.81	1.01	1.41	28.9
6	T1	94	3.0	102	3.0	0.621	16.9	LOS C	5.0	129.3	0.81	1.01	1.41	28.8
16	R2	121	3.0	132	3.0	0.621	16.9	LOS C	5.0	129.3	0.81	1.01	1.41	28.1
Approach		383	3.0	416	3.0	0.621	16.9	LOS C	5.0	129.3	0.81	1.01	1.41	28.6
North: Dallas Rd														
7	L2	167	3.0	182	3.0	1.011	55.2	LOS F	42.3	1083.2	1.00	2.27	4.17	19.7
4	T1	571	3.0	621	3.0	1.011	55.2	LOS F	42.3	1083.2	1.00	2.27	4.17	19.7
14	R2	72	3.0	78	3.0	1.011	55.2	LOS F	42.3	1083.2	1.00	2.27	4.17	19.3
Approach		810	3.0	880	3.0	1.011	55.2	LOS F	42.3	1083.2	1.00	2.27	4.17	19.6
West: Ava Way														
5	L2	154	3.0	167	3.0	0.768	32.2	LOS D	6.5	165.7	0.88	1.22	2.04	24.1
2	T1	49	3.0	53	3.0	0.768	32.2	LOS D	6.5	165.7	0.88	1.22	2.04	24.1
12	R2	135	3.0	147	3.0	0.768	32.2	LOS D	6.5	165.7	0.88	1.22	2.04	23.6
Approach		338	3.0	367	3.0	0.768	32.2	LOS D	6.5	165.7	0.88	1.22	2.04	23.9
All Vehicles		2075	3.0	2255	3.0	1.011	34.0	LOS D	42.3	1083.2	0.89	1.54	2.58	23.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	143	45	246	202	53	59	292	237	68	347	46
Future Volume (vph)	26	143	45	246	202	53	59	292	237	68	347	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		896			1478			569			1455	
Travel Time (s)		15.3			25.2			11.1			28.3	
Confl. Peds. (#/hr)	1		4	4		1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	20.5		9.5	20.5		20.5	20.5		20.5	20.5	
Total Split (s)	9.8	29.0		27.3	46.5		63.7	63.7		63.7	63.7	
Total Split (%)	8.2%	24.2%		22.8%	38.8%		53.1%	53.1%		53.1%	53.1%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	

Intersection Summary

Area Type: Other

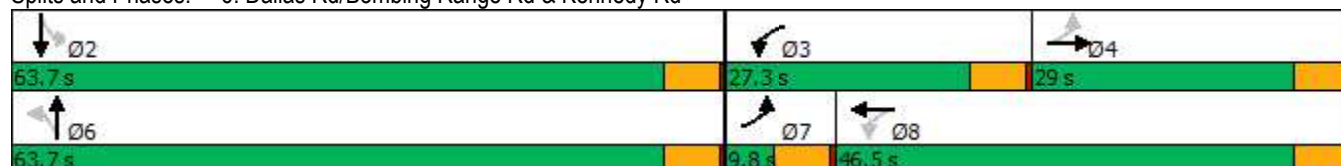
Cycle Length: 120

Actuated Cycle Length: 65

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Splits and Phases: 6: Dallas Rd/Bombing Range Rd & Kennedy Rd



HCM 6th Signalized Intersection Summary

6: Dallas Rd/Bombing Range Rd & Kennedy Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	143	45	246	202	53	59	292	237	68	347	46
Future Volume (veh/h)	26	143	45	246	202	53	59	292	237	68	347	46
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	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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	28	155	49	267	220	58	64	317	258	74	377	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	322	207	65	436	394	104	352	399	324	228	676	90
Arrive On Green	0.02	0.15	0.15	0.15	0.28	0.28	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	1767	1347	426	1767	1413	372	953	947	770	831	1604	213
Grp Volume(v), veh/h	28	0	204	267	0	278	64	0	575	74	0	427
Grp Sat Flow(s),veh/h/ln	1767	0	1772	1767	0	1785	953	0	1717	831	0	1817
Q Serve(g_s), s	0.8	0.0	6.6	7.1	0.0	8.0	3.3	0.0	17.5	5.1	0.0	10.7
Cycle Q Clear(g_c), s	0.8	0.0	6.6	7.1	0.0	8.0	13.9	0.0	17.5	22.6	0.0	10.7
Prop In Lane	1.00		0.24	1.00		0.21	1.00		0.45	1.00		0.12
Lane Grp Cap(c), veh/h	322	0	272	436	0	498	352	0	723	228	0	765
V/C Ratio(X)	0.09	0.00	0.75	0.61	0.00	0.56	0.18	0.00	0.80	0.32	0.00	0.56
Avail Cap(c_a), veh/h	405	0	694	812	0	1219	875	0	1665	684	0	1762
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.6	0.0	24.3	16.3	0.0	18.5	18.4	0.0	15.1	25.0	0.0	13.1
Incr Delay (d2), s/veh	0.0	0.0	1.6	0.5	0.0	0.4	0.1	0.0	0.8	0.3	0.0	0.2
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	0.3	0.0	2.6	2.5	0.0	2.9	0.7	0.0	5.8	0.9	0.0	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	0.0	25.9	16.8	0.0	18.8	18.5	0.0	15.9	25.3	0.0	13.4
LnGrp LOS	C	A	C	B	A	B	B	A	B	C	A	B
Approach Vol, veh/h	232			545			639			501		
Approach Delay, s/veh	25.2			17.9			16.1			15.1		
Approach LOS	C			B			B			B		
Timer - Assigned Phs	2			3			4			6		
Phs Duration (G+Y+Rc), s	30.8			14.5			14.7			30.8		
Change Period (Y+Rc), s	5.5			5.5			5.5			5.5		
Max Green Setting (Gmax), s	58.2			21.8			23.5			58.2		
Max Q Clear Time (g_c+I1), s	24.6			9.1			8.6			19.5		
Green Ext Time (p_c), s	0.7			0.1			0.2			1.0		
Intersection Summary												
HCM 6th Ctrl Delay	17.5											
HCM 6th LOS	B											

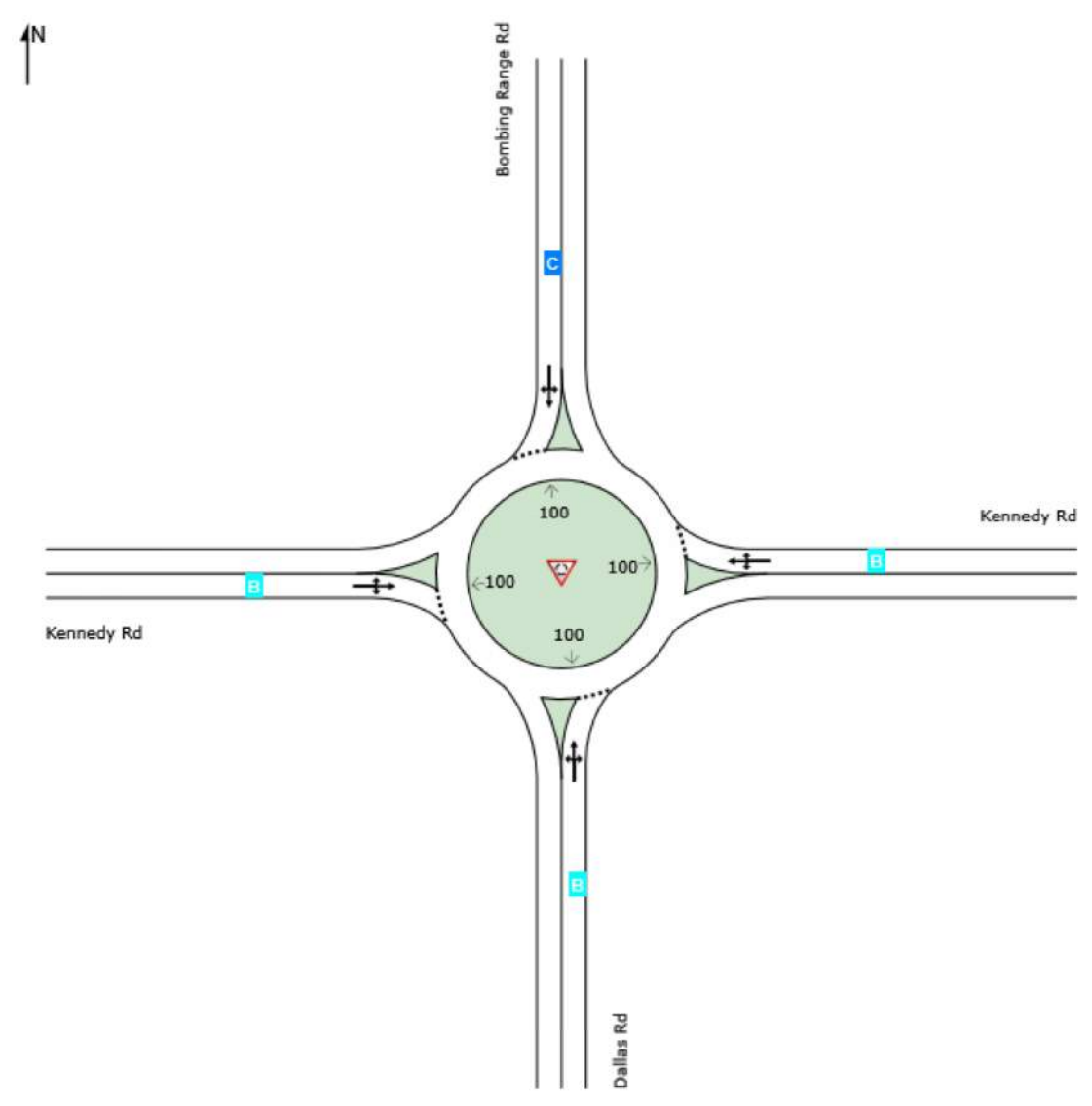
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 6 [Dallas Rd / Bombing Range Rd / Kennedy Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	B	C	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 6 [Dallas Rd / Bombing Range Rd / Kennedy Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Dallas Rd														
3	L2	59	3.0	64	3.0	0.626	12.4	LOS B	7.1	180.7	0.69	0.69	0.95	31.4
8	T1	292	3.0	317	3.0	0.626	12.4	LOS B	7.1	180.7	0.69	0.69	0.95	31.3
18	R2	237	3.0	258	3.0	0.626	12.4	LOS B	7.1	180.7	0.69	0.69	0.95	30.5
Approach		588	3.0	639	3.0	0.626	12.4	LOS B	7.1	180.7	0.69	0.69	0.95	31.0
East: Kennedy Rd														
1	L2	246	3.0	267	3.0	0.626	13.9	LOS B	6.5	167.3	0.77	0.93	1.24	29.9
6	T1	202	3.0	220	3.0	0.626	13.9	LOS B	6.5	167.3	0.77	0.93	1.24	29.9
16	R2	53	3.0	58	3.0	0.626	13.9	LOS B	6.5	167.3	0.77	0.93	1.24	29.1
Approach		501	3.0	545	3.0	0.626	13.9	LOS B	6.5	167.3	0.77	0.93	1.24	29.8
North: Bombing Range Rd														
7	L2	68	3.0	74	3.0	0.668	17.2	LOS C	6.7	172.2	0.83	1.07	1.51	29.4
4	T1	347	3.0	377	3.0	0.668	17.2	LOS C	6.7	172.2	0.83	1.07	1.51	29.3
14	R2	46	3.0	50	3.0	0.668	17.2	LOS C	6.7	172.2	0.83	1.07	1.51	28.6
Approach		461	3.0	501	3.0	0.668	17.2	LOS C	6.7	172.2	0.83	1.07	1.51	29.2
West: Kennedy Rd														
5	L2	26	3.0	28	3.0	0.370	10.9	LOS B	1.8	45.7	0.70	0.75	0.84	32.0
2	T1	143	3.0	155	3.0	0.370	10.9	LOS B	1.8	45.7	0.70	0.75	0.84	32.0
12	R2	45	3.0	49	3.0	0.370	10.9	LOS B	1.8	45.7	0.70	0.75	0.84	31.1
Approach		214	3.0	233	3.0	0.370	10.9	LOS B	1.8	45.7	0.70	0.75	0.84	31.8
All Vehicles		1764	3.0	1917	3.0	0.668	13.9	LOS B	7.1	180.7	0.75	0.86	1.16	30.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings

9: Kennedy Rd & Keene Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	669	40	269	426	14	28	194	406	10	138	135
Future Volume (vph)	77	669	40	269	426	14	28	194	406	10	138	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	260		0	375		0	160		0	0		330
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		45			45			40			40	
Link Distance (ft)		3222			2930			1363			832	
Travel Time (s)		48.8			44.4			23.2			14.2	
Confl. Peds. (#/hr)			1			2	2		7	7		2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA	pm+ov	Perm	NA	pm+ov
Protected Phases	7	4		3	8			6	3		2	7
Permitted Phases							6		6	2		2
Detector Phase	7	4		3	8		6	6	3	2	2	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	9.0
Total Split (s)	16.0	44.0		36.0	64.0		40.0	40.0	36.0	40.0	40.0	16.0
Total Split (%)	13.3%	36.7%		30.0%	53.3%		33.3%	33.3%	30.0%	33.3%	33.3%	13.3%
Yellow Time (s)	5.0	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	5.0
All-Red Time (s)	0.0	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.0
Lost Time Adjust (s)	-1.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	5.0
Lead/Lag	Lead	Lead		Lag	Lag				Lag			Lead
Lead-Lag Optimize?		Yes		Yes	Yes				Yes			
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None

Intersection Summary

Area Type: Other

Cycle Length: 120

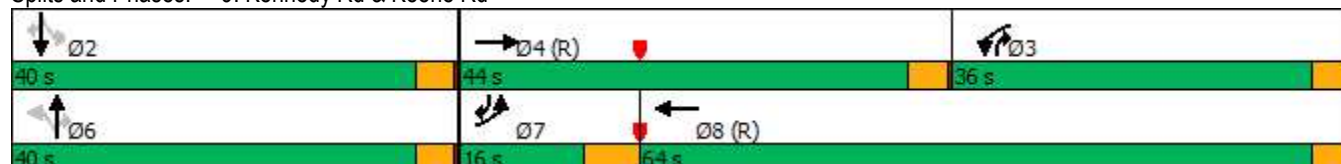
Actuated Cycle Length: 120

Offset: 8 (7%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Splits and Phases: 9: Kennedy Rd & Keene Rd



HCM 6th Signalized Intersection Summary

9: Kennedy Rd & Keene Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	669	40	269	426	14	28	194	406	10	138	135
Future Volume (veh/h)	77	669	40	269	426	14	28	194	406	10	138	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	81	704	42	283	448	15	29	204	427	11	145	142
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	116	1127	67	471	1859	62	34	198	888	32	298	559
Arrive On Green	0.07	0.33	0.33	0.35	0.71	0.71	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1767	3380	202	1767	3481	116	0	659	1561	0	994	1561
Grp Volume(v), veh/h	81	367	379	283	227	236	233	0	427	156	0	142
Grp Sat Flow(s),veh/h/ln	1767	1763	1819	1767	1763	1834	659	0	1561	994	0	1561
Q Serve(g_s), s	5.4	21.0	21.1	15.8	5.4	5.4	0.0	0.0	0.0	0.0	0.0	7.7
Cycle Q Clear(g_c), s	5.4	21.0	21.1	15.8	5.4	5.4	36.0	0.0	0.0	36.0	0.0	7.7
Prop In Lane	1.00		0.11	1.00		0.06	0.12		1.00	0.07		1.00
Lane Grp Cap(c), veh/h	116	588	606	471	942	980	231	0	888	330	0	559
V/C Ratio(X)	0.70	0.62	0.63	0.60	0.24	0.24	1.01	0.00	0.48	0.47	0.00	0.25
Avail Cap(c_a), veh/h	177	588	606	471	942	980	231	0	888	330	0	559
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)	0.57	0.57	0.57	0.94	0.94	0.94	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.9	33.7	33.7	33.5	8.9	8.9	40.4	0.0	15.5	33.3	0.0	27.3
Incr Delay (d2), s/veh	1.6	2.9	2.8	2.0	0.6	0.5	60.9	0.0	0.4	1.0	0.0	0.2
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	9.1	9.4	6.3	2.0	2.1	9.6	0.0	6.5	3.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.5	36.5	36.5	35.5	9.4	9.4	101.4	0.0	15.9	34.3	0.0	27.5
LnGrp LOS	E	D	D	D	A	A	F	A	B	C	A	C
Approach Vol, veh/h	827			746			660			298		
Approach Delay, s/veh	38.5			19.3			46.1			31.1		
Approach LOS	D			B			D			C		
Timer - Assigned Phs	2		3	4	6		7	8				
Phs Duration (G+Y+Rc), s	40.0		36.0	44.0	40.0		11.9	68.1				
Change Period (Y+Rc), s	4.0		4.0	4.0	4.0		5.0	4.0				
Max Green Setting (Gmax), s	36.0		32.0	40.0	36.0		11.0	60.0				
Max Q Clear Time (g_c+l1), s	38.0		17.8	23.1	38.0		7.4	7.4				
Green Ext Time (p_c), s	0.0		0.7	3.9	0.0		0.0	2.6				
Intersection Summary												
HCM 6th Ctrl Delay	33.9											
HCM 6th LOS	C											

Lanes, Volumes, Timings

18: Leslie Rd & Reata Rd

05/12/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	191	398	627	468	388	231
Future Volume (vph)	191	398	627	468	388	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50	0	0			285
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	40			40	40	
Link Distance (ft)	5360			1600	7773	
Travel Time (s)	91.4			27.3	132.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	1	1	6	2	4
Permitted Phases		4	6			2
Detector Phase	4	1	1	6	2	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.5	9.5	9.5	20.5	20.5	20.5
Total Split (s)	26.0	51.0	51.0	94.0	43.0	26.0
Total Split (%)	21.7%	42.5%	42.5%	78.3%	35.8%	21.7%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?						
Recall Mode	None	None	None	Min	Min	None

Intersection Summary

Area Type: Other

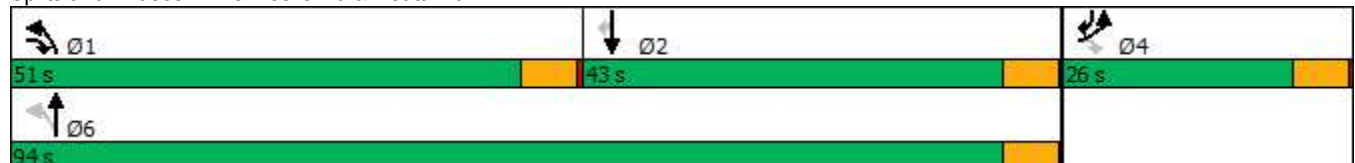
Cycle Length: 120

Actuated Cycle Length: 85.6

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Splits and Phases: 18: Leslie Rd & Reata Rd



HCM 6th Signalized Intersection Summary

18: Leslie Rd & Reata Rd

05/12/2021



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	191	398	627	468	388	231
Future Volume (veh/h)	191	398	627	468	388	231
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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	205	428	674	503	417	248
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	357	839	705	1212	463	711
Arrive On Green	0.20	0.20	0.33	0.65	0.25	0.25
Sat Flow, veh/h	1767	1572	1767	1856	1856	1572
Grp Volume(v), veh/h	205	428	674	503	417	248
Grp Sat Flow(s),veh/h/ln	1767	1572	1767	1856	1856	1572
Q Serve(g_s), s	8.0	13.3	23.1	9.8	16.6	7.8
Cycle Q Clear(g_c), s	8.0	13.3	23.1	9.8	16.6	7.8
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	357	839	705	1212	463	711
V/C Ratio(X)	0.57	0.51	0.96	0.41	0.90	0.35
Avail Cap(c_a), veh/h	476	944	1175	2156	913	1092
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.4	11.4	17.4	6.3	27.7	13.6
Incr Delay (d2), s/veh	0.5	0.2	8.4	0.1	2.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	13.3	9.3	2.8	7.1	3.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	28.0	11.6	25.8	6.4	30.3	13.7
LnGrp LOS	C	B	C	A	C	B
Approach Vol, veh/h	633			1177	665	
Approach Delay, s/veh	16.9			17.5	24.1	
Approach LOS	B			B	C	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	30.7	24.5		20.9		55.3
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	45.5	37.5		20.5		88.5
Max Q Clear Time (g_c+I1), s	25.1	18.6		15.3		11.8
Green Ext Time (p_c), s	0.2	0.5		0.1		0.6
Intersection Summary						
HCM 6th Ctrl Delay			19.1			
HCM 6th LOS			B			

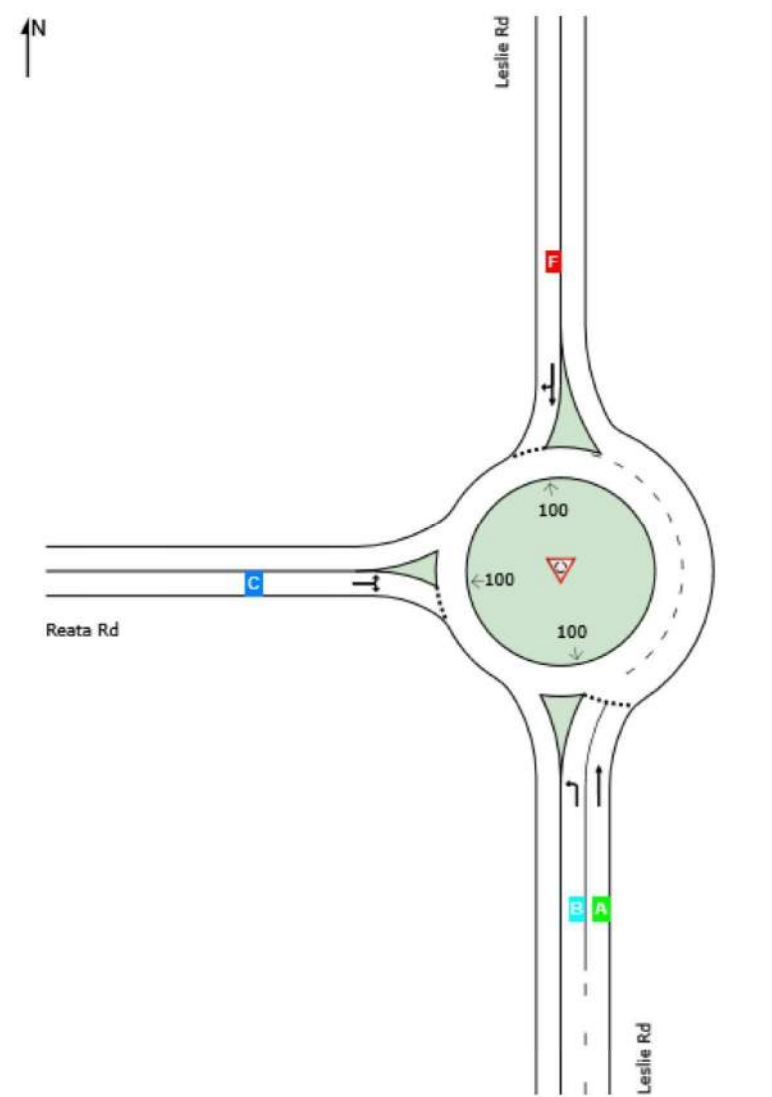
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 18 [Leslie Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	South	North	West	
LOS	A	F	C	D



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 18 [Leslie Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Leslie Rd														
3	L2	627	3.0	674	3.0	0.596	10.7	LOS B	4.3	110.8	0.57	0.43	0.59	30.1
8	T1	468	3.0	503	3.0	0.445	7.9	LOS A	2.5	64.2	0.47	0.34	0.47	33.7
Approach		1095	3.0	1177	3.0	0.596	9.5	LOS A	4.3	110.8	0.53	0.39	0.54	31.5
North: Leslie Rd														
4	T1	388	3.0	417	3.0	1.009	62.4	LOS F	27.8	710.9	1.00	2.17	4.49	18.6
14	R2	231	3.0	248	3.0	1.009	62.4	LOS F	27.8	710.9	1.00	2.17	4.49	18.3
Approach		619	3.0	666	3.0	1.009	62.4	LOS F	27.8	710.9	1.00	2.17	4.49	18.4
West: Reata Rd														
5	L2	191	3.0	205	3.0	0.732	18.3	LOS C	10.5	269.2	0.86	1.17	1.66	28.5
12	R2	398	3.0	428	3.0	0.732	18.3	LOS C	10.5	269.2	0.86	1.17	1.66	27.8
Approach		589	3.0	633	3.0	0.732	18.3	LOS C	10.5	269.2	0.86	1.17	1.66	28.0
All Vehicles		2303	3.0	2476	3.0	1.009	26.0	LOS D	27.8	710.9	0.74	1.07	1.89	25.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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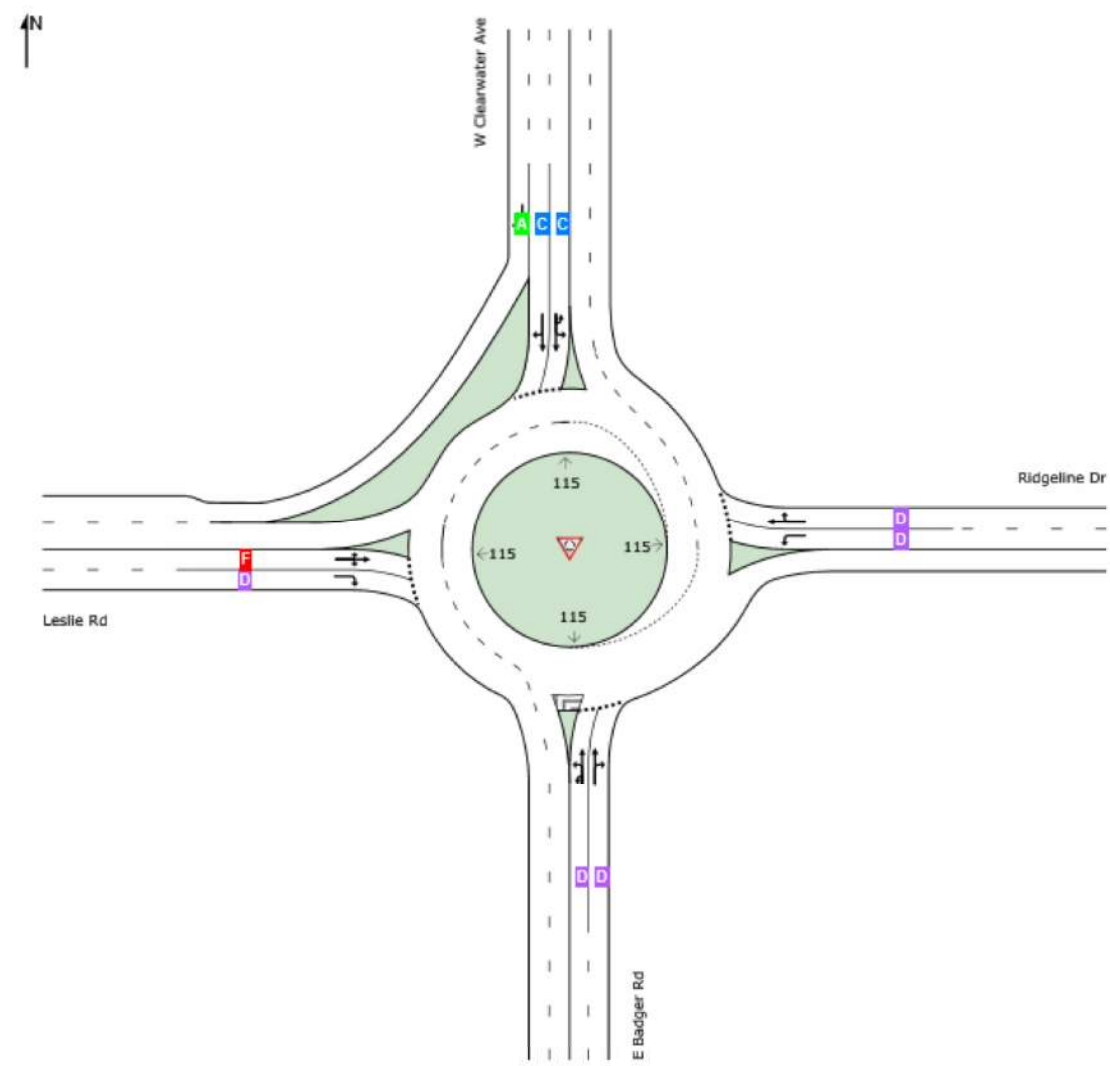
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	D	B	F	D



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 19 [Leslie Rd / Clearwater Ave / E Badger Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] ft				mph
South: E Badger Rd														
3u	U	9	3.0	10	3.0	0.812	25.3	LOS D	11.9	305.4	0.91	1.38	2.23	26.7
3	L2	380	3.0	409	3.0	0.812	25.3	LOS D	11.9	305.4	0.91	1.38	2.23	26.2
8	T1	643	3.0	691	3.0	0.812	25.3	LOS D	11.9	305.4	0.91	1.38	2.23	26.8
18	R2	151	3.0	162	3.0	0.812	25.3	LOS D	11.9	305.4	0.91	1.38	2.23	26.4
Approach		1183	3.0	1272	3.0	0.812	25.3	LOS D	11.9	305.4	0.91	1.38	2.23	26.5
East: Ridgeline Dr														
1	L2	203	3.0	218	3.0	0.633	30.1	LOS D	3.2	81.1	0.88	1.07	1.62	24.3
6	T1	204	3.0	219	3.0	0.734	33.7	LOS D	4.5	114.5	0.89	1.18	1.95	24.5
16	R2	70	3.0	75	3.0	0.734	33.7	LOS D	4.5	114.5	0.89	1.18	1.95	24.0
Approach		477	3.0	513	3.0	0.734	32.2	LOS D	4.5	114.5	0.89	1.13	1.81	24.4
North: W Clearwater Ave														
7u	U	1	3.0	1	3.0	0.730	24.7	LOS C	6.2	158.3	0.84	1.14	1.83	27.6
7	L2	73	3.0	78	3.0	0.730	24.7	LOS C	6.2	158.3	0.84	1.14	1.83	27.0
4	T1	764	3.0	822	3.0	0.730	23.5	LOS C	6.4	164.4	0.84	1.14	1.82	27.5
14	R2	528	3.0	568	3.0	0.363	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	37.1
Approach		1366	3.0	1469	3.0	0.730	14.5	LOS B	6.4	164.4	0.51	0.70	1.12	30.4
West: Leslie Rd														
5	L2	283	3.0	304	3.0	1.037	78.3	LOS F	21.9	560.9	1.00	2.23	5.30	16.5
2	T1	212	3.0	228	3.0	1.037	78.3	LOS F	21.9	560.9	1.00	2.23	5.30	16.4
12	R2	289	3.0	311	3.0	0.691	27.5	LOS D	4.4	112.8	0.85	1.10	1.73	25.5
Approach		784	3.0	843	3.0	1.037	59.6	LOS F	21.9	560.9	0.95	1.81	3.99	18.9
All Vehicles		3810	3.0	4097	3.0	1.037	29.3	LOS D	21.9	560.9	0.77	1.19	2.14	25.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lanes, Volumes, Timings

20: E Badger Rd & I-82 WB Ramps

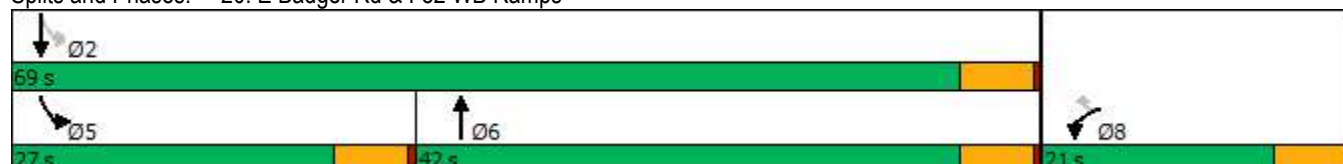
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	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↖	↗		↘	↘↘
Traffic Volume (vph)	78	545	636	45	474	846
Future Volume (vph)	78	545	636	45	474	846
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%		-3%			3%
Storage Length (ft)	0	100		0	95	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25				25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		50			50
Link Distance (ft)	405		216			508
Travel Time (s)	9.2		2.9			6.9
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		6		5	2
Permitted Phases		8			2	
Detector Phase	8	8	6		5	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	20.0	20.0	20.0		9.5	20.0
Total Split (s)	21.0	21.0	42.0		27.0	69.0
Total Split (%)	23.3%	23.3%	46.7%		30.0%	76.7%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5		5.5	5.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Recall Mode	None	None	Min		None	Min

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 83.8
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated

Splits and Phases: 20: E Badger Rd & I-82 WB Ramps



HCM 6th Signalized Intersection Summary 20: E Badger Rd & I-82 WB Ramps

05/12/2021



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	78	545	636	45	474	846
Future Volume (veh/h)	78	545	636	45	474	846
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	1973	1973	1973	1973	1803	1803
Adj Flow Rate, veh/h	83	0	677	48	504	900
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	108		737	52	553	2502
Arrive On Green	0.06	0.00	0.40	0.40	0.22	0.73
Sat Flow, veh/h	1879	1672	1821	129	1717	3515
Grp Volume(v), veh/h	83	0	0	725	504	900
Grp Sat Flow(s), veh/h/ln	1879	1672	0	1950	1717	1712
Q Serve(g_s), s	2.3	0.0	0.0	18.3	9.3	5.0
Cycle Q Clear(g_c), s	2.3	0.0	0.0	18.3	9.3	5.0
Prop In Lane	1.00	1.00		0.07	1.00	
Lane Grp Cap(c), veh/h	108		0	789	553	2502
V/C Ratio(X)	0.77		0.00	0.92	0.91	0.36
Avail Cap(c_a), veh/h	561		0	1371	887	4190
HCM Platoon Ratio	1.00	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	24.1	0.0	0.0	14.6	11.6	2.6
Incr Delay (d2), s/veh	4.3	0.0	0.0	3.2	6.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.0	6.2	2.6	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	28.4	0.0	0.0	17.8	17.6	2.6
LnGrp LOS	C		A	B	B	A
Approach Vol, veh/h	83	A	725			1404
Approach Delay, s/veh	28.4		17.8			8.0
Approach LOS	C		B			A
Timer - Assigned Phs		2			5	6
Phs Duration (G+Y+Rc), s		43.4			16.9	26.5
Change Period (Y+Rc), s		5.5			5.5	5.5
Max Green Setting (Gmax), s		63.5			21.5	36.5
Max Q Clear Time (g_c+I1), s		7.0			11.3	20.3
Green Ext Time (p_c), s		1.2			0.1	0.7

Intersection Summary

HCM 6th Ctrl Delay	12.0
HCM 6th LOS	B

Notes

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

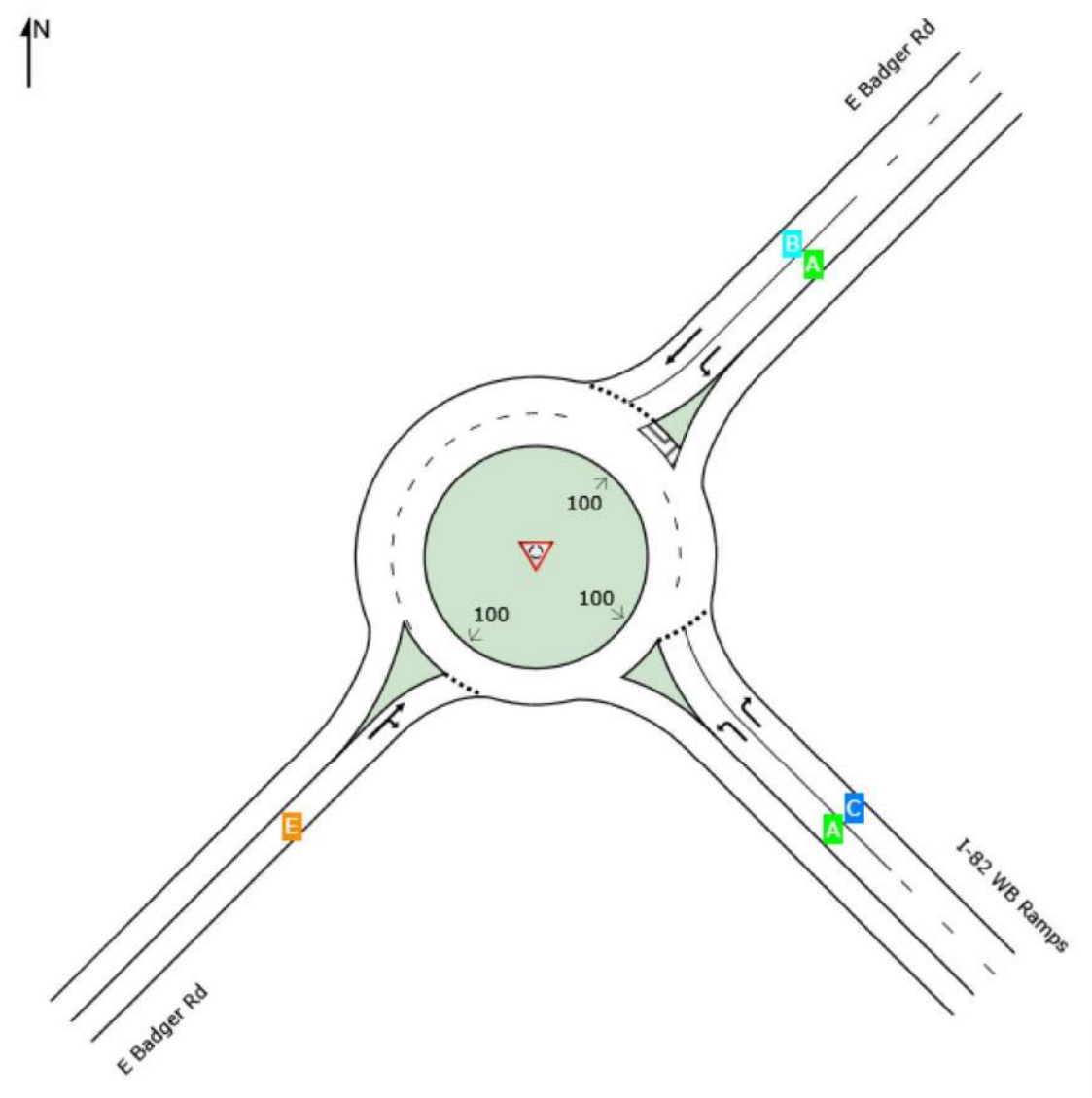
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 20 [E Badger Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Southwest	
LOS	C	B	E	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 20 [E Badger Rd / I-82 WB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
SouthEast: I-82 WB Ramps														
3x	L2	78	3.0	83	3.0	0.113	6.1	LOS A	0.4	10.6	0.56	0.54	0.56	32.0
18x	R2	545	3.0	580	3.0	0.793	25.0	LOS C	9.9	254.3	0.90	1.31	2.12	26.0
Approach		623	3.0	663	3.0	0.793	22.6	LOS C	9.9	254.3	0.86	1.22	1.93	26.6
NorthEast: E Badger Rd														
1x	L2	474	3.0	504	3.0	0.395	6.6	LOS A	2.3	58.2	0.28	0.14	0.28	31.8
6x	T1	846	3.0	900	3.0	0.706	12.8	LOS B	7.1	182.9	0.50	0.26	0.50	31.5
Approach		1320	3.0	1404	3.0	0.706	10.6	LOS B	7.1	182.9	0.42	0.22	0.42	31.6
SouthWest: E Badger Rd														
2x	T1	636	3.0	677	3.0	0.918	38.0	LOS E	22.3	571.1	1.00	1.78	3.11	23.3
12x	R2	45	3.0	48	3.0	0.918	38.0	LOS E	22.3	571.1	1.00	1.78	3.11	22.9
Approach		681	3.0	724	3.0	0.918	38.0	LOS E	22.3	571.1	1.00	1.78	3.11	23.3
All Vehicles		2624	3.0	2791	3.0	0.918	20.5	LOS C	22.3	571.1	0.67	0.86	1.47	27.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lanes, Volumes, Timings
21: E Badger Rd & I-82 EB Ramps

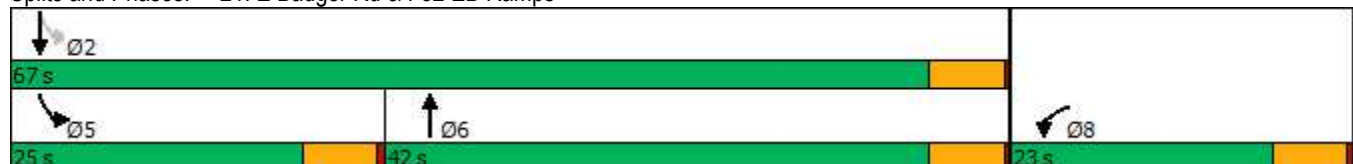
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	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘		↗		↘	↗
Traffic Volume (vph)	33	310	403	64	327	591
Future Volume (vph)	33	310	403	64	327	591
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%		3%			-3%
Storage Length (ft)	0	0		0	250	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		50			50
Link Distance (ft)	410		360			542
Travel Time (s)	9.3		4.9			7.4
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Prot		NA		pm+pt	NA
Protected Phases	8		6		5	2
Permitted Phases					2	
Detector Phase	8		6		5	2
Switch Phase						
Minimum Initial (s)	4.0		4.0		4.0	4.0
Minimum Split (s)	20.0		20.0		9.5	20.0
Total Split (s)	23.0		42.0		25.0	67.0
Total Split (%)	25.6%		46.7%		27.8%	74.4%
Yellow Time (s)	5.0		5.0		5.0	5.0
All-Red Time (s)	0.5		0.5		0.5	0.5
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.5		5.5	5.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Recall Mode	None		Min		None	Min

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 55.4
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated

Splits and Phases: 21: E Badger Rd & I-82 EB Ramps



HCM 6th Signalized Intersection Summary

21: E Badger Rd & I-82 EB Ramps

05/12/2021



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Volume (veh/h)	33	310	403	64	327	591
Future Volume (veh/h)	33	310	403	64	327	591
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	2052	2052	1803	1803	1973	1973
Adj Flow Rate, veh/h	35	330	429	68	348	629
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	40	376	478	76	455	1113
Arrive On Green	0.24	0.24	0.31	0.31	0.15	0.56
Sat Flow, veh/h	168	1585	1519	241	1879	1973
Grp Volume(v), veh/h	366	0	0	497	348	629
Grp Sat Flow(s),veh/h/ln	1758	0	0	1759	1879	1973
Q Serve(g_s), s	11.1	0.0	0.0	14.9	6.3	11.3
Cycle Q Clear(g_c), s	11.1	0.0	0.0	14.9	6.3	11.3
Prop In Lane	0.10	0.90		0.14	1.00	
Lane Grp Cap(c), veh/h	417	0	0	553	455	1113
V/C Ratio(X)	0.88	0.00	0.00	0.90	0.77	0.57
Avail Cap(c_a), veh/h	556	0	0	1161	835	2193
HCM Platoon Ratio	1.00	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	20.3	0.0	0.0	18.1	11.7	7.7
Incr Delay (d2), s/veh	9.8	0.0	0.0	2.2	1.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	0.0	0.0	5.0	1.8	2.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	30.2	0.0	0.0	20.3	12.7	7.9
LnGrp LOS	C	A	A	C	B	A
Approach Vol, veh/h	366		497			977
Approach Delay, s/veh	30.2		20.3			9.6
Approach LOS	C		C			A
Timer - Assigned Phs	2		5		6	8
Phs Duration (G+Y+Rc), s	36.7		13.8		22.9	18.6
Change Period (Y+Rc), s	5.5		5.5		5.5	5.5
Max Green Setting (Gmax), s	61.5		19.5		36.5	17.5
Max Q Clear Time (g_c+I1), s	13.3		8.3		16.9	13.1
Green Ext Time (p_c), s	0.6		0.1		0.5	0.1

Intersection Summary

HCM 6th Ctrl Delay	16.6
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

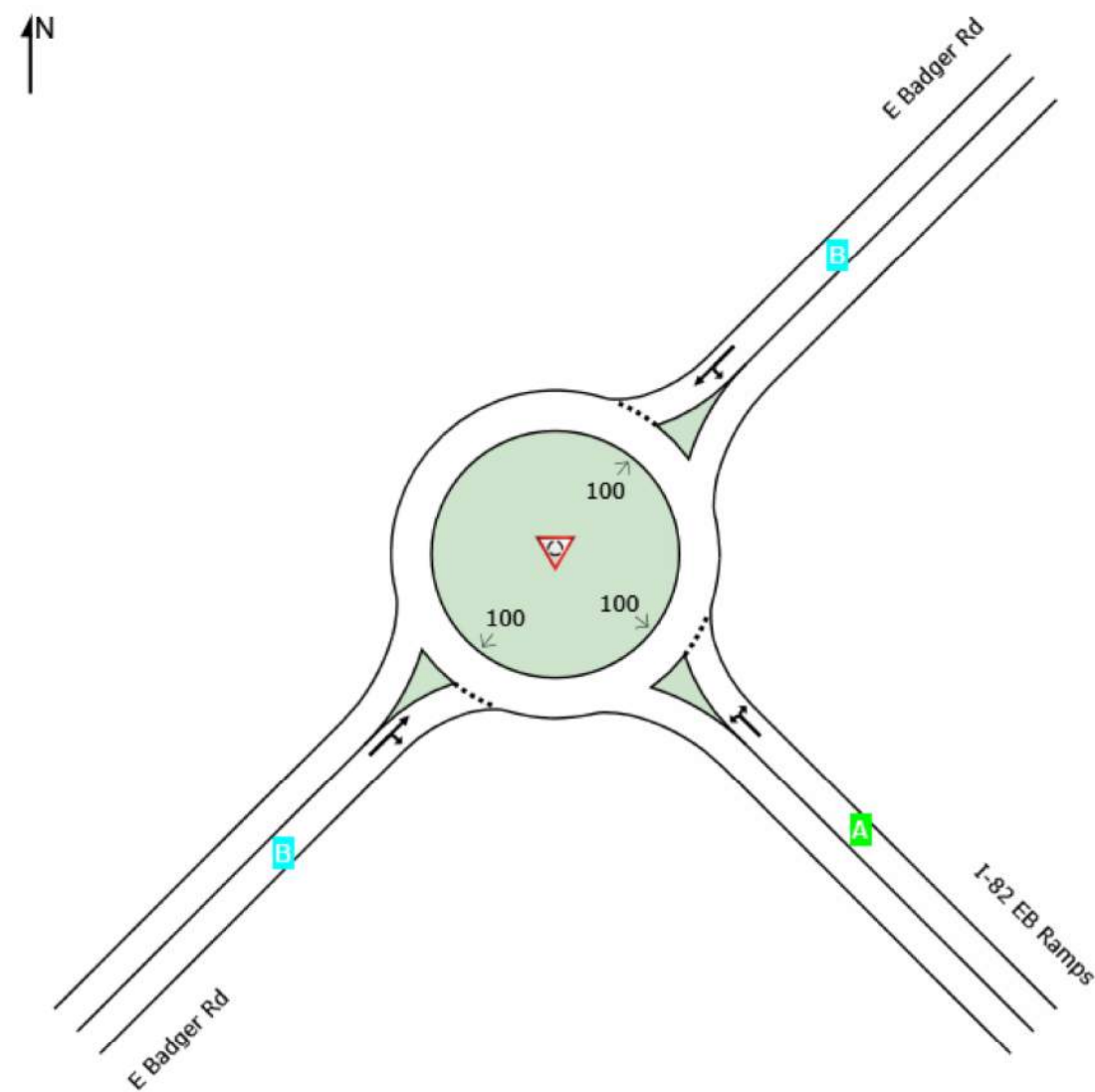
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 21 [E Badger Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Southwest	
LOS	A	B	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 21 [E Badger Rd / I-82 EB Ramps (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] ft				
SouthEast: I-82 EB Ramps														
3x	L2	33	3.0	35	3.0	0.427	9.5	LOS A	2.4	62.5	0.64	0.64	0.72	32.6
18x	R2	310	3.0	330	3.0	0.427	9.5	LOS A	2.4	62.5	0.64	0.64	0.72	31.7
Approach		343	3.0	365	3.0	0.427	9.5	LOS A	2.4	62.5	0.64	0.64	0.72	31.8
NorthEast: E Badger Rd														
1x	L2	327	3.0	348	3.0	0.756	14.6	LOS B	10.5	268.5	0.42	0.16	0.42	29.9
6x	T1	591	3.0	629	3.0	0.756	14.6	LOS B	10.5	268.5	0.42	0.16	0.42	29.9
Approach		918	3.0	977	3.0	0.756	14.6	LOS B	10.5	268.5	0.42	0.16	0.42	29.9
SouthWest: E Badger Rd														
2x	T1	403	3.0	429	3.0	0.534	10.9	LOS B	4.3	110.5	0.67	0.69	0.88	32.3
12x	R2	64	3.0	68	3.0	0.534	10.9	LOS B	4.3	110.5	0.67	0.69	0.88	31.4
Approach		467	3.0	497	3.0	0.534	10.9	LOS B	4.3	110.5	0.67	0.69	0.88	32.2
All Vehicles		1728	3.0	1838	3.0	0.756	12.6	LOS B	10.5	268.5	0.53	0.40	0.60	30.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

22: Bermuda Rd & Reata Rd

05/12/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	454	28	56	579	84	22	8	48	58	4	15
Future Volume (vph)	22	454	28	56	579	84	22	8	48	58	4	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			35			35	
Link Distance (ft)		6954			5360			569			542	
Travel Time (s)		118.5			91.4			11.1			10.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.5	20.5		20.5	20.5		20.5	20.5		20.5	20.5	
Total Split (s)	39.0	39.0		39.0	39.0		21.0	21.0		21.0	21.0	
Total Split (%)	65.0%	65.0%		65.0%	65.0%		35.0%	35.0%		35.0%	35.0%	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	

Intersection Summary

Area Type: Other

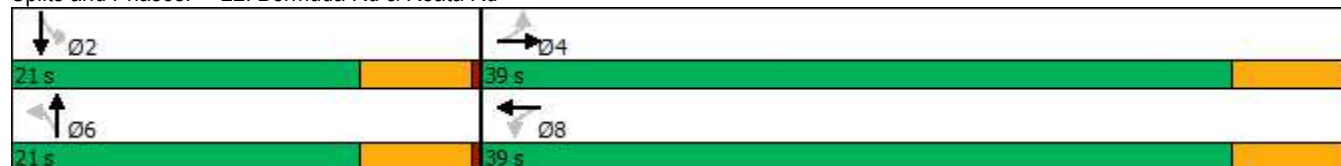
Cycle Length: 60

Actuated Cycle Length: 40

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Splits and Phases: 22: Bermuda Rd & Reata Rd



HCM 6th Signalized Intersection Summary

22: Bermuda Rd & Reata Rd

05/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	454	28	56	579	84	22	8	48	58	4	15
Future Volume (veh/h)	22	454	28	56	579	84	22	8	48	58	4	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	24	493	30	61	629	91	24	9	52	63	4	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	140	849	50	165	736	102	198	37	129	352	21	39
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.13	0.13	0.13	0.13	0.13	0.13
Sat Flow, veh/h	31	1685	100	74	1460	202	341	278	975	1075	158	295
Grp Volume(v), veh/h	547	0	0	781	0	0	85	0	0	83	0	0
Grp Sat Flow(s),veh/h/ln	1816	0	0	1736	0	0	1594	0	0	1528	0	0
Q Serve(g_s), s	0.0	0.0	0.0	5.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.4	0.0	0.0	12.1	0.0	0.0	1.4	0.0	0.0	1.3	0.0	0.0
Prop In Lane	0.04		0.05	0.08		0.12	0.28		0.61	0.76		0.19
Lane Grp Cap(c), veh/h	1039	0	0	1003	0	0	364	0	0	412	0	0
V/C Ratio(X)	0.53	0.00	0.00	0.78	0.00	0.00	0.23	0.00	0.00	0.20	0.00	0.00
Avail Cap(c_a), veh/h	2080	0	0	2015	0	0	949	0	0	941	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	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.3	0.0	0.0	6.6	0.0	0.0	12.0	0.0	0.0	11.9	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.5	0.0	0.0	0.1	0.0	0.0	0.1	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	0.7	0.0	0.0	1.3	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.5	0.0	0.0	7.1	0.0	0.0	12.1	0.0	0.0	12.0	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		547			781			85			83	
Approach Delay, s/veh		5.5			7.1			12.1			12.0	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		9.5		20.7		9.5		20.7				
Change Period (Y+Rc), s		5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s		15.5		33.5		15.5		33.5				
Max Q Clear Time (g_c+I1), s		3.3		8.4		3.4		14.1				
Green Ext Time (p_c), s		0.1		0.7		0.1		1.2				
Intersection Summary												
HCM 6th Ctrl Delay				7.1								
HCM 6th LOS				A								

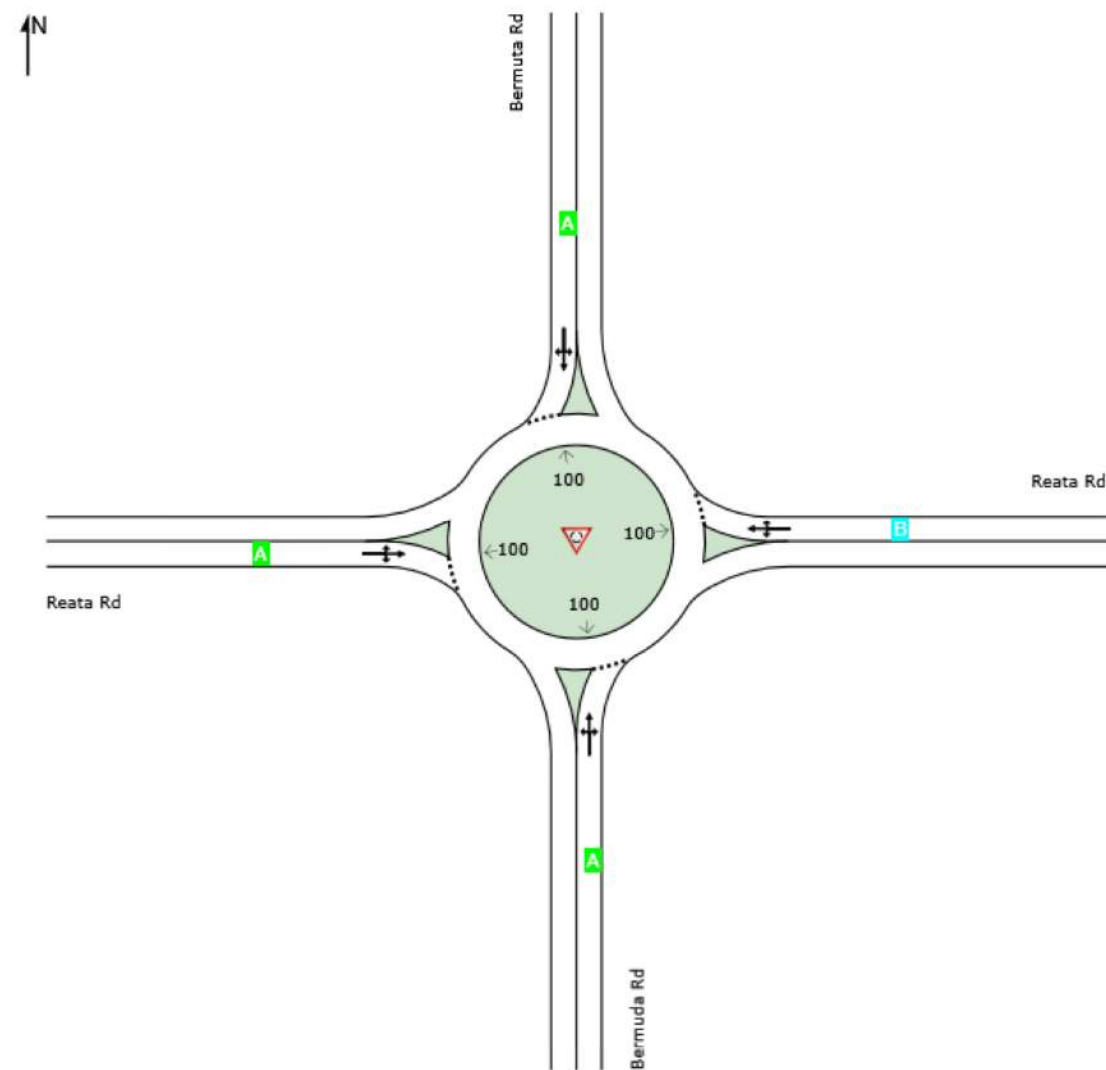
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 22 [Bermuda Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 22 [Bermuda Rd / Reata Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Bermuda Rd														
3	L2	22	3.0	24	3.0	0.117	6.2	LOS A	0.5	11.8	0.57	0.53	0.57	33.8
8	T1	8	3.0	9	3.0	0.117	6.2	LOS A	0.5	11.8	0.57	0.53	0.57	33.7
18	R2	48	3.0	52	3.0	0.117	6.2	LOS A	0.5	11.8	0.57	0.53	0.57	32.8
Approach		78	3.0	85	3.0	0.117	6.2	LOS A	0.5	11.8	0.57	0.53	0.57	33.1
East: Reata Rd														
1	L2	56	3.0	61	3.0	0.619	10.5	LOS B	5.8	147.6	0.37	0.17	0.37	32.3
6	T1	579	3.0	629	3.0	0.619	10.5	LOS B	5.8	147.6	0.37	0.17	0.37	32.3
16	R2	84	3.0	91	3.0	0.619	10.5	LOS B	5.8	147.6	0.37	0.17	0.37	31.4
Approach		719	3.0	782	3.0	0.619	10.5	LOS B	5.8	147.6	0.37	0.17	0.37	32.2
North: Bermuta Rd														
7	L2	58	3.0	63	3.0	0.132	7.2	LOS A	0.5	13.1	0.62	0.62	0.62	32.1
4	T1	4	3.0	4	3.0	0.132	7.2	LOS A	0.5	13.1	0.62	0.62	0.62	32.0
14	R2	15	3.0	16	3.0	0.132	7.2	LOS A	0.5	13.1	0.62	0.62	0.62	31.2
Approach		77	3.0	84	3.0	0.132	7.2	LOS A	0.5	13.1	0.62	0.62	0.62	31.9
West: Reata Rd														
5	L2	22	3.0	24	3.0	0.468	8.1	LOS A	3.1	79.4	0.42	0.26	0.42	33.6
2	T1	454	3.0	493	3.0	0.468	8.1	LOS A	3.1	79.4	0.42	0.26	0.42	33.5
12	R2	28	3.0	30	3.0	0.468	8.1	LOS A	3.1	79.4	0.42	0.26	0.42	32.6
Approach		504	3.0	548	3.0	0.468	8.1	LOS A	3.1	79.4	0.42	0.26	0.42	33.5
All Vehicles		1378	3.0	1498	3.0	0.619	9.2	LOS A	5.8	147.6	0.42	0.25	0.42	32.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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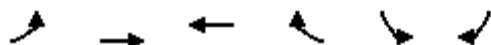
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Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Lanes, Volumes, Timings

23: Reata Rd & Gage Blvd

05/12/2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Traffic Volume (vph)	50	195	208	251	192	31
Future Volume (vph)	50	195	208	251	192	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	0			0	1	1
Taper Length (ft)	25				25	
Right Turn on Red				Yes		Yes
Link Speed (mph)		40	40		30	
Link Distance (ft)		1666	6954		1188	
Travel Time (s)		28.4	118.5		27.0	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)						
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		2	
Permitted Phases	4					2
Detector Phase	4	4	8		2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	20.5	20.5	20.5		20.5	20.5
Total Split (s)	23.0	23.0	23.0		22.0	22.0
Total Split (%)	51.1%	51.1%	51.1%		48.9%	48.9%
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.5	5.5		5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None		Min	Min

Intersection Summary

Area Type: Other

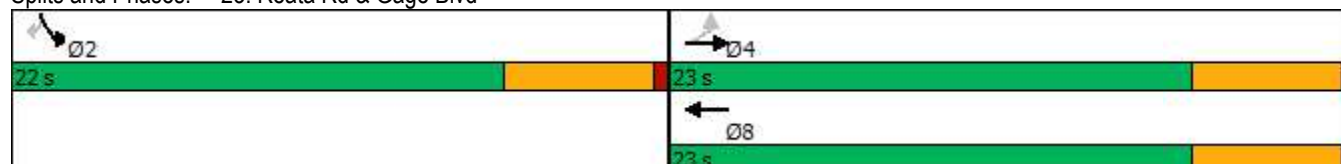
Cycle Length: 45

Actuated Cycle Length: 28.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

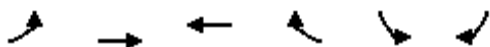
Splits and Phases: 23: Reata Rd & Gage Blvd



HCM 6th Signalized Intersection Summary

23: Reata Rd & Gage Blvd

05/12/2021



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↶		↷	↷
Traffic Volume (veh/h)	50	195	208	251	192	31
Future Volume (veh/h)	50	195	208	251	192	31
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.99	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	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	54	212	226	273	209	34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	206	435	289	349	334	298
Arrive On Green	0.38	0.38	0.38	0.38	0.19	0.19
Sat Flow, veh/h	95	1149	762	921	1767	1572
Grp Volume(v), veh/h	266	0	0	499	209	34
Grp Sat Flow(s),veh/h/ln	1244	0	0	1683	1767	1572
Q Serve(g_s), s	0.6	0.0	0.0	6.7	2.8	0.5
Cycle Q Clear(g_c), s	7.2	0.0	0.0	6.7	2.8	0.5
Prop In Lane	0.20			0.55	1.00	1.00
Lane Grp Cap(c), veh/h	641	0	0	637	334	298
V/C Ratio(X)	0.41	0.00	0.00	0.78	0.63	0.11
Avail Cap(c_a), veh/h	1111	0	0	1157	1145	1019
HCM Platoon Ratio	1.00	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	5.9	0.0	0.0	7.0	9.5	8.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.8	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	0.9	0.7	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.1	0.0	0.0	7.8	10.2	8.6
LnGrp LOS	A	A	A	A	B	A
Approach Vol, veh/h		266	499		243	
Approach Delay, s/veh		6.1	7.8		10.0	
Approach LOS		A	A		A	
Timer - Assigned Phs		2		4		8
Phs Duration (G+Y+Rc), s		10.3		15.1		15.1
Change Period (Y+Rc), s		5.5		5.5		5.5
Max Green Setting (Gmax), s		16.5		17.5		17.5
Max Q Clear Time (g_c+I1), s		4.8		9.2		8.7
Green Ext Time (p_c), s		0.0		0.3		0.6
Intersection Summary						
HCM 6th Ctrl Delay			7.9			
HCM 6th LOS			A			

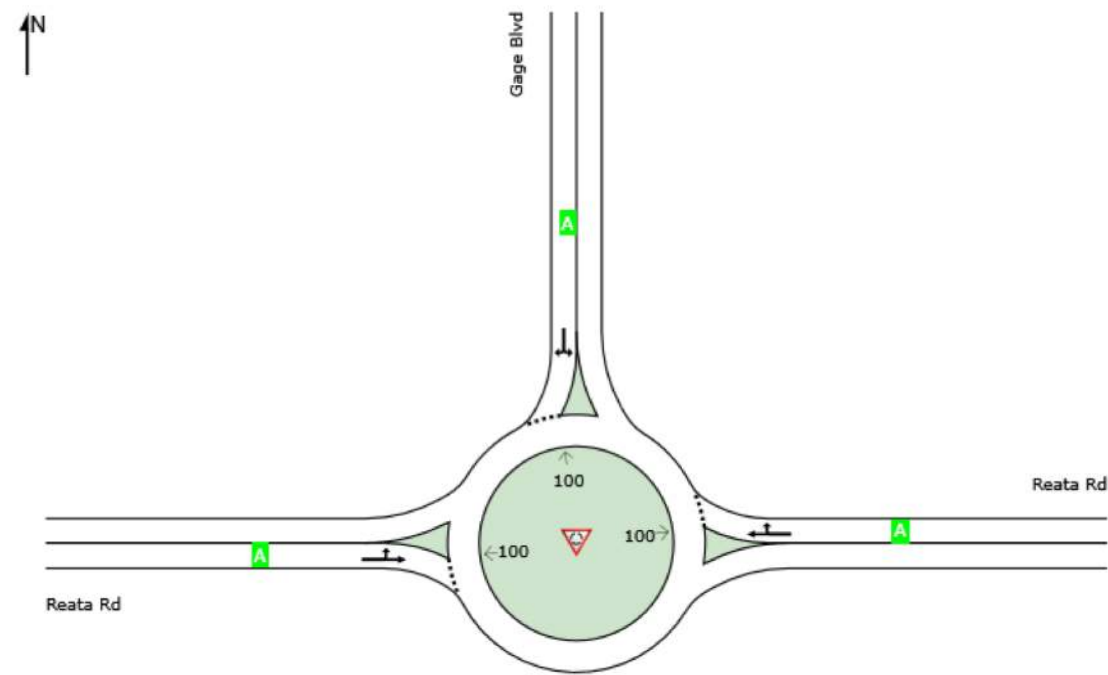
LANE LEVEL OF SERVICE

Lane Level of Service

 **Site: 23 [Gage Blvd / Reata Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

MOVEMENT SUMMARY

 **Site: 23 [Gage Blvd / Reata Rd (Site Folder: 2040 With Project Mitigation - PM Peak Hour)]**

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
East: Reata Rd														
6	T1	208	3.0	226	3.0	0.395	6.7	LOS A	2.5	63.9	0.25	0.11	0.25	34.3
16	R2	251	3.0	273	3.0	0.395	6.7	LOS A	2.5	63.9	0.25	0.11	0.25	33.3
Approach		459	3.0	499	3.0	0.395	6.7	LOS A	2.5	63.9	0.25	0.11	0.25	33.7
North: Gage Blvd														
7	L2	192	3.0	209	3.0	0.230	5.6	LOS A	1.1	28.0	0.42	0.30	0.42	32.6
14	R2	31	3.0	34	3.0	0.230	5.6	LOS A	1.1	28.0	0.42	0.30	0.42	31.7
Approach		223	3.0	242	3.0	0.230	5.6	LOS A	1.1	28.0	0.42	0.30	0.42	32.4
West: Reata Rd														
5	L2	50	3.0	54	3.0	0.248	5.7	LOS A	1.2	31.0	0.41	0.28	0.41	34.3
2	T1	195	3.0	212	3.0	0.248	5.7	LOS A	1.2	31.0	0.41	0.28	0.41	34.3
Approach		245	3.0	266	3.0	0.248	5.7	LOS A	1.2	31.0	0.41	0.28	0.41	34.3
All Vehicles		927	3.0	1008	3.0	0.395	6.1	LOS A	2.5	63.9	0.33	0.20	0.33	33.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Organisation: TENW | Licence: PLUS / 1PC | Processed: Tuesday, May 11, 2021 10:40:37 AM

Project: T:\Active Projects\Badger Mountain South (Richland) - 2020-216\Planning - 2020-216\LOS\BMS - RAB Mitigation Alternatives.sip9

Badger Mountain South**Master Agreement Consistency Recommendation (MACR)
Supplement to the Preliminary Plat Application for Villa Vista
Townhouses****Executive Summary**

The successful development of the Badger Mountain South Master Plan Community requires close attention to the detailed planning and standards created in the adopted Master Agreement, specifically to the Land Use and Development Regulations as found in Exhibit C of the Master Agreement, commonly identified as the LUDR (Land Use and Development Regulations). The LUDR standards are designed to go beyond the more typical City requirements or standards because they are seen by the Master Developer as building blocks to creating a walkable and sustainable community.

The LUDR establishes a process for the review of development applications that is intended to integrate into the existing City application processes, and yet provide the close attention to LUDR standards without adding significant review time by City staff. This is accomplished by requiring each development application to meet all City code submittal requirements and, at the same time, undergo a review for consistency with the standards of the LUDR. This latter review is completed by the Badger Mountain South Master Plan Administrator who makes a written recommendation of consistency to the City's Development Services Manager. A final "Master Agreement Consistency Determination" is issued by the City after the Manager's review.

The document that follows is the Master Plan Administrator's recommendation for a determination of consistency for this application. It includes a review of all relevant standards found in the LUDR related to a preliminary plat application. The standards are cited, the specific responses are provided for this application, and the Reviewer Comment section adds other pertinent information. The document concludes with references to other relevant Master Agreement provisions that are met with this application.

The applicant has stated that this plat will be finalized in one phase. The conditions of the approved Preliminary Plat, the Master Agreement, and specifically, the LUDR must be met before it will be finalized.

Badger Mountain South
Master Agreement Consistency Recommendation (MACR)
Supplement to the Preliminary Plat Application for
Villa Vista Townhomes

Date: December 23, 2020

The purpose of completing the MACR is to ensure that the applicant has met the special requirements for Badger Mountain South, as found in the Land Use and Development Regulations (LUDR). It also allows City staff to be assured that the Master Developer is meeting the terms and obligations of the approved Master Agreement, as it applies to each development activity in Badger Mountain South.

The MACR will be completed by the applicant, as indicated, and submitted with other Preliminary Plat materials, as required in Richland Municipal Code (RMC) Chapter 24.12. It is recommended that the applicant has met with the Master Developer prior to completion of this Supplement.

1. Applicant name, address and contact information:

South Richland Communities
PO Box 1307
Gig Harbor, WA 98335
Contact: Geoff Clark
253-677-3402

2. Project name:

Villa Vista Townhomes

3. Project description including site size in acres:

A subdivision of 13.13 acres total area; 66 lots created all within Badger Mountain South, lying adjacent to and east of Dallas Road and north of Interstate 82.

4. Is phasing proposed? Please explain:

The project will be completed in one phase

5. Regulating Plan District(s) (see LUDR p. 2-2):

Specialty Retail (BMS-SD-SR)

6. What is the name of the neighborhood? (See LUDR pp. 7-1 through 7-3).

Neighborhoods: West Vineyard (LUDR 7-3)

7. What is proposed use? See Allowable Use Table (see LUDR p. 2-3).

Row Houses

8. What building types are likely to be developed here? (See LUDR p. 2-4):

2- and 3-unit shared wall, zero lot line row houses

Section 1

This is the introduction and administration section of the LUDAR and thus it is not applicable to this review.

Section 2

This section identifies the Regulating Plan Districts and permitted land uses.

Please define the District for this application:

District Type:

Specialty Retail (BMS-SD-SR)

Does the requested use meet the requirements outlined in 2.C Land Use?

Yes; see note P-4 on land use table 2.C

Does the requested use meet the Building Type requirements outlined in 2.D Building Type?

Yes; Special districts are not regulated by building type

Section 3

This section identifies the district development standards for five of the districts in Badger Mountain South. Not included are the standards for the three specialty districts which are found in Section 4.

Section 4

This section identifies the special district development standards. The Special Districts are outlined in section 2.B.

Does the proposed project meet the intent of the Special District development standards? Explain.

Yes; The Special District development standards are intended to accommodate a wide variety of uses meant to encourage shopping, dining, business offices, entertainment centers, and multi-family residences for a pedestrian-friendly, integrated development.

Section 5

This section identifies the open space, trails, and community facilities that will be constructed in Badger Mountain South.

Badger Mountain South - MA Section 25.3

"As part of the Master Plan Consistency Determination described in Paragraph 23, the City, shall consult with the Master Agreement Administrator, and the applicant in determining the appropriate share of infrastructure and mitigation costs that shall be borne by the proposed development and how that development's share of infrastructure and mitigation relates to the overall infrastructure and mitigation that is required for buildout of Badger Mountain South."

Does the number of residential lots trigger additional MA Exhibit D, Green Infrastructure Improvements?

Yes X No

Please explain:

Green Infrastructure Improvements are required and as found in the Master Agreement Exhibit D, are linked to the numbers of residential units (RU) developed.

In the case of Villa Vista Townhomes Preliminary Plat, 64 multi-family units are anticipated for a total

of 64 RU. With the improvements identified below, this Preliminary Plat meets the requirements of the Master Agreement, Exhibit D.

For planning purposes, it is assumed that the Green Infrastructure requirements of 68 RU will be provided in the following manner:

Requirement	Improvement Required/Provided
Primary and Secondary Trails	<u>City Primary</u>
400 LF of equivalent trail to	Trail 0 LF
be created per 25 RU, which	<u>Primary Trail</u>
equals 16 LF per RU.	1088 LF Required
So, 68 RU=1088 Equivalent	1225.7 LF Provided along
LF Required	Trowbridge frontage of Villa Vista
Equivalent trail lengths shall	<u>Secondary Trail</u>
be applied be the length of	0 LF Required
trail constructed multiplied by	0 LF Provided
the appropriate trail factor	<u>Equestrian Trail</u>
below:	0 LF
City Primary Trail =	<u>Urban</u>
1 Primary Trail = 1	<u>Trail</u> 0 LF
Secondary Trail = .6	
Equestrian Trail = .8 (where	
shown on trail plan)	
Urban Trail = 1	
Parks	
0.375 AC of park area to be	.96 AC of park area required.
created per 25 RU, which	To be accounted for in the COR
equals 0.015 AC, or 650 SF,	Park on 32 acres adjacent to the
per RU.	project

Other Comments:

Nor Am Investment, LLC and South Richland Communities, LLC are currently supporting the COR in ongoing planning of a large park adjacent to this project. The park will also contain required trails. NAI and SRC currently plan to construct the park and all Green Infrastructure requirements are to be satisfied with this park. Therefore, this requirement is deemed to have been met.

There is an active comprehensive traffic mitigation plan study currently underway. Under the direction of the Master Plan Administrator, South Richland Communities contracted with TENW Engineers located in Tacoma, Washington to conduct the study. TENW has coordinated their efforts with the City of Richland's traffic engineer to make sure the City approves the scope and methodology that will be used for the study. The study is a comprehensive analysis of the entire project and surrounding area rather than an incremental study as outlined in the Master Agreement per the City of Richland's request. As part of the study, TENW collected actual traffic counts in Badger Mountain South and found the peak afternoon trips are at or below the Phase 1 requirements in the Master Agreement. The results of this study including any mitigation measures will be submitted by TENW by April 30, 2021. The contract with TENW is attached to this MACR letter. Based on the actual traffic counts and the current comprehensive traffic mitigation study that is underway, the Master Plan Administrator deems the master agreement traffic study requirements met.

Section 6

This section identifies the street layout for the arterial collectors, the proposed layout for the internal collector streets, and the right-of-way standards for each street type in the Badger Mountain South Development.

Is a public street to be constructed?

Yes ☒ No ☐

Provide separate sheet with street type and edge type(s) indicated.

See the proposed preliminary plat.

Section 7

This section establishes the framework for creating the pedestrian-scaled, walkable community of Badger Mountain South by outlining the process for using Block Standards to subdivide land.

LUDR 7.B.2 identifies the Block Size and Configuration should meet the following Block Dimension Standards: Block length= 1000' max., except in VMU District= 400' max. Identify the following for the smallest and largest blocks:

Block length: Smallest: 282 ft.; largest: 866 ft

LUDR 7.B.4 addresses alleys and front facing blocks. Please answer the following: Does the proposal include only blocks to be constructed with alleys?

Yes ☐ No ☒

If yes, skip to LUDAR 7.B.5.a below; otherwise please select response:

Do those blocks with direct street access lots (i.e., without alleys) meet the following criteria:

1. Non-alley load lots do not front onto a Collector Street, except in single-loaded, perimeter location; or, are located in the NE District; or, where located in an area where two districts abut (NG to NE District).

Yes X No

2. Non-alley load lots are not across from a Civic District space.

Yes X No

Per the LUDR 3.E.1, in the NE District houses are typically accessed by streets. Per LUDR 7.B.4.d(1), direct street access lots are permitted onto a Collector Street when they are (i) located in the BMS-NG District; (ii) when they are in the BMS-NG District and are located along the perimeter of the BMS project boundary; or (iii) when they are located in the BMS-NG District where that district abuts the BMS-NE District.

Does this preliminary plat include any areas where the NE and NG districts abut?

Yes No X

LUDR 7.B.5.a Other Block Requirements -In the Village Mixed Use (VMU), Neighborhood Collector (NC), and Neighborhood General (NG) Districts, two (2) building types required on each block; see Section 2.D. for Building Type Table. Identify Building Types proposed if known or enter N/A:

N/A for this District type

LUDR 7.B.4 Dead-end alleys greater than 150' ft. are not permitted; are dead end alleys greater than 150' proposed?

Yes No X

Section 8

This section identifies the design standards for each of the Building Types allowed within the Districts.

LUDR 8.B - 8.P Lot Size by District and Proposed Building Type. In LUDAR 7.B.5.a (above), proposed Building Types were identified for this project. Do the proposed lot size(s) meet the proposed Building Types lot standards?

Yes X No

Please describe:

Special Districts are not regulated by Building Type. See Section 4 for District intent and standards. See also 8.C for Common Design Standards applicable to all districts.

Recommendation of Consistency:

It is my opinion as the Master Plan Administrator that the application as submitted is consistent with the intent and the purpose of the Master Agreement relative to this plat dated 10/13/20 and the approved LUDAR.

Signature: 

Date: 05/24/2021



www.ci.richland.wa.us

May 28, 2021

Development Permitting Division

625 Swift Blvd.

Richland, WA 99352

Telephone 509-942-7794

Fax 509-942-7764

MASTER AGREEMENT CONSISTENCY DETERMINATION

For: Preliminary Plat Application of Villa Vista Townhomes, a Badger Mountain South Development (S2021-102)

Applicant: South Richland Communities, LLC

Project Description: A subdivision of 13.31 acres into 68 residential lots and four tracts as depicted on the preliminary plat submittal.

Consistency Determination Type: Level 1

Master Agreement Consistency Recommendation: The Richland Planning Department received a revised master agreement consistency recommendation from the Badger Mountain South Master Program Administrator on May 26, 2021.

After completing the review of the preliminary plat application of Villa Vista Townhomes, evaluating it against the standards contained in the adopted Land Use and Development Regulations (LUDR) for the Badger Mountain South Community and the Master Agreement between the City of Richland and Nor Am Investments, LLC and after reviewing the recommendation of the Badger Mountain South Master Program Administrator, I find that the application is consistent with the Master Agreement and the LUDR and hereby issue this Master Agreement Consistency Determination. This determination is made with the understanding that a traffic impact analysis has been provided to the city and that the Villa Vista Townhomes plat may not move forward with development until such time the traffic revisions recommended in the TIA and agreed upon by the City Public Works office, have been completed.

Sincerely,

A handwritten signature in blue ink, appearing to be 'S. O'Hall', is written below the 'Sincerely,' text.

Shane O'Neill,
Senior Planner



www.ci.richland.wa.us

Development Permitting Division

625 Swift Blvd.

Richland, WA 99352

Telephone 509-942-7794

Fax 509-942-7764

May 28, 2021

PLANNED ACTION CONSISTENCY DETERMINATION

For: Preliminary Plat Application of Villa Vista Townhomes, a Badger Mountain South Development (S2021-102)

Applicant: South Richland Communities, LLC

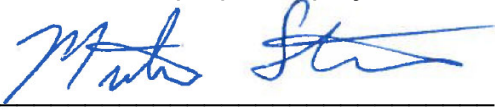
Project Description: A subdivision of approximately 13.31 acres into 68 residential lots and four tracts as depicted on the preliminary plat submittal.

Master Agreement Consistency Determination: Issued May 28, 2021.

After completing the review of the preliminary plat application of Villa Vista and evaluating it in light of the mitigating conditions established in the Final Supplemental Environmental Impact Statement prepared for the Badger Mountain South Subarea Plan and as delineated as Exhibit B in the Master Agreement between the City of Richland and Nor Am Investments, LLC, the City finds the following:

1. The Villa Vista preliminary plat meets the description for a planned action as defined in City code and that as conditioned, the project will implement any applicable conditions or mitigation measures identified in RMC 19.50 (Consistency with Development Regulations and SEPA);
2. The Villa Vista preliminary plat is consistent with the City of Richland Comprehensive Plan and the Badger Mountain Subarea Plan;
3. The Villa Vista preliminary plat is consistent with the Master Agreement between the City and Nor Am Development, LLC regarding development of Badger Mountain South, as evidenced by the Master Agreement Consistency Determination issued by the City on May 28, 2021;
4. The probable significant adverse environmental impacts of the proposed project have been adequately addressed in the Planned Action Ordinance [RMC 19.50.030 (B)] and as described in the Badger Mountain South Planned Action Consistency Determination for Villa Vista preliminary plat;

5. The Villa Vista preliminary plat is not an essential public facility, as defined in RCW 36.70A.200.
6. Based on the foregoing, a SEPA threshold determination or EIS is not required.
7. The following environmental mitigation conditions shall apply to the Villa Vista Townhomes preliminary plat:
 - a. Erosion control measures as required by City of Richland shall be implemented; vegetative cover on exposed soils shall be provided as soon as practicable following clearing and grading activities; water of exposed soils shall be performed in accordance with Benton Clean Air Authority requirements; soils shall be compacted at densities appropriate for planned uses.
 - b. The applicants shall submit a dust control plan to the Benton County Clean Air Authority for their review and approval. All construction work shall be performed in accordance with the provisions of the approved dust control plan.
 - c. The applicants shall submit an erosion control plan to the City of Richland Public Works Department for their review and approval based on the Washington State Department of Ecology Stormwater Management Manual for Eastern Washington. All construction work shall be performed in accordance with the provisions of the approved erosion control plan which shall be consistent with City standards.
 - d. The applicants shall conform to City noise standards.
 - e. Transportation mitigation measures shall be applied pursuant to the most recent traffic impact analysis prior to recording any phase of Villa Vista. The mitigation measures identified therein shall be implemented in accordance with the planned action ordinance.
 - f. Potable water systems shall be designed and constructed in accordance with City standards.
 - g. Sewer systems shall be designed and constructed in accordance with City standards.
 - h. All residential dwelling units shall be constructed with a residential fire sprinkler system.
 - i. Energy conservation measures and sustainability standards as established in the LUDR shall apply to new construction within the proposed project.



Mike Stevens,
SEPA Responsible Official

May 28, 2021

Chapter 19.50

CONSISTENCY WITH DEVELOPMENT REGULATIONS AND SEPA

Sections:

19.50.010 Determination of consistency.

19.50.020 Initial SEPA analysis.

19.50.030 Categorically exempt and planned actions.

19.50.010 Determination of consistency

A. Purpose. When the city receives a project permit application, consistency between the proposed project and the applicable regulations and comprehensive plan should be determined through the process in this chapter and the city's adopted SEPA ordinance, Chapter 22.09 RMC.

B. Consistency. During project permit application review, the city shall determine whether the items listed in this subsection are defined in the development regulations applicable to the proposed project. In the absence of applicable development regulations, the city shall determine whether the items listed in this subsection are defined in the city's adopted comprehensive plan. This determination of consistency shall include the following:

1. The type of land use permitted at the site, including uses that may be allowed under certain circumstances, if the criteria for their approval have been satisfied;
2. The level of development, such as units per acre, density of residential development in urban growth areas, or other measures of density;
3. Availability and adequacy of infrastructure and public facilities identified in the comprehensive plan, if the plan or development regulations provide for funding of these facilities as required by Chapter 36.70A RCW; and
4. Character of the development, such as development standards.

C. Concurrency. For Type II and Type III applications, a concurrency review shall be completed by the city. The review shall consist of an evaluation of the transportation impacts created by the proposed project on the city street system. The city shall make a determination as to whether the transportation impacts of the proposed project will cause the level of service on the city street system to drop below the level of service adopted in the city's comprehensive plan. In the event that a proposed project is anticipated to create a drop in the level of service below the standard adopted in the comprehensive plan, the city shall identify mitigation measures that could be implemented to prevent the projected decline in the level of

service. Nothing in this section would prevent an applicant from modifying his proposal to avoid a projected decline in the level of service. Mitigation measures may not be necessary if the city has a transportation project listed in its adopted six-year plan that, if implemented, would prevent the decline in the projected level of service. [Ord. 12-96; Ord. 02-00; Ord. 29-12 § 1.01].

19.50.020 Initial SEPA analysis

A. The city shall also review the project permit application under the requirements of the State Environmental Policy Act (“SEPA”), Chapter 43.21C RCW; the SEPA rules, Chapter 197-11 WAC; and RMC Title 22 (Environment), and shall:

1. Determine whether the applicable regulations require studies that adequately analyze all of the project permit application’s specific probable adverse environmental impacts;
2. Determine if the applicable regulations require measures that adequately address such environmental impacts;
3. Determine whether additional studies are required and/or whether the project permit application should be conditioned with additional mitigation measures;
4. Provide prompt and coordinated review by government agencies and the public on compliance with applicable environmental laws and plans, including mitigation for specific project impacts that have not been considered and addressed at the plan or development regulation level.

B. In its review of a project permit application, the city may determine that the requirements for environmental analysis, protection and mitigation measures in the applicable development regulations, comprehensive plan and/or in other applicable local, state or federal laws provide adequate analysis of the mitigation for the specific adverse environmental impacts of the application.

C. A comprehensive plan, development regulation or other applicable local, state or federal law provides adequate analysis of and mitigation for the specific adverse environmental impacts of an application when:

1. The impacts have been avoided or otherwise mitigated; or
2. The city has designated as acceptable certain levels of service, land use designations, development standards or other land use planning required or allowed by Chapter 36.70A RCW.

D. In its decision whether a specific adverse environmental impact has been addressed by an existing rule or law of another agency with jurisdiction with environmental expertise with regard to a specific environmental impact, the city shall

consult orally or in writing with that agency and may expressly defer to that agency. In making this deferral, the city shall base or condition its project approval on compliance with these other existing rules or laws.

E. Nothing in this section limits the authority of the city in its review or mitigation of a project to adopt or otherwise rely on environmental analyses and requirements under other laws, as provided by Chapter 43.21C RCW.

F. The city shall also review the application under RMC Title 22 (Environment). [Ord. 12-96; Ord. 29-12 § 1.01].

19.50.030 Categorically exempt and planned actions.

A. Categorically Exempt. Actions categorically exempt under RCW 43.21C.110(1)(a) do not require environmental review or the preparation of an environmental impact statement. An action that is categorically exempt under the rules adopted by the Department of Ecology (Chapter 197-11 WAC) may not be conditioned or denied under SEPA.

B. Planned Actions.

1. A planned action does not require a threshold determination or the preparation of an environmental impact statement under SEPA, but is subject to environmental review and mitigation under SEPA.

2. A “planned action” means one or more types of project action that:

a. Are designated planned actions by an ordinance or resolution adopted by the city;

b. Have had the significant impacts adequately addressed in an environmental impact statement prepared in conjunction with:

i. A comprehensive plan or subarea plan adopted under Chapter 36.70A RCW; or

ii. A fully contained community, a master planned resort, a master planned development or a phased project;

c. Are subsequent or implementing projects for the proposals listed in subsection (B)(2)(b) of this section;

d. Are located within an urban growth area, as defined in RCW 36.70A.030;

e. Are not essential public facilities, as defined in RCW 36.70A.200; and

f. Are consistent with the city’s comprehensive plan adopted under Chapter 36.70A RCW.

C. Limitations on Planned Actions. The city shall limit planned actions to certain types of development or to specific geographical areas that are less extensive than the jurisdictional boundaries of the city, and may limit a planned action to a time period identified in the environmental impact statement or the adoption of this chapter.

D. During project review, the city shall not reexamine alternatives to or hear appeals on the items identified in RMC 19.50.010(B), except for issues of code interpretation.

E. Project review shall be used to identify specific project design and conditions relating to the character of development, such as the details of site plans, curb cuts, drainage swales, the payment of impact fees, or other measures to mitigate a proposal's probable adverse environmental impacts. [Ord. 12-96; Ord. 29-12 § 1.01].



CITY OF RICHLAND NOTICE OF APPLICATION AND PUBLIC HEARING (S2021-102)

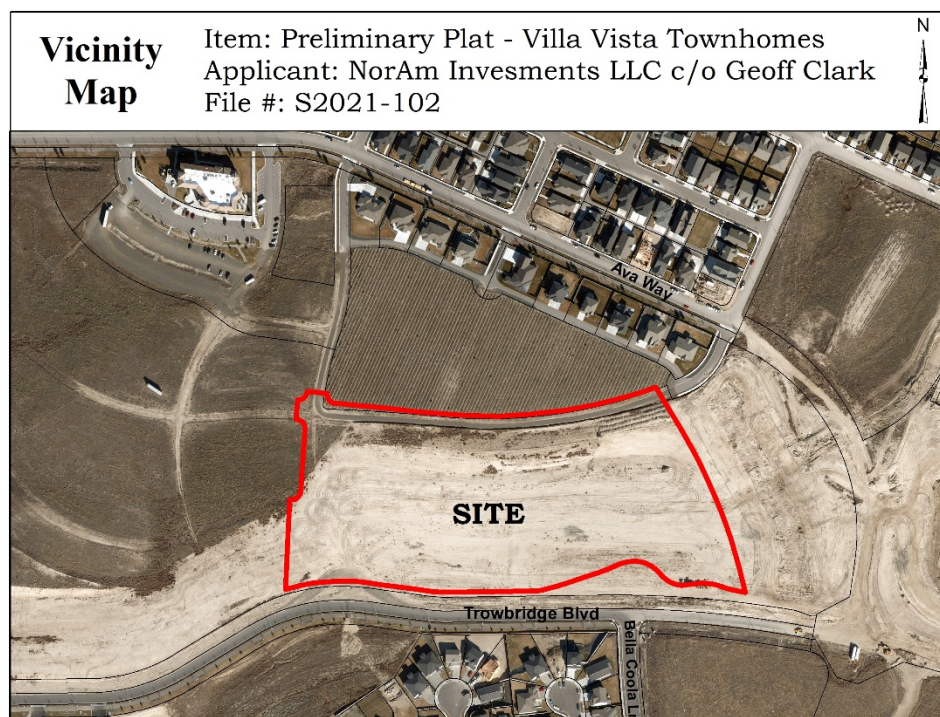
Notice is hereby given that Geoff Clark has filed an application on behalf of NorAm Investments, LLC for preliminary plat approval to subdivide a 13.31 acre site into 68 residential lots referred to as the Preliminary Plat of Villa Vista Townhomes. The project site is located along the north side of Trowbridge Boulevard, approximately 1,050-feet east of Dallas Road in the Badger Mountain South master planned community (APN 1-32982BP4732021). The plat proposes an average lot size of 5,867 square feet.

The Richland Hearings Examiner will conduct a public hearing and review of the application at 6:00 p.m., Monday, June 14, 2021. All interested parties are invited to participate in the virtual public hearing by visiting the City of Richland website (www.ci.richland.wa.us).

Environmental Review: The proposal is not subject to specific environmental review. Environmental impacts of Badger Mountain South, a master planned community, have previously been analyzed. The final environmental impact statement and related file information are available to the public and can be viewed at www.ci.richland.wa.us.

Any person desiring to express their views or to be notified of any decisions pertaining to this application should notify Shane O'Neill, Senior Planner, 625 Swift Boulevard, MS-35, Richland, WA 99352. Comments may also be faxed to (509) 942-7764 or emailed to soneill@ci.richland.wa.us. Written comments should be received no later than 5:00 p.m. on Friday, June 4, 2021 to be incorporated into the staff report. Comments received after that date will be entered into the record at the hearing.

The application will be reviewed in accordance with the regulations in RMC Title 19 Development Regulations Administration, Title 24 Plats and Subdivisions, the Badger Mountain South Land Use & Development Regulations and the Badger Mountain South Master Agreement. Appeal procedures of decisions related to the above referenced application are set forth in RMC Chapter 19.70. Contact the Richland Planning Division at the above referenced address with questions related to the available appeal process.



AFFIDAVIT OF POSTING

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

COMES NOW, **Shane O'Neill**, who, being first duly sworn upon oath deposes and says:

1. I am an employee in the Planning Division of the Development Services Department for the City of Richland.

2. On the 10th day of May, 2021, I posted the attached NOTICE OF PUBLIC HEARING, File Number S2021-102 (Preliminary Plat of Villa Vista Townhomes) in the following location:

The north side of Trowbridge Boulevard immediately west of the intersection of Bella Coola Lane and Trowbridge Boulevard



Signed: Shane O'Neill

SIGNED AND SWORN to before me this 10th day of May, 2021, by Shane O'Neill.




Signature of Notary

Briana C. Ghbein
Printed Name

Notary Public in and for the State of Washington,
Residing in Benton county, WA
My appointment expires: 4-25-23

AFFIDAVIT OF MAILING

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

COMES NOW, Briana Ghbein, who, being first duly sworn upon oath deposes and says:

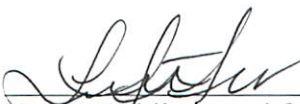
1. I am an employee in the Planning & Development Department for the City of Richland.

2. On the 10th day of May, 2021, I mailed a copy of the attached NOTICE OF APPLICATION AND PUBLIC HEARING (S2021-102) to the attached list of individuals via regular USPS on the date indicated above. The Richland Hearing Examiner will conduct a virtual public hearing at 6:00 PM on Monday, June 14, 2021.


Signed: Briana Ghbein

SIGNED AND SWORN to before me this 10th day of May, 2021 by Briana Ghbein.




Notary Public in and for the State of Washington,


Print Name
Residing at 1025 Swift Blvd 99352
My appointment expires: 4-25-23

owner	mail addr_line1	addr_city	addr_state	addr_zip
TADESSE MELESSE & GEBRETSADIK KONJIT KASSA	2371 BELLAVIEW AVE	RICHLAND	WA	99352
KEVIN & KIM KELLER	3710 CANYON LAKES DR L106	KENNEWICK	WA	99337
LAWRENCE TRUSTEE DAMON E	4524 AVA WAY	RICHLAND	WA	99352
BADGER MOUNTAIN SOUTH COMMUNITY ASSOCIATION	12513 AVENUE DUBOIS SW	LAKEWOOD	WA	98498
KENNETH & TERESA MEAD	4608 VINEYARD ESTATE LANE	RICHLAND	WA	99352
AMANDA HELMANN	4594 VINEYARD ESTATE LANE	RICHLAND	WA	99352
OSMAN & AFTAB AHMED	4566 VINEYARD ESTATE LANE	RICHLAND	WA	99352
ANDREA BROWN & DEXTER BROWN	4546 VINEYARD ESTATE LANE	RICHLAND	WA	99352
RUSSELL PFEIFFER & BARB THRALL	4518 VINEYARD ESTATE LANE	RICHLAND	WA	99352
DANIEL & LYNNDELL AFFLECK	4504 VINEYARD ESTATE LANE	RICHLAND	WA	99352
NOR AM INVESTMENT LLC	PO BOX 1307	GIG HARBOR	WA	98335
MONSON DEVELOPMENT WASHINGTON LLC	63615 E JACOBS RD	BENTON CITY	WA	99320
ANTONIO & RACHEL ANZUREZ	2246 MORRIS AVE	RICHLAND	WA	99352
ANTHONY HOWARD	2234 MORRIS AVE	RICHLAND	WA	99352
JOHN & BRIANNA YOUNG	2222 MORRIS AVE	RICHLAND	WA	99352
REED MURRI	1245 GAGE BLVD	RICHLAND	WA	99352
MATTHEW & JACQUELINE TUTTLE	2233 MORRIS AVE	RICHLAND	WA	99352
JOHN A & ELIZABETH TORRES	2245 MORRIS AVE	RICHLAND	WA	99352
LISA SANDERS	2268 SEVILLA CT	RICHLAND	WA	99352
TCB CONSTRUCTION LLC	3102 S EVERETT ST	KENNEWICK	WA	99336
JAMES & MAYRA KNOX	2244 SEVILLA CT	RICHLAND	WA	99352
ALI SABRI & TAMEEMI DHUHA AL	2232 SEVILLA CT	RICHLAND	WA	99352
PAUL & ANITA IVANOV	3019 DUPORTAIL ST #176	RICHLAND	WA	99352
ANGELA & ANTHONY BORNINO	2243 SEVILLA CT	RICHLAND	WA	99352
STEVEN & ANGIE GOODRICH	4844 SMITTY DRIVE	RICHLAND	WA	99352
MARK & TIFFANY DEGEORGE	4856 SMITTY DRIVE	RICHLAND	WA	99352
BADGER DEVELOPERS LLC	PO BOX 1307	GIG HARBOR	WA	98335
CORPORATION OF THE PRESIDING BISHOP OF THE CHURCH OF JESUS CHRIST OF L	50 EAST NORTH-TEMPLE ST	SALK LAKE CITY	UT	84150
SOUTH RICHLAND COMMUNITIES LLC	PO BOX 1307	GIG HARBOR	WA	98335

THANK YOU for your legal submission!

Your legal has been submitted for publication. Below is a confirmation of your legal placement. You will also receive an email confirmation.

ORDER DETAILS**Order Number:**

IPL0023185

Order Status:

Submitted

Classification:

Legals & Public Notices

Package:

TRI - Legal Ads

Final Cost:

135.78

Payment Type:

Account Billed

User ID:

IPL0024915

ACCOUNT INFORMATION

CITY OF RICHLAND/LEGALS IP

625 SWIFT BLVD. MS-11

RICHLAND, WA 99352

509-942-7547

AccountsPayable@ci.richland.wa.us

CITY OF RICHLAND/LEGALS

TRANSACTION REPORT**Date**

May 10, 2021 4:53:44 PM EDT

Amount:

135.78

SCHEDULE FOR AD NUMBER IPL00231850

May 16, 2021

Tri-City Herald

PREVIEW FOR AD NUMBER IPL00231850

**CITY OF RICHLAND
NOTICE OF APPLICATION,
PUBLIC HEARING, AND
OPTIONAL DNS**

Bethel Church c/o Green Plan Construction, LLC, has filed an application for a 70-lot residential subdivision named the Preliminary Plat of Fairhaven. The site is located immediately north of Shockley Road, approximately 1,700 feet west of Keene Road. The Richland Hearing Examiner will conduct a virtual public hearing and review of the application on Monday, June 14, 2021 at 6:00 p.m. All interested parties are invited to participate in the virtual public hearing by visiting the City of Richland website at www.ci.richland.wa.us. Environmental Review: The proposal is subject to environmental review. The City of Richland is lead agency for the proposal under the State Environmental Policy Act (SEPA) and has reviewed the proposed project for probable adverse environmental impacts and expects to issue a determination of non-significance (DNS) for this project. The optional DNS process in WAC 197-11-355 is being used. This may be your only opportunity to comment on the environmental impacts of the proposed development. The environmental checklist and related file information are available to the public and can be viewed at www.ci.richland.wa.us. Any person desiring to express their views or to be notified of any decisions pertaining to this application should notify Shane O'Neill, Senior Planner, 625 Swift Boulevard, MS-35, Richland, WA 99352. Comments may also be faxed to (509) 942-7764 or emailed to sonell@ci.richland.wa.us. Written comments should be received no later than 5:00 p.m. on Friday, June 4, 2021 to be incorporated into the staff report. Comments received after that date will be entered into the record at the hearing. Published: Sunday, May 16, 2021
W00000000
Publication Dates

[<< Click here to print a printer friendly version >>](#)

ONeill, Shane

From: Matt Tuttle <mj_tuttle@hotmail.com>
Sent: Sunday, May 16, 2021 2:33 PM
To: ONeill, Shane
Subject: Villa Vista Townhome application viewpoint

Mr. O'Neill,

Hello, my name is Matt Tuttle; I live at 2233 Morris Ave in Richland, WA 99352--across the street from the proposed Villa Vista Townhome development.

Thank you to the City of Richland for making local residents aware of this proposed development and for providing an efficient channel of communication to provide viewpoints.

I am disappointed and very discouraged to see this proposal--and that the City is even taking applications to develop that area as residential property. I have lived at my current address for over two years now; moving in shortly after the house was finished being built in early 2019, and have really enjoyed the neighborhood and its rural feel. However, since that time, more and more new houses have been built and a new apartment complex was constructed; the area is becoming densely populated, with more to come. Trowbridge has also become heavily trafficked, along with Bella Coola, and a great number of loud-engine cars have decided to make both roads drag strips; the creation of a traffic circle is only going to just add more distance for those cars to accelerate farther, faster, and louder--yet more and more houses, cars and people are moving into a compact area of land.

I moved into my house knowing more growth was coming; the traffic and speedsters dampen that joy, but that don't completely extinguish it, as I have held hope for planned city parks, recreation areas, trails, and a quaint wine village. This townhouse application seems to read that those previous development plans are quickly pivoting and that Badger Mountain South is on a trajectory to stuff as many people into the area, rather than build a special community and a wonderful wine destination.

The City of Richland still has the opportunity to make this area great for residents and for tourists; pumping more residential development into 13 acres creates an over-populated section of that town that will quickly lose its charm, become congested with traffic, and be filled with the sound of revving, unmuffled muscle cars marking their territory.

I am going to oppose this development, and work to get my fellow neighbors to support that as well--not because I'm opposed to people moving in, but because the optics appear that the City of Richland is losing sight of their original vision and is losing sight of how special this area of town can be--both as a community and as a destination. I would ask that the City application review committee stand on the corner of Trowbridge and Bella Coola someday and remind themselves what this area can truly become--and to listen to the cars and how it is today. You all have an opportunity to make this part of town unique, charming and special; adding 68 residential townhouses into 13 acres will just make this area average, at best, and a footnote for southeast Washington. Thank you.

Matt Tuttle

2233 Morris Ave.
Richland, WA 99352
512-354-6033

ONeill, Shane

From: cbreitkreitz@aol.com
Sent: Thursday, June 3, 2021 9:45 PM
To: O'Neill, Shane
Subject: Land Use Action S2021-102 Preliminary Plat of Villa Vista Townhomes

Hello Mr. O'Neill,

This e-mail is in reference to Land Use Action S2021-102 Preliminary Plat of Villa Vista Townhomes, which provided your name and email as the City of Richland's POC for any comments, etc., to be submitted to you by fax or email (by June 4, 2021 at 5pm).

We are homeowners in the Badger Mountain South community, and are submitting this e-mail in opposition (or to suggest some changes) to S2021-102, hoping to bring it in line with the intent and vision of the Master Agreement Regarding the Community Known as Badger Mountain South (the "Master Agreement"), and Exhibit C to the Master Agreement - i.e. the Land Use and Development Regulations (the "LUDR").

Geoff Clark filed his application on behalf of NorAm Investments, LLC ("NorAm), proposing the construction of "Row Houses" in the Specialty Retail Special District (See, BMS-SD-SR: SPECIALTY RETAIL, as described in the LUDR p. 2-2). In support, NorAm claims the requested use meets the requirements outlined in 2.C Land Use, referencing the "P-4" notation on the Land Use Table, 2.C, of the LUDR. NorAm further claims that the proposed project meets the intent of the Special District development standards, claiming "The Special District development standards are intended to accommodate a wide variety of uses meant to encourage shopping, dining, business offices, entertainment centers, and multi-family residences for a pedestrian-friendly, integrated development."

A review of the Land Use Table, 2.C, does seem to provide permission to build "Row Houses", subject to the P-4 classification. A further review of the P-4 characterization reveals the following language: "Multi-family housing includes the following Building Types – Live/work; Row house; Commercial/Mixed-use/Liner over commercial and Stacked Units."

However, upon reviewing the LUDR's BMS-SD-SR: SPECIALTY RETAIL area description (page 2-2), one would find the following language: "The Specialty Retail Special District is intended to support the growing interest in local and regional agricultural products, in particular the local wine industry."

We would submit that the construction of Row Houses within BMS-SD-SR: SPECIALTY RETAIL area, **and nothing more, without** any street level shops devoted to the local wine industry and/or regional agricultural products would *not* serve the LUDR's true intent of "support[ing] the growing interest in local and regional agricultural products, in particular the local wine industry."

When many of the residents first purchased our homes in the Badger Mountain South community, we were led to believe that the BMS-SD-SR: SPECIALTY RETAIL area would be the future home of a wine village and related shops, a wine cave, plazas, etc. In fact, the LUDR [4.B BADGER MOUNTAIN SOUTH SPECIAL DISTRICT- SPECIALTY RETAIL (BMS-SD-SR), p. 4-2] contemplated the creation of an area that would serve the City of Richland (as well as the region) by: a. Providing a gathering place for group events, festivals and other community-wide activities; b. Providing sites for: vineyards, wine caves, wineries, tasting rooms, wine making, other specialty brewing and craft distilling, the sale of other agricultural-related products, education, retail and hospitality that support this focus; and c. Showcasing innovative sustainable design features in both building and site design.

While “Row Homes” are seemingly within the approved classification of the Land Use Table, 2.C, and likely within the intent of the Master Agreement, we submit it would be inappropriate for the City of Richland to allow NorAm’s construction of the Row Houses in the BMS-SD-SR: SPECIALTY RETAIL area, almost exclusively exhausting the area originally set aside for its intended purpose. Plainly stated, the construction of “Row Houses” alone does not “support the growing interest in local and regional agricultural products, in particular the local wine industry,” nor does it honor the intent of the Master Agreement and LUDR [4.B BMS-SD-SR].

Instead, we submit that it would be more appropriate for the City of Richland to preserve the BMS-SD-SR: SPECIALTY RETAIL area, and encourage the construction of the LUDR’s originally contemplated amenities, thereby furthering the “live/work”, “mixed-use over commercial” units concept (as contemplated in the P-4 characterization), as well as “support[ing] the growing interest in local and regional agricultural products, in particular the local wine industry.”

Failing to set aside the BMS-SD-SR: SPECIALTY RETAIL area, or preserving a significant portion of it, for the future home of the wine village and related shops, etc. (as contemplated above by the LUDR, 4.B BMS-SD-SR), would be unfaithful to the Master Agreement and the LUDR’s original intent and purpose for the area. Indeed, allowing Row Houses to occupy the SPECIALTY RETAIL area without the above-referenced wine village and related shops, etc., *would be a missed opportunity for the City of Richland to honor the vision of the Badger Mountain South community, and to create something different and unique for the region.*

We appreciate your consideration of our email, and would request that we be notified of any decisions pertaining to this application.

Best regards,

Chris and Allison
4996 McEwan Drive
Richland, WA 99352

ONeill, Shane

From: Eric Mendenhall <emendenhall@westrichland.org>
Sent: Friday, May 28, 2021 9:08 AM
To: O'Neill, Shane
Cc: Prilucik, Jacob; Roscoe Slade
Subject: RE: BMS Traffic

Follow Up Flag: Follow up
Flag Status: Flagged

Shane,

When I calculated the trips I came up with a number of 861 building permitted trips. The BMS Parks Trigger Report shows 781 residential trips. 505 SFR, 276 MF ($276 \times 0.62 = 172$), and 184 commercial trips. This totals **861 total trips** that have been permitted for building permits as of May 1st. My question now is how many final platted lots have been approved? Has that number gone over the 1,000 trips? If the total final platted trips is or will be equal to or greater than 1,000 I would recommend not approving any further final plats until the required work has been completed or bonded as that can put Richland in a precarious situation if they elect to not issue building permits associated with the final platted lots. Especially, while the TENW TIA submitted has not yet been accepted/approved by the City of Richland. As you may be aware West Richland has a third party reviewer checking the TENW TIA report and we plan on providing comments soon. I am more than happy to discuss further if you like. I can be reached at 509.967.7113.

Best regards,

Eric Mendenhall
Community Development Director

From: O'Neill, Shane <soneill@CI.RICHLAND.WA.US>
Sent: Thursday, May 27, 2021 2:43 PM
To: Prilucik, Jacob <PrilucJ@wsdot.wa.gov>
Cc: Eric Mendenhall <emendenhall@westrichland.org>
Subject: BMS Traffic

Jacob, Eric,

As of 5/1, the city has issued permits for 781 residential units in BMS. I am in the process of converting that into trips. I see that Julie West was applying 1:1 ratios for single family and 1:0.62 for multi-family units. The attached trip tracker is old but shows the trip rates. The attached parks trigger doc is the most recent dwelling unit tally. Traffic-related triggers are described in the trip tracker. My report will include conditions for the 600-trip trigger improvements.



Shane O'Neill
Senior Planner
625 Swift Blvd., MS-35 | Richland, WA 99352
(509) 942-7587

ONeill, Shane

From: SEPA (DAHP) <sepa@dahp.wa.gov>
Sent: Friday, May 14, 2021 8:36 AM
To: O'Neill, Shane
Subject: RE: Preliminary Plat Review (S2021-102) Villa Vista Townhomes

Hi Shane,

Good morning. DAHP is requesting that an Inadvertent Discovery Plan be created and kept on site during the grading. Thanks, and please let me know if you have any questions.

Regards,
Dennis

Dennis Wardlaw, M.A.
Transportation Archaeologist
Dept. of Archaeology and Historic Preservation
1110 Capitol Way South, Suite 30
Olympia, WA 98501
Phone: 360-485-5014

 please consider the environment before printing this email

From March 16th until we are told otherwise, DAHP employees will be working remotely. This means that correspondence, phone calls and the processing of invoices/payments may be delayed. Please have patience as we all work together during this difficult time. Thank you!

From: O'Neill, Shane <soneill@CI.RICHLAND.WA.US>
Sent: Friday, May 7, 2021 11:27 AM
To: Anthony Muai <anthony.muai@ci.kennewick.wa.us>; Anthony Von Moos <anthony.vonmoos@co.benton.wa.us>; Ashley Morton <AshleyMorton@ctuir.org>; Badger Mountain Irrigation District <bmidmanager@badgermountainirrigation.com>; Benton County - Segregations <Segregations@co.benton.wa.us>; Benton PUD, Broadband <osp@noanet.net>; Benton PUD, Electrical <engservice@bentonpud.org>; Bill Barlow <bbarlow@bft.org>; Blaine Broberg, KID <bbroberg@kid.org>; Boring, Michael <MBoring@CI.RICHLAND.WA.US>; Boshart, Thomas <tboshart@CI.RICHLAND.WA.US>; Buechler, Ken <KBuechler@CI.RICHLAND.WA.US>; Carrie Thompson <carrie.thompson@bnsf.com>; Casey Barney, Yakama Nation <Casey_Barney@Yakama.com>; Catherine Dickson <catherinedickson@ctuir.org>; Clark Posey <clark.posey@co.benton.wa.us>; Corrine Camuso, Yakama Nation <Corrine_Camuso@Yakama.com>; Hamilton, Craig <C.Hamilton@bces.wa.gov>; SEPA (DAHP) <sepa@dahp.wa.gov>; Darrick Dietrich <darrick@basindisposal.com>; Deanna Davis <d.davis@bces.wa.gov>; Deborah Rodgers <dxrodders@bpa.gov>; Deskins, John <jdeskins@CI.RICHLAND.WA.US>; Eric Mendenhall <emendenhall@westrichland.org>; Florinda Coleman <florinda.coleman@co.benton.wa.us>; ECY RE Former Orchards <formerorchards@ECY.WA.GOV>; Ghbein, Briana <bghbein@ci.richland.wa.us>; Greg McCormick <gregory.mccormick@ci.kennewick.wa.us>; Greg Wendt <greg.wendt@co.benton.wa.us>; Clear, Gwen (ECY) <GCLE461@ECY.WA.GOV>; Hill, Kelly <khill@CI.RICHLAND.WA.US>; USPS Ina N. Beutler <ina.n.beutler@usps.gov>; Jason McShane <jmcsbane@kid.org>; Jennings, Tyler <tjennings@CI.RICHLAND.WA.US>; Jerrod Macpherson <Jerrod.Macpherson@co.benton.wa.us>; Jessica Lally, Yakama Nation <Jessica_Lally@Yakama.com>; Joseph Cichy, Ziply <joseph.cichy@ziply.com>; Joseph Cottrell <jecottrell@bpa.gov>; Junior Campos <junior.campos@charter.com>;



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1250 West Alder Street • Union Gap, Washington 98903-0009 • (509) 575-2490

May 18, 2021

Shane O'Neill
City of Richland
PO Box 190
Richland, WA 99352

Re: S2021-102

Dear Shane O'Neill:

Thank you for the opportunity to comment on the subdivision of 13.31 acres into 68 lots, proposed by Nor Am Investment, LLC. We have reviewed the application and have the following comments.

WATER QUALITY

Project with Potential to Discharge Off-Site

If your project anticipates disturbing ground with the potential for stormwater discharge off-site, the NPDES Construction Stormwater General Permit is recommended. This permit requires that the SEPA checklist fully disclose anticipated activities including building, road construction and utility placements. Obtaining a permit may take 38-60 days.

The permit requires that a Stormwater Pollution Prevention Plan (Erosion Sediment Control Plan) shall be prepared and implemented for all permitted construction sites. These control measures must be able to prevent soil from being carried into surface water and storm drains by stormwater runoff. Permit coverage and erosion control measures must be in place prior to any clearing, grading, or construction.

In the event that an unpermitted Stormwater discharge does occur off-site, it is a violation of Chapter 90.48 RCW, Water Pollution Control and is subject to enforcement action.

More information on the stormwater program may be found on Ecology's stormwater website at: <http://www.ecy.wa.gov/programs/wq/stormwater/construction/>. Please submit an application or contact Lloyd Stevens, Jr. at the Dept. of Ecology, (509) 574-3991 or lloyd.stevensjr@ecy.wa.gov, with questions about this permit.

Sincerely,

A handwritten signature in blue ink that reads "Gwen Clear".

Gwen Clear
Environmental Review Coordinator
Central Regional Office
(509) 575-2012
crosepa@ecy.wa.gov

ONeill, Shane

From: Hill, Kelly
Sent: Thursday, May 20, 2021 9:44 AM
To: O'Neill, Shane
Subject: FW: Villa Vista Townhouses
Attachments: FINAL Plat Design.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Shane,

RES did have a request for 2 additional easements as shown on the attached pdf.

Thanks
Kelly

From: Goulet, Steven <sgoulet@CI.RICHLAND.WA.US>
Sent: Wednesday, May 19, 2021 5:12 PM
To: Hill, Kelly <khill@CI.RICHLAND.WA.US>
Subject: Villa Vista Townhouses

Kelly,

After looking at this again, I did have some minor comments. I would like to see easements in the two yellow shaded regions. The one being outside the pavement plans.

Thanks,



Steven Goulet
Electrical Distribution Engineer
625 Swift Blvd., MS-23 | Richland, WA 99352
(509) 942-7747

Disclaimer: Emails and attachments sent to or from the City of Richland are public records subject to release under the Washington Public Records Act, Chapter 42.56 RCW. Sender and Recipient have no expectation of privacy in emails transmitted to or from the City of Richland.

LEGAL DESCRIPTION

THAT PORTION OF PARCEL A OF RECORD SURVEY 4905 (A.F.# 2017-022372) IN SECTION 32, TOWNSHIP 9 NORTH, RANGE 28 EAST W.M., CITY OF RICHLAND, BENTON COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

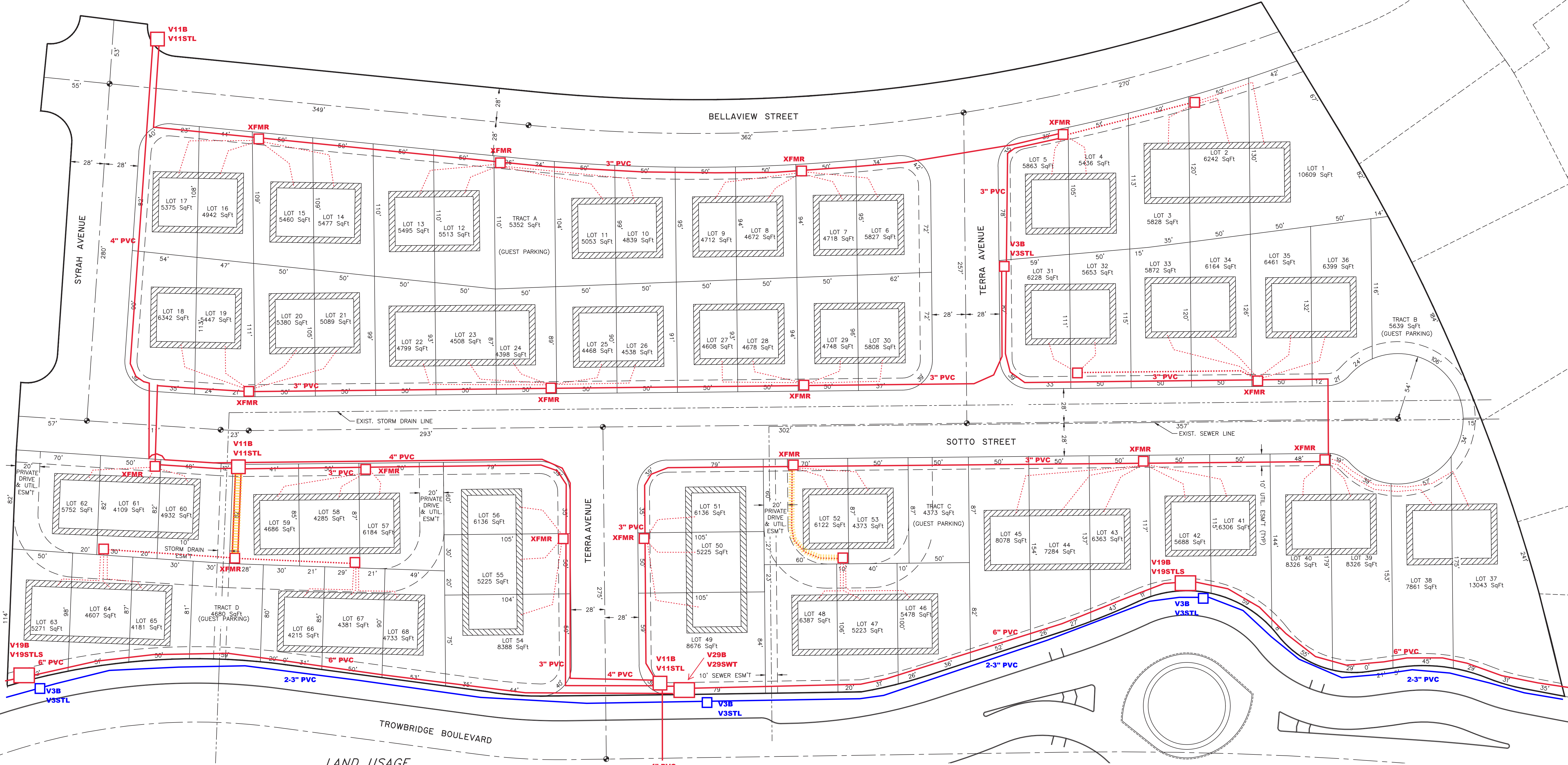
COMMENCING AT THE SOUTHEAST CORNER OF TRACT B OF THE FINAL PLAT OF WEST VINEYARD 1, PHASE 1, RECORDED IN VOLUME 15 OF PLATS, PAGE 458, (A.F.# 2013-010783); THENCE SOUTH 60°47'41" WEST 247.08 FEET TO THE TRUE POINT OF BEGINNING;

THENCE SOUTH 31°11'37" EAST 124.38 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTHWEST HAVING A RADIUS OF 1535.00 FEET; THENCE SOUTHEASTERLY 507.15 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 18°55'49"; THENCE NORTH 79°15'55" WEST 35.15 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHEAST, HAVING A RADIUS OF 157.50 FEET; THENCE NORTHWESTERLY 30.81 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 11°12'33" TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 142.50 FEET; THENCE WESTERLY 74.32 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 29°52'57"; THENCE SOUTH 82°03'40" WEST 26.35 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTH, HAVING A RADIUS OF 80.50 FEET; THENCE WESTERLY 84.32 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 60°00'45" TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 95.50 FEET; THENCE WESTERLY 128.40 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 77°01'53" TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 579.50 FEET; THENCE SOUTHWESTERLY 69.54 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 06°52'31"; THENCE SOUTH 71°55'04" WEST 114.61 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 402.50 FEET; THENCE SOUTHWESTERLY 57.38 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 08°10'04"; THENCE SOUTH 89°08'18" WEST 244.27 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTH, HAVING A RADIUS OF 447.50 FEET; THENCE WESTERLY 66.23 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 08°28'47" THENCE NORTH 82°22'55" WEST 168.99 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 552.50 FEET; THENCE WESTERLY 232.55 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 24°06'58"; THENCE NORTH 02°14'17" EAST 195.93 FEET; THENCE NORTH 03°51'32" EAST 56.00 FEET; THENCE SOUTH 86°08'28" EAST 3.75 FEET; TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 25.00 FEET; THENCE NORTHWESTERLY 38.49 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 90°00'00"; THENCE NORTH 03°51'32" EAST 175.50 FEET; TO THE BEGINNING OF A CURVE, CONCAVE TO THE SOUTHWEST, HAVING A RADIUS OF 25.00 FEET; THENCE NORTHWESTERLY 38.49 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 88°12'48"; THENCE NORTH 84°21'16" WEST 3.31 FEET; THENCE NORTH 05°38'44" EAST 56.00 FEET; TO THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE NORTHWEST HAVING A RADIUS OF 25.00 FEET; THENCE NORTHEASTERLY 40.05 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 91°47'12" (THE LONG CHORD OF SAID CURVE BEARS NORTH 49°45'08" EAST 35.90 FEET) THENCE SOUTH 82°45'44" EAST 56.10 FEET; TO THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE NORTHEAST HAVING A RADIUS OF 25.00 FEET; THENCE SOUTHEASTERLY 38.49 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 88°12'48" (THE LONG CHORD OF SAID CURVE BEARS SOUTH 40°14'52" EAST 34.80 FEET) THENCE SOUTH 84°21'16" EAST 297.43 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTH, HAVING A RADIUS OF 1390.51 FEET; THENCE SOUTHEASTERLY 613.83 FEET ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 25°17'35" TO THE TRUE POINT OF BEGINNING

CONTAINS 13.31 ACRES, MORE OR LESS.

PRELIMINARY PLAT OF
VILLA VISTA TOWNHOMES

LOCATED IN A PORTION OF SECTION 32,
TOWNSHIP 9 NORTH, RANGE 28 EAST, W.M.
CITY OF RICHLAND, BENTON COUNTY, WASHINGTON



DEVELOPER

SOUTH RICHLAND COMMUNITIES LLC
GEOFF CLARK
P.O. BOX 1307
GIG HARBOR, WA. 98335
253-677-3402 (OFFICE)
253-265-3163 (FAX)

OWNER

NOR AM INVESTMENT LLC
GEOFF CLARK
P.O. BOX 1307
GIG HARBOR, WA. 98335
253-677-3402 (OFFICE)
253-265-3163 (FAX)

LAND USAGE

GROSS PLANNING AREA = 13.31 ACRES
3044 LINEAR FEET PLAT STREETS = 3.81 ACRES
3 GUEST PARKING TRACTS = 0.46 ACRES

NET PLANNING AREA = 9.04 ACRES

9.04 ACRES X 43560 SQ. FT. = 5791 SQ. FT.
68 LOTS AVERAGE LOT SIZE

13,043 SQ FT LARGEST LOT (37)
4108 SQ FT SMALLEST LOT (61)

ZONING = BMS-SD-SR

WATER SUPPLY = CITY OF RICHLAND

SEWAGE DISPOSAL = CITY OF RICHLAND

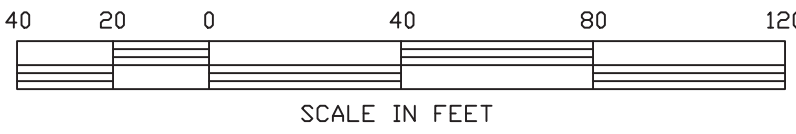
ROAD DESIGN PARAMETER = 16' LOCAL STREET W/ EDGE TYPE A (PUBLIC)

LEGEND

- EXTERIOR PLAT BOUNDARY
- PROPOSED PROPERTY LINE
- PROPOSED EASEMENT
- - - - EXISTING UNDERGROUND UTILITY
- PROPOSED ROAD CENTERLINE
- /// APPROXIMATE FOOTPRINT OF PROPOSED DUPLEX/TRIPLEX

DEVELOPER'S NOTES:

- EACH LOT SHALL INCLUDE AN INDIVIDUAL ATTACHED GARAGE & DRIVEWAY.
- PRIVATE DRIVES OUTSIDE THE PUBLIC ROAD RIGHTS OF WAY SHALL BE MAINTAINED BY THE HOMEOWNERS ASSOCIATION.
- LOTS SHALL NOT HAVE DIRECT ACCESS TO TROWBRIDGE BLVD.



RSI ROGERS SURVEYING INC., P.S.
1455 COLUMBIA PARK TRAIL
RICHLAND, WA. 98352
PHONE (509) 783-4141
FAX: (509) 783-8994
www.rogerssurveying.com

May 20, 2021

City of Richland
625 Swift Blvd.
Richland, WA 99352

Attn: Shane O'Neill, Senior Planner

RE: S2021-102 – Villa Vista Townhomes
SR 82 Exit 106 – Reata Road vicinity

We have reviewed the preliminary plat and have the following comment.

The subject property is in the vicinity of Interstate 82 (I-82) and within the Badger Mountain South (BMS) subarea. It is anticipated the majority of vehicle trips generated by this proposal will utilize the Exit 104/Dallas Road interchange. WSDOT is not opposed to this project or other developments within the subarea; however, we are concerned with the cumulative impact these developments will have on the interchange, including the thresholds used to determine impacts and the proposed mitigation measures.

According to the BMS master agreement between the city and the developer, the developer is required to implement specific mitigation measures based on project peak trip thresholds. It is important to note, I-82 is a Highway of Statewide Significance (HSS) with a Level of Service (LOS) threshold of LOS D. As developments are proposed, we urge the city to ensure the LOS of I-82, including the interchange and ramp terminals, will not fall below LOS D.

Finally, any mitigation measures proposed inside I-82 right-of-way will be required to follow current WSDOT and FHWA design documentation and approval processes. The developer should be aware, the state's preferred alternative for intersection control is the roundabout and signalization of the ramp terminals may not be allowed in this location. We recommend the city and developer coordinate with this office early, in order to avoid any potential delays.

Thank you for the opportunity to review and comment on this proposal. If you have any questions regarding this letter, please contact me at (509) 577-1635.

Sincerely,

Jacob Prilucik
Development Services Supervisor

cc: SR 82, File #2021_007

ONeill, Shane

From: Jennings, Tyler
Sent: Friday, May 7, 2021 11:55 AM
To: ONeill, Shane
Cc: Westphal, Nichole; Stevens, Mike; Boring, Michael
Subject: RE: Preliminary Plat Review (S2021-102) Villa Vista Townhomes

Shane, please provide them the following comment:

Prior to plat recording: Grading permit GR-18-03120 shall have a complete and final geotechnical investigation report and letter documenting completion of grading in accordance with said report submitted to the City of Richland Development Services Dept. Final grading inspection approval shall be granted by said dept. Any specific geotechnical requirements regarding foundation footings and site slopes shall be noted on the face of the plat along with reference to the geotechnical investigation report.

For those involved, please note that this permit has been expired since 9/4/2020, with the last recorded inspection being 8/12/2019. In order to proceed, the permit will need to be reinstated, testing and observation reports submitted, and a final letter from the GER provided that accepts the mass grading.

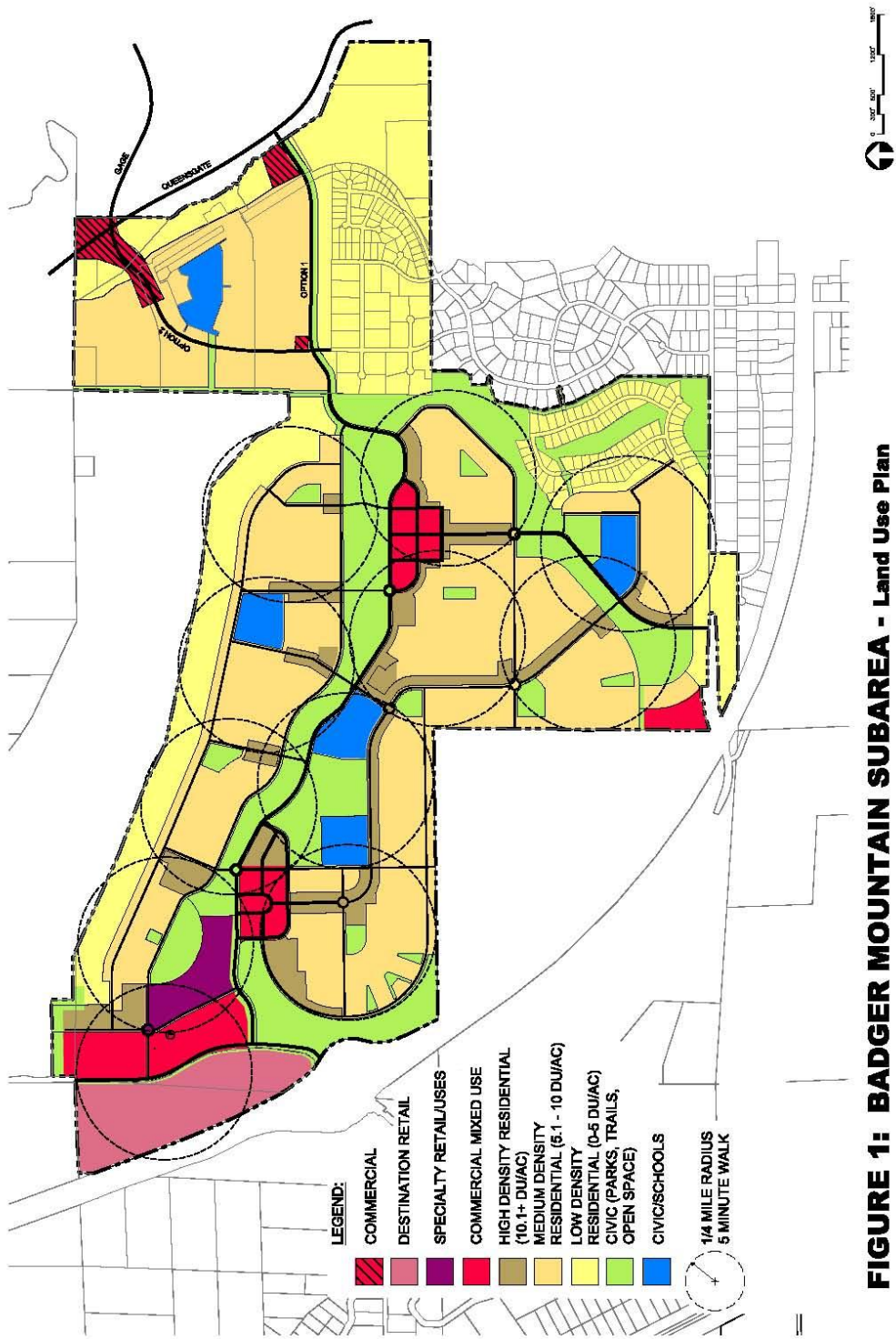
Thank you.



Ty Jennings, CBO · CFM · MCP
Plans Examiner
625 Swift Blvd., MS-35 | Richland, WA 99352
(509) 942-7793

From: ONeill, Shane <soneill@CI.RICHLAND.WA.US>
Sent: Friday, May 7, 2021 11:27 AM
To: Anthony Muai <anthony.muai@ci.kennewick.wa.us>; Anthony Von Moos <anthony.vonmoos@co.benton.wa.us>; Ashley Morton <AshleyMorton@ctuir.org>; Badger Mountain Irrigation District <bmidmanager@badgermountainirrigation.com>; Benton County - Segregations <Segregations@co.benton.wa.us>; Benton PUD, Broadband <osp@noanet.net>; Benton PUD, Electrical <engservice@bentonpud.org>; Bill Barlow <bbarlow@bft.org>; Blaine Broberg, KID <bbroberg@kid.org>; Boring, Michael <MBoring@CI.RICHLAND.WA.US>; Boshart, Thomas <tboshart@CI.RICHLAND.WA.US>; Buechler, Ken <KBuechler@CI.RICHLAND.WA.US>; Carrie Thompson <carrie.thompson@bnsf.com>; Casey Barney, Yakama Nation <Casey_Barney@Yakama.com>; Catherine Dickson <catherinedickson@ctuir.org>; Clark Posey <clark.posey@co.benton.wa.us>; Corrine Camuso, Yakama Nation <Corrine_Camuso@Yakama.com>; Hamilton, Craig <C.Hamilton@bces.wa.gov>; DAHP SEPA Reviews <sepa@dahp.wa.gov>; Darrick Dietrich <darrick@basindisposal.com>; Deanna Davis <d.davis@bces.wa.gov>; Deborah Rodgers <dxrodders@bpa.gov>; Deskins, John <jdeskins@CI.RICHLAND.WA.US>; Eric Mendenhall <emendenhall@westrichland.org>; Florinda Coleman <florinda.coleman@co.benton.wa.us>; FormerOrchards@ecy.wa.gov; Ghbein, Briana <bghbein@ci.richland.wa.us>; Greg McCormick <gregory.mccormick@ci.kennewick.wa.us>; Greg Wendt <greg.wendt@co.benton.wa.us>; Gwen Clear <gcle461@ecy.wa.gov>; Hill, Kelly <khill@CI.RICHLAND.WA.US>; USPS Ina N. Beutler <ina.n.beutler@usps.gov>; Jason McShane <jmcsbane@kid.org>; Jennings, Tyler <tjennings@CI.RICHLAND.WA.US>; Jerrod Macpherson <Jerrod.Macpherson@co.benton.wa.us>; Jessica Lally, Yakama Nation <Jessica_Lally@Yakama.com>; Joseph Cichy, Ziply <joseph.cichy@ziply.com>; Joseph Cottrell <jecottrell@bpa.gov>; Junior Campos <junior.campos@charter.com>; Kelly Cooper <kelly.cooper@doh.wa.gov>; Kevin Knodel <kevin.knodel@rsd.edu>; Kevin Sliger <KSliger@bft.org>; KID

Figure 1: Badger Mountain Subarea Land Use Plan



Looking North

SITE



Looking East

BMS 4-Plexes Site



Looking East

Trowbridge/Bella Coola
Round-About



Looking South



Trowbridge Blvd.

Looking West

Trowbridge Blvd.

SITE





HEARING EXAMINER AGENDA ITEM COVERSHEET

Meeting Date: 6/14/2021

Agenda Category: New Business - Public Hearing

Prepared By: Shane O'Neill, Senior Planner

Subject:
S2021-103 Fairhaven Townhome Estates
Bethel Church

Department:
Development Services

Recommended Motion:
Approval subject to the conditions contained in the June 14 staff report

Summary:
The preliminary plat of Fairhaven proposed to divide approximately 10.2 acres into 70 single family residential lots designed for attached townhome construction. The subject site is comprised of two adjacent tax parcels located on the north side of Shockley Road approximately 1,700 feet west of Keene Road.

Attachments:
1. FULL Staff Report -Fairhaven
2. KID Comments - Fairhaven Additional Comments

**CITY OF RICHLAND DEVELOPMENT SERVICES DIVISION
STAFF REPORT TO THE HEARING EXAMINER**

GENERAL INFORMATION:

PROPOSAL NAME: Fairhaven - Preliminary Plat

LOCATION: 666 & 686 Shockley Road

APPLICANT: Green Plan Construction, LLC c/o Stan Nuxall Jr.

PROPERTY
OWNER: Bethel Church

FILE NO.: S2021-103

DESCRIPTION: Request to divide approximately 10.2 acres into 70 single family residential lots designed for attached townhome construction.

PROJECT TYPE: Type III Preliminary Plat

HEARING DATE: June 14, 2021

REPORT BY: Shane O'Neill, Senior Planner

RECOMMENDED
ACTION: Approval subject to completion of proposed conditions



Figure 1 - Vicinity Map

DESCRIPTION OF PROPOSAL

Green Plan Construction, has filed a preliminary plat application (Exhibit 1) to divide approximately 10.2 acres of land into seventy (70) lots known as the plat of Fairhaven. Proposed lot sizes range from 3,050 square feet to 10,891 square feet; with an average lot size of 5,110 square feet. Access to the plat of Fairhaven will come from two points on Shockley Road. The proposed subdivision survey is provided herein as Exhibit 2.

GENERAL INFORMATION

SURVEYOR: ASHLEY GARZA, PERMIT SURVEYING, INC.
ANNEXATION DATE: JULY 1, 1974
COMPREHENSIVE PLAN: HIGH-DENSITY RESIDENTIAL (10.1 OR MORE DWELLING UNITS PER ACRE)
CURRENT ZONING: R-3 (HIGH-DENSITY RESIDENTIAL)

PROJECT DATA

Gross Plat Area:	10.2 acres
Net Planning Area:	8.3 acres
Number of Lots:	70
Land for Streets/Other:	1.9 acres
Gross Density:	6.86 units/acre
Net Density:	8.43 units/acre

SITE DESCRIPTION & ADJACENT LAND USES

The site consists of two rectangular parcels located on the north side of Shockley Road, west of Keene Road. The site is nearly flat with the exception of the raised earthen KID irrigation pond located in the southeast corner which rises a few feet above the general site-grade.

The site was annexed into the City on July 1, 1974 through adoption of Ordinance No. 40-74.

Property to the west is an approximately five (5) acre, agriculturally zoned, parcel containing a single-family residence with two (2) accessory structures. Property to the north, also zoned agriculture (AG) contains a couple of single-family homes on large lots; one of which is surrounded by a fruit orchard. The 19-acre parcel to the west contains Bethel church in the R-1-12 (low-density residential) zone. Lands to the south are residentially zoned and are currently the subjects of residential subdivisions.

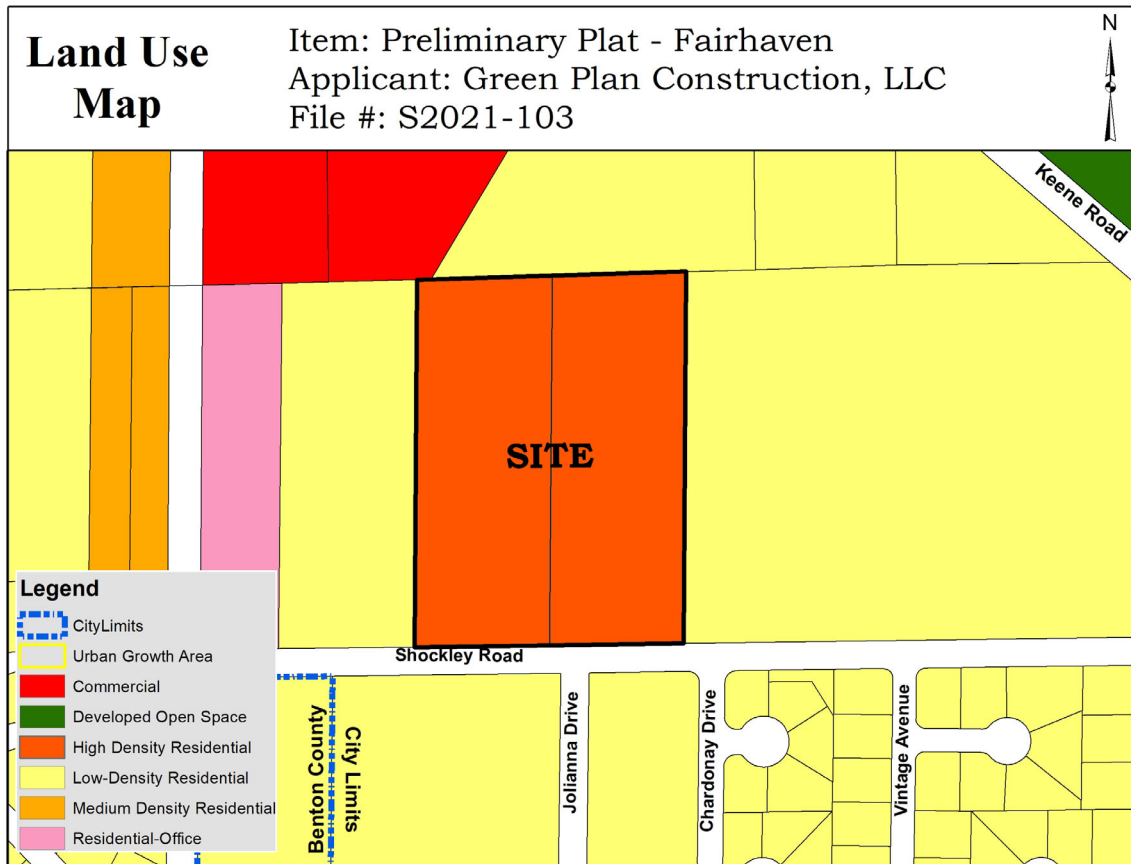


Figure 2 – Comprehensive Plan Map

COMPREHENSIVE PLAN

Richland's Comprehensive Plan designates the plat site for high-density residential development with an average allowable residential density of 10.1 or more dwelling units per acre. The plat of Fairhaven proposes a net residential density of 8.43 dwelling units/acre. Though under the residential density goal of the Comprehensive Plan the proposed residential density falls within the range of permitted residential density permitted in the R-3 zone.

Applicable Goals & Policies

Provided below is a set of Comprehensive Plan goals & policies which are particularly applicable to the subject residential subdivision.

Land Use Goal 3: Maintain a broad range of residential land use designations to accommodate a variety of lifestyles and housing opportunities.

Policy 1: Distribute residential uses and densities throughout the urban growth area consistent with the City's vision.

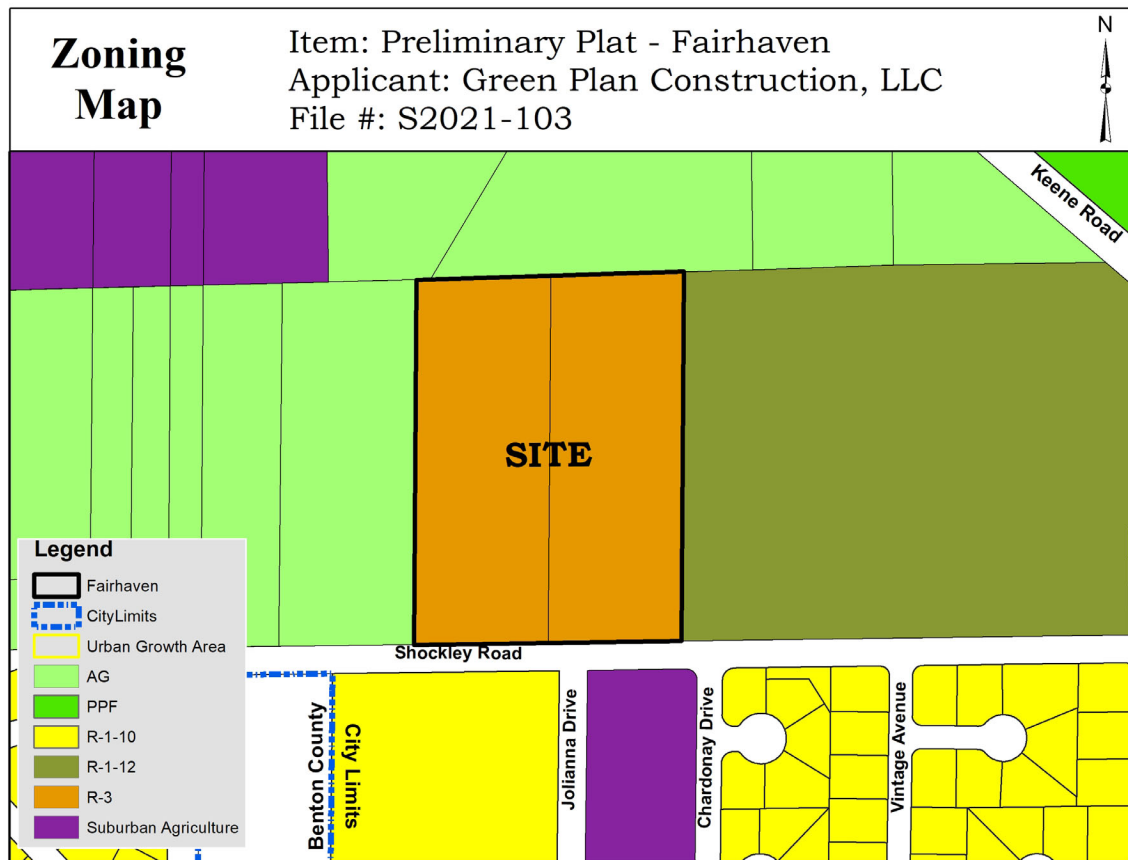
Policy 3: Innovative and non-traditional residential developments can occur through the use of planned unit developments, density bonuses, new types of housing, and multi-use or mixed-use developments.

Land Use Goal 8: Address unique land use situations in the urban area with policies specific to those situations that ensure compatibility between land uses without infringing on private property rights.

Policy 4: Identify and encourage the preservation of lands, sites, and structures that have historical or archaeological significance.

Natural Environment Goal 1: Promote the protection, conservation, and restoration of natural areas, shorelines, and critical areas as unique assets to the community, and provide public access for enjoyment of such facilities based on the ability of the resource to support the use.

Policy 1: Use the critical areas ordinance, SMP, the state environmental policy act (SEPA), and other ordinances, as applicable, to designate and protect the critical areas and natural environment.



ZONING

This preliminary plat site is zoned R-3 (High-Density Residential) allowing for each lot to be developed with detached single-family residences, attached single-family residences (townhomes), duplexes, multiple family dwellings (apartments

or condominiums). Fairhaven is designed to be developed with attached single-family residences (townhomes). This design involves attached homes with property lines separating each dwelling unit. Because the resulting development is one dwelling unit on its own tax parcel, it is a single-family residential land use. The smallest lot is 3,050ft² in size, while the largest lot is 10,891ft² acres in size.

Land Uses and Dimensional Standards

In the context of attached single family dwellings, R-3 zoning reverts to site requirements of the R-2S zone (23.18.040 footnotes 6 & 10). The following zoning dimensional standards apply to the proposed plat:

Uses Permitted:	Detached single family homes Attached single family homes (townhomes) Multi-family dwellings (apartments/condominiums) Duplexes
Minimum lot size:	3,000 square feet (attached single family dwellings)
Front yard setback:	20 feet minimum
Side yard setback:	6 feet minimum (attached single family dwellings)
Rear yard setback:	20 feet minimum (attached single family dwellings)
Maximum building height:	40 feet (mid-roof-point)
Maximum lot coverage:	50% (attached single family dwellings)

CRITICAL AREAS

The subject property does not contain any critical areas as identified by the city's critical areas regulations (Title 22.10).

CRITERIA FOR PRELIMINARY PLAT APPROVAL

Section 24.12.053 of the RMC sets forth the criteria that must be met before a preliminary plat application can be approved; it states:

The hearing examiner shall not recommend approval of any preliminary plat application, unless the approval is accompanied by written findings that:

- A. The preliminary plat conforms to the requirements of this title;*
- B. Appropriate provisions are made for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys, other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features that assure safe walking conditions for students who only walk to and from school;*
- C. The public use and interest will be served by the platting of such subdivision and dedication; and*
- D. The application is consistent with the requirements of RMC 19.60.095*

RMC Section 24.12.050 designates the Hearing Examiner as the hearing body responsible for conducting the review of preliminary plat applications.

PUBLIC NOTICE

Application Date:	March 31, 2021
Notice of Hearing/Optional DNS Mailed:	May 6, 2021
Notice of Hearing/Optional DNS Posted:	May 4, 2021
Notice of Hearing/Optional DNS Published:	May 16, 2021
DNS Issued:	June 4, 2021
Public Hearing:	June 14, 2021

A combined notice of application and SEPA Optional DNS determination was provided by mailing notices to property owners within 300 feet. Public hearing notices were distributed through posting of the property, mailing of notice to property owners within 300 feet of the site and publication in the *Tri-City Herald* newspaper. Copies of the notices and affidavits are included in Exhibit 4.

SEPA

A SEPA checklist (Exhibit 5) addressing potential impacts of the proposed subdivision was included in the preliminary plat application. On Friday, June 4, 2021 staff issued a Determination of Non-Significance (DNS) (Exhibit 6) using the Optional DNS process available under the provisions of WAC 197-11-355.

UTILITIES

All of the necessary public utilities are available on the site or very close to the site and available for extension as necessary.

Sewer

The nearest sewer main available to serve Fairhaven is an eight (8) inch main located within the right of way of Shockley Road immediately south of the site.

Water

Potable

The nearest water main available to serve Fairhaven is located within the adjacent Shockley Road right-of-way directly south of the site. This water main is 16-inches in diameter.

Irrigation

The project site is located within the irrigation district boundary of the Kennewick Irrigation District (KID). Irrigating lines exist on-site and on parcels surrounding the site. An irrigation source and distribution system, entirely separate from the City's domestic water system, shall be provided for this development. It will be the developer's responsibility to obtain irrigation water to service the proposed

subdivision. Conditions of approval related to irrigation service and delivery are included with the other conditions of approval at the end of this report.

There is currently a raised, earthen, open-air K.I.D. pond in the southwest corner of the Fairhaven site. The pond is enclosed by a 6-foot-tall chain-link fence with three strands of barbed-wire. Residential development of the site involves removal of this pond.

Electrical Power

A three-phase overhead electrical power distribution system currently extends the full length of Shockley Road and is available to serve the proposed development.

ACCESS/TRANSPORTATION

The proposed subdivision will be accessed via a new looped public roadway extending north from Shockley Road. Shockley Road is classified as a “major collector” street/roadway. Major collector streets distribute trips between the principal and minor arterials and the ultimate destination, or may collect traffic from the neighborhood streets and channel it into the arterial system. They carry a low portion of through traffic and a high portion of local traffic with an origin or destination within the area. Major collector streets provide both land access service and traffic mobility with more emphasis given to access. Spacing is approximately one-quarter mile. The average daily trip volume is typically in the range of 1,500 to 8,000 vehicles per day (12.02.050 RMC).

In regard to the level-of-service (LOS), pursuant to Sections 12.03.170 and 12.03.180 [RMC] this development proposal as submitted is in general conformance with the assumptions made for land use and scale/density. Through collection of impact fees, the project will comply with concurrency requirements of the Municipal Code.

Development proposals that are submitted in general conformance with the assumptions made for land uses and scale/density will be deemed to meet the concurrency requirements of the Growth Management Act by paying the appropriate transportation impact fee. A development proposal not meeting such may require additional review and studies to determine concurrency (12.03.180 RMC).

FIRE SAFETY

The City of Richland Fire Department will provide fire protection services to the subject property and resulting development. Currently there are no existing fire hydrants along the adjacent segment of Shockley Road.

SCHOOLS

The plat falls within the boundaries of the Richland School District. The proposed plat was routed to the district for review and commenting as part of the standard referral process. No comments from the district were received by the City. Standard city streets with appropriate sidewalks will be constructed as part of the proposed development and it is anticipated that Richland School District will make the necessary arrangements to accommodate the pickup and delivery of students residing in the new subdivision.

PARKS

The site falls within Parks District 2. The public park nearest the site, Trailhead Park, lies one-half mile to the southwest. Trailhead Park contains a medium-sized parking lot, playground equipment, gazebo, bathrooms and it serves as the primary access-point to the hiking-trail network extending up to Badger Mountain peak and beyond.

The second closest public park, Gala Park, lies 0.8-miles to the southeast, on Westcliffe Blvd. This 3-acre park is mostly lawn with a small play area and gazebo.

The largest nearby public park is Badger Mountain Park which is located adjacent to Keen Road, 1-mile southeast of the Fairhaven pre-plat site. Badger Mountain Park is a 38.5-acre multi-facility park containing: 2 child-play areas, 1 tennis court, 1 basketball court, 1 football field, 1 soccer field, restrooms, 2 picnic shelters, parking, paths and 5 baseball diamonds.

The developer and/or builder will be required to pay Park Mitigation Fees as set forth in the City's adopted Fee Schedule. Fees received are used to construct and develop new city parks as well as to provide funding to maintain existing parks throughout the city.

AGENCY COMMENTS

A variety of public agencies and City departments were given an opportunity to comment on the proposal. Comments were received from the Kennewick Irrigation District (KID), and a neutral comment from Badger Mountain Irrigation District. All comments received are provided herein as Exhibit 7. Comments from the City Public Works/Engineering Department and from KID are entered directly into the set of recommended approval conditions listed at the end of this report.

PUBLIC COMMENTS

At the time this report was prepared, the City had not received any comments from the public at large.

ANALYSIS

The criteria for approval of a preliminary plat application (RMC 24.12.053) are reprinted here, with a summary of how the application complies with the requisite standard:

A. The preliminary plat conforms to the requirements of this title (RMC Title 24);

- The City's subdivision regulations set forth specific requirements for the filing of an application, how notice of the application is to be provided and requires that the Hearing Examiner conduct a public hearing and make recommendation to the City Council. These steps have been followed to date.

B. Appropriate provisions are made for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys, other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features that assure safe walking conditions for students who only walk to and from school;

- Several city parks and other recreational opportunities exist within approximately one mile of the project site. New homes within the proposed development will be required to pay Park Impact Fees, which are used to construct new parks and/or maintain existing park facilities within the city.
- The site is not located along an existing bus route. The Ben Franklin Transit Authority provides bus service to the area along Keene Road approximately 0.25 miles to the east.
- The plat will be served by City domestic water lines currently existing adjacent to the project site. Water lines have capacity to provide for the proposed project.
- Sanitary sewer service will be extended to this project.
- The plat will be served by Richland Energy Services electrical power by way of service line extension.
- An irrigation source and distribution system, entirely separate from the City's domestic water system, shall be provided for this development.
- Kennewick Irrigation District indicated that the development site is within their district boundaries and has provided a comment letter advising the applicant of options for addressing the existing and future irrigation systems.
- In accordance with City development standards, storm water drainage will have to be retained and managed on-site. The proposed plat design includes provisions for retaining and managing on-site storm water. Project specific designs have not been created yet; however, prior to the city allowing construction of the subdivision to occur, the development will need to be designed by a licensed civil engineer and meet the requirements of the city and state storm water regulations.

- Richland School District was given the opportunity to comment, however chose not to. The Richland School District currently serves approximately 13,000 children within a multitude of school facilities some of which are new or have been recently remodeled to accommodate the increasing student enrollment seen as a result of new housing being built within the area.

C. The public use and interest will be served by the platting of such subdivision and dedication;

- The proposed project is consistent with the Comprehensive Plan in terms of the proposed density of the plat. The project is consistent with the City's zoning regulations. The additional housing units will contribute to meeting the housing demand experienced in the Tri-Cities thereby serving public interest.

D. The application is consistent with the requirements of RMC 19.60.095, which states: No development application for a Type II or Type III permit shall be approved by the city of Richland unless the decision to approve the permit application is supported by the following findings and conclusions:

1) The development application is consistent with the adopted Comprehensive Plan and meets the requirements and intent of the Richland Municipal Code.

The proposal is generally consistent with the intent of the Comprehensive Plan and as conditioned will meet requirements of the Municipal Code as outlined above.

2) Impacts of the development have been appropriately identified and mitigated under Chapter 22.09 RMC.

Chapter 22.09 is the City's adoption of the State Environmental Policy Act provisions. The applicant filed an environmental checklist (Exhibit 5) for which the City issued and distributed a Determination of Non-Significance (Exhibit 6) after utilizing the Optional DNS process.

3) The development application is beneficial to the public health, safety and welfare and is in the public interest.

The project is consistent with the City's Comprehensive Plan and development regulations and it therefore would be considered beneficial to public health, safety and welfare and would be in the public interest. As mentioned above, staff is recommending several requirements in the form of conditions, aimed at ensuring the development does not generate any significant impacts which would be detrimental to the peaceful enjoyment of existing land uses in the surrounding vicinity.

- E. *The development does not lower the level of service of transportation facilities below the level of service D, as identified in the Comprehensive Plan; provided, that if a development application is projected to decrease the level of service lower than level of service D, the development may still be approved if improvements or strategies to raise the level of service above the minimum level of service are made concurrent with development. For the purposes of this section, "concurrent with development" means that required improvements or strategies are in place at the time of occupancy of the project, or a financial commitment is in place to complete the required improvements within six years of approval of the development.*

The project would add 70 new residential lots to be accessed from newly constructed and existing roadways leading into the subdivision; serving each proposed lot.

- F. *Any conditions attached to a project approval are as a direct result of the impacts of the development proposal and are reasonably needed to mitigate the impacts of the development proposal.*

The conditions of approval recommended for this project are a direct result of imposing City development standards as contained in City code and are directly related to the development proposal. Additional conditions have been included as a result of comments received by other agencies.

FINDINGS AND CONCLUSIONS

Staff has completed its review the preliminary plat application for Fairhaven (S2021-103) and recommends approval of the request subject to conformance with the conditions of approval included below and based on the following findings:

Findings of Fact:

1. Richland's Comprehensive Plan designates the plat site for high-density residential development with an average allowable residential density of 15 units per acre, which could not be reached under the R-3 zoning lot size limits). The plat of Fairhaven proposes a net residential density of 8.43 dwelling units/acre.
2. R-3 (Multiple Family Residential) zoning is applied to the site. R-3 zoning regulations permit residential densities of up to 14.5 dwelling units per acre and a 3,000ft² min lot size.
3. Fairhaven preliminary plat consists of 70 residential lots. Proposed residential lot sizes range from 3,050 square feet to 10,891 square feet, with a 5,164ft² average lot size.
4. Section 24.12.053 of the RMC sets forth standards for review of preliminary plats that require the Hearing Examiner to consider whether appropriate provisions are made for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys other public ways, transit stops, potable water supplies, sanitary wastes, parks and

recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features that assure safe walking conditions for students who only walk to and from school.

5. The proposed preliminary plat provides for the extension of streets consistent with the surrounding street network, includes provisions for the extension of public domestic water, sewer, irrigation water and electrical power lines.
6. Improvements proposed to serve the preliminary plat will be consistent with the City's development standards by applying municipal code provisions.
7. The Richland School District was invited to comment and expressed no concerns with the plat.
8. City staff and other utility providers reviewed the project and have recommended specific conditions of approval as set forth in this report.
9. The applicant filed an environmental checklist along with their preliminary plat application as required under the State Environmental Policy Act.
10. After review of the checklist, application materials and receipt of agency and public comments, staff issued a Determination of Non-Significance on Friday, June 4, 2021 after utilizing the Optional DNS process.
11. The site is not located within nor does it contain any critical areas as defined by the city's critical areas regulations contained within RMC 22.10.
12. RMC 19.60.095(D) requires that development not lower the level of service standard for transportation facilities below a level of service D.
13. The proposed project would add 70 single family lots that would have direct access onto roadways proposed in the plat.
14. Fairhaven is subject to RMC 12.03, the City's traffic impact fee program. Since this property is included within the traffic impact fee program it is exempt from the SEPA-related traffic study requirement (TIA).

Conclusions of Law:

1. The lots within the proposed subdivision are consistent with the provisions of the City's respective (R-3) zoning regulations.
2. The proposed preliminary plat conforms to the density and type of land use envisioned in the land use and transportation elements of the adopted Comprehensive Plan.
3. Pursuant to RMC Chapters 22.09 and 22.10, the procedures required under the State Environmental Policy Act have been completed.
4. As conditioned, the proposed preliminary plat makes appropriate provisions for the public health, safety and general welfare and for such open spaces, drainage ways, streets or roads, alleys, other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features that assure safe walking conditions for students who only walk to and from school.
5. Based on the above findings and conclusions, approval of the proposed preliminary plat of Fairhaven, subject to the recommended conditions listed

in this report, is warranted because the project conforms to the City's adopted comprehensive plan and zoning regulations; has followed the required State Environmental Policy Act procedures; and is consistent with the requirements of the City's subdivision regulations.

Overall Conclusion:

Based on the above findings and conclusions, approval of the proposed preliminary plat of Fairhaven, subject to the recommended conditions listed below, is warranted because the project conforms to the City's adopted Comprehensive Plan and zoning regulations; has followed the required State Environmental Policy Act procedures; and is consistent with the requirements of the City's subdivision regulations.

RECOMMENDED CONDITIONS OF APPROVAL

Public Works Pre-Plat Specific Conditions

1. The preliminary plat is not showing any phase lines. Phasing is not required but if the project is to be phased during construction phasing lines need to be shown on the pre-plat map.

General Conditions:

2. All final, approved plans for public improvements shall be submitted prior to pre-con on a 24" x 36" hardcopy format and also electronically in .dwg format compatible with the City's standard CAD software. Addendums are not allowed, all information shall be supplied in full size (and electronic) format. Electronic copies of the construction plans are required prior to the pre-con meeting along with the multiple sets of paper drawings. When construction of the public infrastructure has been substantially completed, the applicant shall provide paper and electronic record drawings in accordance with the City's "Record Drawing Requirements". The electronic record drawings shall be submitted in an AutoCAD format compatible with the City's standard CAD software. The final record drawings shall be submitted and approved by the City before the final punchlist inspection will be performed. All final punchlist items shall be completed or financially guaranteed prior to recording of the final plat.
3. A copy of the construction drawings shall be submitted for review to the appropriate jurisdictions by the developer and his engineer. All required comments / conditions from all appropriate reviewing jurisdictions (e.g.: Benton County, any appropriate irrigation districts, other utilities, etc.) shall be incorporated into one comprehensive set of drawings and resubmitted (if necessary) for final permit review and issuance. Any and all necessary permits that may be required by jurisdictional entities outside of the City of Richland shall be the responsibility of the developer to obtain.

4. Any work within the public right-of-way or easements or involving public infrastructure will require the applicant to obtain a right-of-way construction permit prior to beginning work, per RMC Chapter 12.08. The applicant shall pay a plan review fee based on a cost-per-sheet of engineering infrastructure plans. This public infrastructure plan review fee shall apply each time a project is submitted for review. This fee will be different for commercial projects versus subdivision projects. Please visit the Public Works Private Development page on the City's webpage to find the current per-sheet fee. A permit fee in the amount equal to 3% of the construction costs of the work within the right-of-way or easement will be collected at the time the construction permit is issued. A stamped, itemized Engineers estimate (Opinion of probable cost) and a copy of the material submittals shall be submitted along with the approved plan submittal.
5. Public utility infrastructure located on private property will require recording of a City standard form easement prior to acceptance of the infrastructure and release of the final plat. The City requires preparation of the easement legal description by the developer two weeks prior to the scheduled date of plat acceptance. Once received, the City will prepare the easement document and provide it to the developer. The developer shall record the easement at the Benton County Assessor and return a recorded original document to the City prior to application for final plat acceptance.
6. A pre-construction conference will be required prior to the start of any work within the public right-of-way or easement. Contact the Public Works Engineering Division at 942-7500 to schedule a pre-construction conference.
7. Site plan drawings which involve the construction of public infrastructure shall be drawn on a standard 24" x 36" drawing format to a scale which shall not be less than 1"=40'.
8. All plan sheets involving construction of public infrastructure shall have the stamp of a current Washington State licensed professional engineer.
9. All construction plan sheets shall include the note "CALL 811" or: <http://www.call811.com/>
10. A copy of the preliminary plat shall be supplied to the Post Office and all locations of future mailbox clusters approved prior to final platting.

Design Standards:

11. Public improvement design shall follow the following general format:
 - a. All materials and workmanship shall be in conformance with the latest revision of the City of Richland Standard Specifications and Details,

Public Infrastructure Design Guidelines and the current edition of the State of Washington Standard Specifications for Road, Bridge, and Municipal Construction. Please confirm that you have the latest set of standard specs and details by visiting the City's web page.

- b. Water lines shall be aligned on the south and east side of street centerlines.
- c. Sanitary sewer shall be aligned on the north and west side of street centerlines.
- d. Storm sewer shall be aligned on the south and east side of street centerlines.
- e. Any sewer or storm manholes that are installed outside of public Right of Way shall have an acceptable 12-foot wide gravel access road (minimum) provided from a public street for maintenance vehicles.
- f. 10-foot horizontal spacing shall be maintained between domestic water and sanitary sewer mainlines and service lines.
- g. Watermains larger than 8-inches in diameter shall be ductile iron.
- h. Watermains installed outside of the City Right of Way or in very rocky native material, shall be ductile iron and may need restrained joints.
- i. Fire hydrant location shall be reviewed and approved by the City Fire Marshal.
- j. Sewer mains over 15-feet deep shall be constructed out of SDR26 PVC.
- k. All utilities shall be extended to the adjacent property (properties) at the time of construction.
- l. The minimum centerline finish grade shall be no less than 0.30 % and the maximum centerline finish grade shall be no more than 10.0% for local streets. 12% can be allowed for local streets for short distances.
- m. The minimum centerline radius for local streets shall be 100-feet.
- n. Any filling of low areas that may be required within the public Right of Way shall be compacted to City standards.
- o. An overall, composite utility plan shall be included in the submitted plan set if the project is phased. This comprehensive utility plan benefits all departments and maintenance groups involved in the review and inspection of the project.
- p. A detailed grading plan shall be included in the submitted plan set.
- q. For public utilities not located within public street rights-of-way the applicant shall provide maintenance access acceptable to the City and the applicant shall provide an exclusive 10-foot wide public utility easement (minimum) to be conveyed to the City of Richland.
- r. Final design of the public improvements shall be approved at the time of the City's issuance of a Right-of-way Construction Permit for the proposed construction.
- s. All public improvements shall comply with the State of Washington and City of Richland requirements, standards and codes.

- t. All curb returns at minor intersections shall have a minimum radius of 25-feet. Curb returns at major intersections should have minimum radius of 30-feet but should be evaluated on a case by case basis.
 - u. All public streets shall meet design requirements for sight distance (horizontal, vertical and intersectional).
 - v. The final engineered construction plans shall identify locations for irrigation system, street lighting, gas service, power lines, telephone lines, cable television lines, street trees and mail boxes. All electrical appurtenances such as transformers, vaults, conduit routes, and street lights (including their circuit) need to be shown in the plan view.
 - w. Construction plans shall reference all City of Richland standard details necessary to construct all public improvements which will be owned, operated, maintained by the City or used by the general public.
 - x. The contractor shall be responsible for any and all public infrastructure construction deficiencies for a period of one year from the date of the letter of acceptance by the City of Richland.
12. If the project will be built in phases the applicant shall submit a master plan for the sanitary sewer, domestic water, storm drainage, electrical, street lighting and irrigation system for the entire project prior to submitting plans for the first phase to assure constructability of the entire project. This includes the location and size of any storm retention ponds that may be required to handle runoff.
13. If the City Fire Marshal requires a secondary emergency vehicle access, it shall be included in the construction plan set and be designed to the following standards:
- 2-inches compacted gravel, minimum (temp. SEVAs only).
 - 2% cross-slope, maximum.
 - 5% slope, maximum. Any access road steeper than 5% shall be paved or be approved by the Fire Marshal.
 - Be 20-feet in width.
 - Have radii that are accommodating with those needed for City Fire apparatus.

Secondary emergency vehicles accesses (SEVA's) shall be 20-feet wide, as noted. Longer secondary accesses can be built to 12-feet wide with the approval of the City of Richland Fire Marshal, however turn-outs are required at a spacing acceptable to the Fire Dept. Temporary SEVA's shall be constructed with 2-inches of compacted gravel, at a minimum. Permanent SEVA's shall be paved with 2-inches of asphalt over 4-inches of gravel, at a minimum.

SURVEY MONUMENT DESTRUCTION:

14. All permanent survey monuments existing on the project site shall be protected. If any monuments are destroyed by the proposed construction, the applicant shall retain a professional land surveyor to replace the monuments and file a copy of the record survey with the City.
- A. No survey monument shall be removed or destroyed (*the physical disturbance or covering of a monument such that the survey point is no longer visible or readily accessible*) before a permit is obtained from the Department of Natural Resources (DNR). WAC 332-120-030(2) states "It shall be the responsibility of the governmental agency or others performing construction work or other activity (including road or street resurfacing projects) to adequately search the records and the physical area of the proposed construction work or other activity for the purpose of locating and referencing any known or existing survey monuments." (RCW 58.09.130).
 - B. Any person, corporation, association, department, or subdivision of the state, county or municipality responsible for an activity that may cause a survey monument to be removed or destroyed shall be responsible for ensuring that the original survey point is perpetuated. (WAC 332-120-030(2)).
 - C. Survey monuments are those monuments marking local control points, geodetic control points, and land boundary survey corners. (WAC 332-120-030(3)).

When a monument must be removed during an activity that might disturb or destroy it, a licensed Engineer or Land Surveyor must complete, sign, seal and file a permit with the DNR.

It shall be the responsibility of the designing Engineer to identify the affected monuments on the project plans and include a construction note directing them to the DNR permit.

Traffic & Streets:

15. The "Fairhaven Townhome Estates" preliminary plat is subject to the City's traffic impact fee program (RMC 12.03). Since this property is included within the traffic impact fee program, and since staff analysis indicates the project will create no unusual or unanticipated traffic impacts, it is exempt from the SEPA-related traffic study requirement (TIA).
16. The Shockley Road frontage shall be completed to City standards at the time that the phase which constructs the lots adjacent to it are developed.

17. A note will be shown on the face of the final plat stating that Shockley Road is classified as a "Major Collector street". Subsequently, no driveways accessing single family lots will be allowed onto it.
18. City standard local streets are intended to support on-street parking. This development will create a demand for parking off of the developed lots, which could be met if adequate parking is provided for on the City streets. Because of the density of the housing units and the number of proposed driveways there is a need to design available spaces for on-street parking. Driveway spacing and widths shall be designed to allow for a minimum of one on-street vehicle parking space per every two dwelling units.
19. The proposed intersections with Shockley Road are acceptable for this project. The City is receptive to a variance request for the easterly intersection that could reduce or eliminate the reverse curves of the street within the project.
20. Per Richland Municipal Code chapter 24.16, the minimum centerline radius for a local street shall be 100-feet. The proposed roadways in this pre-plat have several curves that are less than this and need correction.
21. Concurrent with phase 1 of this development the developer shall complete the street section immediately to the east of the site by installing approximately 320-feet of curb, gutter and sidewalk, asphalt widening as needed to complete the street, storm drainage facilities as needed, and street lighting to City standards across the neighboring property to connect to the existing sidewalk. This sidewalk connection is needed to connect this development, and its residents, with several services along Keene Road (transit, a recreation pathway, stores, etc.)
22. Sidewalks within the plat shall be installed along all public right-of-way frontages that building lots do not front on during construction of those phases (e.g., storm drainage ponds, parks, open space tracts, etc.).
23. The developer and his engineer shall demonstrate on the construction plans that all future driveway entrances, sidewalks and pedestrian ramps will meet City and ADA requirements, and also provide at least 5-feet of separation between driveways and/or pedestrian ramp transitions.
24. Pedestrian ramps shall be designed to current City standard details and A.D.A. standards. Adequate right-of-way shall be provided at corners to allow for at least 1-foot of ROW behind the ped. ramp landing. Crosswalks between pedestrian ramps shall be designed to City standards. Crosswalks at stop-controlled intersections shall have cross-slopes less than 2%. Crosswalks crossing thru-streets shall have cross-

slopes less than 5%. The road profile shall be designed to accommodate this.

25. The vision-clearance triangle needs to be shown on all corner lots on both the construction plans and the final plat document, in accordance with RMC Chapter 12.11.020. If the intersection is in a curve, it will have to be evaluated per AASHTO guidelines. This information may need to be designed by the engineer of record and supplied to the surveyor of record for inclusion into the final plat document.
26. All roads shall be constructed to provide for adequate fire truck & solid waste collection truck access & turnaround movements.
27. If the project is to be constructed in phases, all dead-end streets longer than 150-feet that will be continued later need to have temporary turnarounds built at the end of them. If the temporary turnaround is not located within the final plat an easement with a 50-foot radius will be required.

Domestic Water:

28. The proposed preliminary plat is located within the "Tapteal 1" water pressure zone. The closest Tapteal 1 watermain is located in Shockley Road. It shall be the responsibility of the developer to extend a watermain west up Shockley Road to the western intersection ("Road A") and onto this property to serve domestic water at the time of plat construction. This water main shall be sized to adequately supply domestic water and fire flows to the proposed development. The water main shall be looped through the plat and connected to the pipeline in Shockley Road at two locations.
29. In accordance with municipal code, domestic water mains shall be extended to the adjoining properties adjacent to the preliminary plat, provided they are in the correct pressure zone. The domestic water main shall be extended to the north plat boundary to provide for an eventual loop to Keene Road.
30. The developer will be required to demonstrate that all phases are capable of delivering adequate fire flows prior to construction plans being accepted for review. This may require looping of the watermain from off-site locations, or oversizing of the main where needed.
31. The fire hydrant layout shall be approved by the City Fire Marshal.
32. In accordance with Richland Municipal Code Chapter 18.16.080, an irrigation source and distribution system, entirely separate from the City's domestic water system, shall be provided for this development. Construction plans will not be accepted for review until adequate and viable

proof of an irrigation source is made available by the developer. The designing Engineer shall submit plans for the proposed irrigation system to the Irrigation District with jurisdiction over the property at the same time that they are submitted to the City for construction review. Plans shall be reviewed and accepted by said irrigation district prior to issuance of a Right-of-Way permit by the City. Easements shall be provided on the final plat for this system where needed.

Sanitary Sewer:

33. The closest sanitary sewer available for this development is located to the South in Shockley Road, or to the North in Keene Road. It shall be the responsibility of the developer to extend a sewer main to this property to serve sanitary sewer at the time of plat construction.
34. A 10-foot wide exclusive sanitary sewer easement shall be provided for any sewer main that is outside of the public Right-of-Way. Wider easements are required for mains that are buried deeper than 10-feet. If any manholes are located outside of the public Right-of-Way, maintenance truck access to said structure may be required.

Ground Water:

35. A master grading plan completed by a licensed engineer shall be submitted along with the first submission of construction plans. Given the amount of groundwater encountered in this area (in both developed and undeveloped areas), the possibility of an underdrain system being required exists. The geotech report for this project needs to address any potential groundwater impacts to existing properties downslope of the proposed preliminary plat. It shall also include a means for managing groundwater or subsurface springs if any are encountered during grading or construction. If groundwater is encountered within 5-feet of finished grade during plat construction, an underdrain system will be required.

Storm Water:

36. All construction projects that don't meet the exemption requirements outlined in Richland Municipal Code, Section 16.06 shall comply with the requirements of the Washington State Department of Ecology issued Eastern Washington NPDES Phase II Municipal Stormwater Permit. The Developer shall be responsible for compliance with the permit conditions. All construction activities subject to this title shall be required to comply with the standards and requirements set forth in the Stormwater Management Manual for Eastern Washington (SWMMEW) and prepare a Stormwater Site Plan. In addition, a Stormwater Pollution Prevention Plan (SWPPP) or submission of a completed erosivity waiver certification is required at the time of plan submittal. The City has adopted revised standards affecting the construction of new stormwater facilities in order to

comply with conditions of its NPDES General Stormwater Permit program. This project, and each phase thereof, shall comply with the requirements of the City's stormwater program in place at the time each phase is engineered. The project will require detailed erosion control plans.

37. All public storm drainage systems shall have their flow rate and storage capacity designed by a professional engineer following the core elements defined in the latest editions of the Stormwater Management Manual for Eastern Washington, the current Richland municipal codes, the Phase II Municipal Stormwater Permit, and the City's "Public Infrastructure Construction Plan Requirements and Design Guidelines". The storm water calculations shall be stamped by a professional engineer and shall include a profile of the storm system showing the hydraulic grade line. The calculations should include an accurate delineation of the contributing drainage area to accurately size the stormwater facilities. Passing the storm water downhill to an existing storm system will require an analysis of the downstream storm system to determine its capability of accepting the storm water without being overwhelmed. The applicant's design shall provide runoff protection to downstream property owners.
38. If any existing storm drainage or ground water seepage drains onto the proposed site, said storm drainage shall be considered an existing condition, and it shall be the responsibility of the property developer to design a system to contain or treat and release the off-site storm drainage.
39. If there are any natural drainage ways across the proposed pre-plat, the engineered construction plans shall address it in accordance with Richland Municipal code 24.16.170 ("Easements-watercourses").
40. Any proposed storm drainage retention facilities within the boundary of the proposed preliminary plat shall not adversely affect neighboring properties.
41. Prior to or concurrent with the submittal of the first phase the developer shall provide a Geotechnical report including the percolation rate of the soils in the area of any storm retention ponds. If the project constructs a storm retention pond then the engineer will need to demonstrate that the pond will drain itself within 72 hours after the end of a storm event, and not have standing water in it longer than that. Engineering solutions are available for retention ponds that do not percolate within 72 hours.
42. A segment of the 18-inch Shockley Storm Mainline Conveyance pipe, as indicated in the City's 2016 Stormwater Management Plan, shall be installed in Shockley Road. The pipeline has been determined essential to the effective operation of the stormwater system serving this property and others in this area of the City. This existing storm pipe currently ends

- very near the southeast corner of this property. It shall be the responsibility of the developer of this project to extend this storm main to and across the frontage of this property. This storm main may be used for overflow for storm events larger than the design storm.
43. The amount of post-development storm runoff from the proposed site shall be in compliance with RMC Chapter 16.06.
44. The parcel occupied by the stormwater basin shall be identified as a separate parcel or tract on the final plat and shall be dedicated to the City stormwater utility. The design of the basin shall include access features meeting the city's needs for maintenance.
45. The developer shall consider the long-term appearance of the storm basin, particularly if it will occupy a prominent location in the development. The City's typical storm pond maintenance practices consist of semi-annual vegetation trimming and silt and debris removal. If the pond location is visible to residents the City will require landscaping or fencing to mitigate the visual impact of the pond. If the City requires this type of treatment to the pond site the developer may propose landscaping treatments consistent with the development and establish maintenance responsibilities to remain with the development. These maintenance responsibilities shall be noted on the final plat. Basins designed as detention and evaporative basins need to include plantings that will tolerate or thrive in standing water. Planting designs for areas not routinely exposed to water shall include plants that will thrive without irrigation unless the developer intends to maintain an irrigated pond site. At a minimum the landscaping plan should be consistent with the City's intended maintenance standard as described above.
46. The developer shall be responsible for landscaping the storm pond and for its maintenance and the plantings through the one-year infrastructure warranty period. At 11 months after the final acceptance date the developer shall clean the storm system and basin of all accumulated oil, sediment, and debris. After this maintenance is completed and inspected the City will begin routine maintenance of the system and basin. The developer shall replace any plantings that have failed to survive the warranty period. The developer shall also perform trimmings required to control weeds in excess of 18-inches in height for the 12-months following the date of final plat acceptance.

Final Platting / Project Acceptance Requirements:

47. When the construction is substantially complete a paper set of "record drawings" shall be prepared by a licensed surveyor and include all changes and deviations. Please reference the Public Works document

- “RECORD DRAWING REQUIREMENTS & PROCEDURES” for a complete description of the record drawing process. All final punchlist items shall be completed or financially guaranteed prior to recording of the final plat.
48. Public utility infrastructure located on private property will require recording of a City standard form easement prior to acceptance of the infrastructure and release of a certificate of occupancy. The City requires preparation of the easement legal description by the developer two weeks prior to the scheduled date of final acceptance. Off-site (“third party”) easements or right-of-ways for City infrastructure are the responsibility of the developer to obtain. Once received, the City will prepare the easement document and provide it to the developer. The developer shall record the easement at the Benton County Assessor and return a recorded original document to the City prior to application for final occupancy.
 49. Any off-site easements or permits necessary for this project shall be obtained and secured by the applicant and supplied to the City at the time of plat construction and prior to final plat acceptance by the City.
 50. Ten-foot wide public utility easements will be required on the final plat along both sides of all Right-of-Ways within the proposed plat. In addition, a ten-foot public utility easement along the Shockley frontage shall also be provided on the face of the final plat.
 51. The vision-clearance triangle needs to be shown on all corner lots on the final plat document, in accordance with RMC Chapter 12.11.020. If the intersection is in a curve, it will have to be evaluated per AASHTO guidelines. This information may need to be designed by the engineer of record and supplied to the surveyor of record for inclusion into the final plat document.
 52. The final plat shall include notes identifying all common areas including tracts and acknowledging the ownership and maintenance responsibility of them. The intended use and ownership of all tracts within the plat shall be noted on the final plat.
 53. Any roads narrower than 34-feet shall have parking restricted on one side, and any roads narrower than 27-feet shall have parking restricted on both sides. Street signs indicating restricted parking shall be installed prior to final platting at the developers expense. The restricted parking areas shall be indicated on the final plats.
 54. All landscaped areas within the plat that are in the public Right of Way shall be the responsibility of the homeowners to maintain.

55. A one-foot "No access / screening easement" will be required along the Shockley Road Right of Way for Lots 1, 41, 42 and 70.

56. Property with an unpaid L.I.D. assessment towards it must be paid in full or segregated per Richland Municipal Code 3.12.095.

57. Any restricted parking areas shall be indicated on the final plats.

KENNEWICK IRRIGATION DISTRICT:

The properties identified on the proposed preliminary plat are located within the KID boundaries. The properties within this preliminary plat are classified as irrigable land and consist of 9.80 irrigable acres. Accordingly, KID provides the following comments to be included as required conditions of approval by the legislative authority under RCW 58.17.310(2):

- 1) The plat shall include the following irrigation easements consistent with KID requirements:
 - a. Dedicate to KID an irrigation easement 10 feet in width via a recorded deed to match irrigation system components, centered on an irrigation pipe line.
 - b. On all lots within the plat, dedicate to KID an irrigation easement 10 feet in width, or five (5) feet in width if adjacent to a utility easement, located along the road frontage of each lot. An irrigation easement may be included within the 'sidewalk and utility' easement if one is proposed, denoting the easement as a "Sidewalk, Utility, and Irrigation Easement."
- 2) The Applicant is required to install an irrigation system that conforms to the most recent edition of the KID Standard Specifications pursuant to Resolution 86-15-A. This includes providing distribution pipelines adequate to provide individual pressurized irrigation services to each lot within the preliminary plat. This system will be dedicated to the KID upon completion, at the time of final plat.
 - a. KID Standard Specifications require a storage pond facility be constructed and sized appropriately for this plat application. Please dedicate this storage facility as a tract of land deeded to the KID. In addition, the KID Standard Specifications require a pump station facility be constructed and sized appropriately for this plat application.
 - b. **As an alternative** to a pond, pump station, and other "on site" construction requirements per KID Standards Specifications, the Applicant and KID may mutually agree that it is in each of their best interests that other "off site" improvements may be made to allow

for the delivery of pressurized irrigation water to the plat. This agreement is typically referred to as a Voluntary Mitigation Agreement (VMA). The other improvements would be proportionate and equal to the "on site" requirements and may include:

- i. Contributions made towards a regional pump facility.
- ii. The installation of pipelines off site.
- iii. Upsizing of pipelines adjacent or within the subdivision. **KID plans to upsize the pipeline adjacent to Shockley Road in coordination with the project.**
- iv. There is an existing KID Irrigation pond and pump station located within the pre plat boundaries. **Decommissioning of this facility will be contingent upon approval of a VMA. KID estimates the decommissioning and the other off-site improvements necessary to extend irrigation service from a neighboring system at \$116,051.04. This number is subject to change depending on timing of the VMA.**

3) Design of the required irrigation system must be approved by KID prior to installation. The Applicant is required to submit an irrigation plan designed by a professional engineer for review and approval by the KID. The plan may be hand drawn or computer drafted. The plan shall be accurate and to a scale not to exceed one (1) inch = 50 feet. This is a vital step of the approval process. In addition to compliance with Condition 2 above, the Plan must ensure all reasonable measures are taken to protect any easements, right-of-ways, and facilities. Please contact me at 586-6012 for more information regarding this irrigation plan.

- a. **For single-family attached units (town homes or townhouses), service risers shall be installed no further than 300 feet apart, with a service riser to each side of a street right-of-way or access easement.**
 - i. **Based on the information provided, irrigation distribution pipelines will need to be installed adjacent to the project along Shockley Road with a looped pipeline within the project itself. KID estimates approximately 12 service riser connections will be needed to service the project but actual service riser locations will be dependent upon town home layout.**
- b. **Please note, there are existing irrigation pipelines within the project likely to be impacted due to grading and building/street layouts.**
 - i. **Applicant is responsible for the relocations and reinstallation of these pipelines per KID Standards and they must be located within a designated irrigation easement if located outside of the street ROW.**

- 4) Completion of all the facilities, consistent with irrigation plan approved by KID, is required prior to KID signature on the Final Plat.
 - a. In the event any KID facilities are damaged during construction, the damage must be fully repaired to KID's then-existing standards.
 - b. For each phase of the plat, KID review and approval of construction and grading plans is required to allow KID to assure all reasonable measures to protect any easements and right-of-ways. Such review and approval will be coordinated as part of City review and the Final Plat approval process.
 - c. The KID must inspect any new irrigation system installations or modifications. The Applicant shall contact the KID to arrange an inspection at least 48 hours in advance of the desired inspection date.
 - d. As an alternative to immediate construction prior to approval of the Final Plat, the Applicant may choose to delay installation of the irrigation system by entering into a facilities installation agreement with the KID. The Applicant must still provide the KID with an irrigation system design that conforms to the most recent addition of the KID standard specifications. This irrigation system may be bonded and delayed up to five years. The facility installation agreement charge is \$350.00. The Applicant must establish an approved bonding mechanism with the KID in an amount approved by KID.

In addition, pursuant to RCW 58.17.310 (1), KID would like to inform the City of the following information regarding the proposed preliminary plat upon the structural integrity, including lateral support, of KID's facilities, other risk exposures, and the safety of the public and irrigation district, and conditions of approval that KID deems to be necessary as a result:

- 5) For each phase of the Project, KID/USBR review and approval of grading and construction plans is required to allow KID to assure all reasonable measures to protect any easements and ROWs. Such review and approval will be coordinated as part of the City's review and Final Plat approval process.
- 6) The Applicant shall include the potential failure of KID system components in its public offering statement for the plat pursuant to RCW 58.19.055(1)(r), which requires a public offering statement to include "[a] list of any physical hazards known to the developer which particularly affect the development or the immediate vicinity in which the developer is located and which are not readily ascertainable by the purchaser."

- 7) The Applicant shall post signs in appropriate areas with KID's easements and ROW's identifying KID's facilities (with locations and design approved by KID).
- 8) The Applicant shall provide fencing for the protection of KID facilities, which shall include but not be limited to adjacent KID/USBR ROW, with fencing locations and design approved by KID.

Finally, KID requests the following additional conditions of final plat approval:

- 9) Prior to approval of each phase, the current year's assessment must be paid. If the final plat is submitted for review after May 31st of a given year or submitted for review prior to May 31st but not submitted for final approval prior to June 15th, the next year's estimated assessment (125% of the current year's assessment) must be paid prior to plat approval.
- 10) Prior to approval of the first phase, the USBR construction loan for **all parcels** owned by the property owner within the boundaries of the KID must be paid and all other USBR requirements associated with this payout must be completed.
- 11) The Review and Inspection fees in place at the time of each review request must be paid. At the time of application the review fees are as follows:
 - a. A Preliminary Plat review fee of **\$825.00** which must be paid prior to scheduling for final plat approval at a KID Board meeting for the first phase.
 - b. For each Phase an inspection fee **\$350** for the first 20 lots/tracts plus \$25 per lot/tract after 20 lots/tracts.
 - c. Final Plat review fee for each phase of **\$225.00**.
- 12) Per KID Policy 4.17, "Irrigable Land Recalibration Principles," as land within the plat is subdivided or developed; KID will remove the irrigation water allocation from the impermeable surfaces, such as streets, from the plats.
- 13) In order to receive KID irrigation water delivery, a water master (or point of contact) for the subdivision must be appointed. This water master can be appointed by the Homeowners Association (or similar organization) officers, or must be elected from among the property owners within the boundary of this proposed subdivision. If no HOA (or similar organization) is organized, then an election method similar to the attached document is required.

- 14) Prior to approval of each phase, an electronic file (AutoCAD 2004 format) and hard copy (6-mil mylar, sealed by a professional engineer) of construction as-builts must be provided to KID.
- 15) All subdivisions of land are required to be approved by the KID Board of Directors during a KID Board Meeting. KID Board Meetings are regularly scheduled on the first and third Tuesdays of each month. All conditions must be completed prior to submittal to KID for final approval. The submittal for final approval must be received by KID a minimum of two weeks prior to a regularly scheduled Board Meeting in order to be considered at that meeting.

KID reserves the following rights regarding future review of the plat:

- 16) KID reserves the right to provide review comments under RCW 58.17.330(1) and RCW 58.17.330(2) in response to future design submittals by the Applicant prior to final plat approval. The scope of these reviews will be limited to Phases that are adjacent to the District's Rights of Way. KID review of construction plans will be consistent with the City of Kennewick's plan review timelines.
- 17) KID reserves the right to review and comment on the Applicant's plat line revisions for potential additional revisions to protect KID system components for Phases that are adjacent to KID's easements or ROWs.
- 18) KID reserves the right to review and comment on the Applicant's covenants, conditions, and restrictions to evaluate whether they should include any terms regarding protection of KID system components after construction and fencing requirements.
- 19) KID reserves the right to submit additional comments during the City's review process under the State Environmental Policy Act (SEPA).

EXHIBIT LIST

1. Application
2. Fairhaven Survey
3. Title Report
4. Public Notices & Affidavits
5. SEPA Environmental Checklist
6. Determination of Non-Significance
7. Agency Comments
8. Maps
9. Site Photos



City of Richland
Development Services

Exhibit 1

625 Swift Blvd. MS-35
Richland, WA 99352
☎ (509) 942-7794
📠 (509) 942-7764

S2021-103

Preliminary Plat Application

Note: A Pre-Application meeting is required prior to submittal of an application.

PROPERTY OWNER INFORMATION

☐ Contact Person

Owner: Bethel Church Contact: Jim Dirks

Address: Bethel Church, 600 Shockley Rd, Richland, WA 99352

Phone: 509-374-4662

Email: jdirks@frontier.com

APPLICANT/CONTRACTOR INFORMATION (if different)

☒ Contact Person

Company: Green Plan Construction, LLC

UBI#: 45-4246148

Contact: Stan Nuxall Jr

Address: 101 N Morain St, Ste 100, Kennewick, WA 99336

Phone: 509.539.6323

Email: stan@nuxall.com

SURVEYOR INFORMATION

Contact: Ashley Garza

Address: 2245 Robertson Dr, Richland, WA 99354

Phone: 509.901.8753

Email: agarza3605@gmail.com

ENGINEER INFORMATION

Contact:

Address:

Phone:

Email:

PROJECT DESCRIPTION

Townhome Community, Multiple Floor Plans, 1 and 2 Story Units

Parcel #: 1-2298-300-0006-002 and 1-2298-300-006-003

PROPERTY INFORMATION

Parcel #: See Above

Zoning: R-3

Legal Description: Look up - Meets and Bounds

Proposed Subdivision Name: Fairhaven Townhome Estates

Gross Plat Acreage: 10

Number of Lots: 70

Smallest Lot Size: 2,891 sf

Net Lot Area Acreage: 358,836 sf

Avg. Lot Size: 5,126 sf

Largest Lot Size: 10,891 sf

Domestic Water Supply: ☒ City ☐ Private Well

Sewage Disposal: ☒ City ☐ Septic

Irrigation Source: ☐ City ☐ Private Well ☐ Columbia Irrig. District ☒ Kennewick Irrig. District ☐ Other

SEPA Checklist submitted? ☒ Yes ☐ No

Title Report (Subdivision Guarantee) submitted? ☒ Yes ☐ No

APPLICATION MUST INCLUDE

1. Completed application and filing fee
2. 2 – Full-size copies of proposed survey
3. 1 – 11" x 17" copy of proposed survey
4. 1 – PDF file of proposed survey
5. Title Report showing ownership, easements, restrictions and accurate legal description of the property involved
6. SEPA Checklist
7. Other information as determined by the Administrator

I authorize employees and officials of the City of Richland the right to enter and remain on the property in question to determine whether a permit should be issued and whether special conditions should be placed on any issued permit. I have the legal authority to grant such access to the property in question.

I also acknowledge that if a permit is issued for land development activities, no terms of the permit can be violated without further approval by the permitting entity. I understand that the granting of a permit does not authorize anyone to violate in any way any federal, state, or local law/regulation pertaining to development activities associated with a permit.

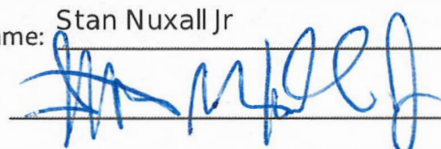
I hereby certify under penalty of perjury under the laws of the State of Washington that the following is true and correct:

1. I have read and examined this permit application and have documented all applicable requirements on the site plan.
2. The information provided in this application contains no misstatement of fact.
3. I am the owner(s), the authorized agent(s) of the owner(s) of the above referenced property, or I am currently a licensed contractor or specialty contractor under Chapter 18.27 RCW or I am exempt from the requirements of Chapter 18.27 RCW.
4. I understand this permit is subject to all other local, state, and federal regulations.

Note: This application will not be processed unless the above certification is endorsed by an authorized agent of the owner(s) of the property in question and/or the owner(s) themselves. If the City of Richland has reason to believe that erroneous information has been supplied by an authorized agent of the owner(s) of the property in question and/or by the owner(s) themselves, processing of the application may be suspended.

Applicant Printed Name: Stan Nuxall Jr

Applicant Signature:



Date

3/29/21

APPLICATION MUST INCLUDE

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3. 1 – 11" x 17" copy of proposed survey
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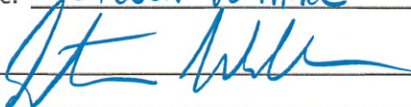
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1. I have read and examined this permit application and have documented all applicable requirements on the site plan.
2. The information provided in this application contains no misstatement of fact.
3. I am the owner(s), the authorized agent(s) of the owner(s) of the above referenced property, or I am currently a licensed contractor or specialty contractor under Chapter 18.27 RCW or I am exempt from the requirements of Chapter 18.27 RCW.
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Applicant Printed Name: Steven Wallace (agent of owner)

Applicant Signature:  Date 5/12/21



BETHEL CHURCH CONSTITUTION AND BYLAWS

CONSTITUTION

PREAMBLE

Placing our faith entirely in the Lord Jesus Christ for our salvation and believing the Bible to be our sole basis of authority and practice, we adopt this Constitution and Bylaws.

ARTICLE I – NAME

This organization shall be known as Bethel Church and includes all campuses.

ARTICLE II – PURPOSE

Our purpose is to build a community of whole people who, through devotion to Jesus Christ, are learning to live every day by the Word of God.

ARTICLE III – GOVERNMENT

Believing in the sovereignty of the local church as an autonomous body of believers under the leadership of the Holy Spirit, the government of this church shall be vested in its members who exercise the right of control in its affairs.

ARTICLE IV – STATEMENT OF FAITH

Section 1 – The Scripture – We believe the Bible and only the Bible to be God's infallible Word and the Christian's supreme authority in all matters of faith and practice. We affirm our belief in the verbal and plenary inspiration of the Scripture in their original autographs. (II Timothy 3:16-17; II Peter 1:20-21; I Peter 1:25)

Section 2 – God and the Trinity – We believe in one God, Creator of all things, infinitely perfect and eternally existing in three persons, Father, Son, and Holy Spirit. While its members possess individual, personal attributes, the Trinity is without division of nature, essence, or being. (Genesis 1:1; Matthew 28:19; John 10:30; 4:24; II Corinthians 13:14; I John 4:13).

Section 3 – Jesus Christ – We believe in the deity of our Lord Jesus Christ, God's only begotten Son, born of the Virgin Mary, sinless in life, who atoned for the sins of the world by His substitutionary death on the cross. We believe in His bodily resurrection, His ascension into heaven, and His High Priestly intercession for His people. (Matthew 1:18-25; Luke 1:35; John 1:1, 14; Acts 1:9-11; II Corinthians 5:21; Hebrews 4:15; 7:25; 9:24; I John 2:1-2)

Section 4 – The Holy Spirit – We believe the Holy Spirit to be the third person in the Trinity, whose ministry is to glorify the Lord Jesus Christ. During this age, the Holy Spirit draws men unto God; convicts men of sin, righteousness, and judgment; and indwells, guides, instructs, and empowers the believer for godly service. (John 14:16-17, 26; 16:8-15; Romans 5:5; 8:9-11; I Corinthians 3:16; 12:12-14; II Corinthians 13:14; Ephesians 1:13-14; Matthew 28:19-20)

Section 5 – Man – We believe that Adam was created in the image of God but fell into sin and that all men are sinners by nature and by choice and, therefore, are lost. However, we believe that "God so loved the world that He gave His only begotten Son that whosoever believeth in Him should not perish, but have everlasting life" (John 3:16). We believe that those who accept Christ as Savior and Lord shall be forever in God's presence and those who reject Christ as Savior and Lord will be forever separated from God and be cast into the lake of fire for eternal punishment. (Genesis 1:26-27; Mark 9:43-44; John 3:36; Romans 3:23; Romans 5:12; Ephesians 2:1-3, 12; II Thessalonians 1:9; Revelation 20:15)



BETHEL CHURCH CONSTITUTION AND BYLAWS

Section 6 – Salvation – We believe that the shed blood of Jesus Christ provides the only ground for justification and salvation for all who believe. Only those who receive Jesus Christ and are born of the Holy Spirit can thus become children of God. (John 1:12; 3:16; Acts 13:38-39; Romans 5:1; 8:14-17; Ephesians 1:7; Philippians 1:5-8; Hebrews 9:22; I Peter 1:18-19; 2:24)

Section 7 – Satan – We believe in the reality of Satan as a personal angelic being who has fallen from his original state of perfection and is now the prince of the corrupt, anti-God world-system. We believe in Satan's final and eternal judgment in the Lake of Fire. (Revelation 20:10; Ephesians 2:2; II Corinthians 4:4; Ezekiel 28:11-19; John 14:30; Job 1:12; 2:6)

Section 8 – The Church – We believe that the true Church is composed of all persons who, through saving faith in Jesus Christ, have been regenerated by the Holy Spirit. They are united together in the body of members of the true Church and shall be eligible for membership in the local church. (Acts 2:41; I Corinthians 12:12-13; II Corinthians 6:14; Ephesians 4:4-6, 15-16)

Section 9 – The Ordinances – We believe that baptism is the immersion of a believer in water in the name of the Father, and of the Son, and of the Holy Spirit, as a testimony of the person's faith in the crucified, buried, and risen Christ. It is a confession that the believer is dead to sin and risen to newness of life in Christ Jesus. We believe that the Lord's Supper is a commemoration of the Lord's death "until He come." (Matthew 28:19; 26:26-30; Acts 8:35-38; Romans 6:3-5; I Corinthians 11:23-26),

Section 10 – The Priesthood of the Believer – We believe all who are born of God have equal, direct access to God's ear and heart, and there is no distinction between believers in their exercise of that priesthood in their personal relationships with the Lord. (I Peter 2:5, 9; Hebrews 4:14-16; 2:10-18; Revelation 1:6)

Section 11 – The Last Things – We believe in "that blessed hope" (Titus 2:13) -- the personal, visible, pre-millennial return of our Lord and Savior Jesus Christ. We believe in the bodily resurrection of the just and the unjust, the everlasting blessedness of the saved and the everlasting conscious suffering of the lost. (Zechariah 14:4-11; Matthew 25:46; John 5:28-29; 11:25-26; Acts 1:11; I Thessalonians 4:16-18; Revelation 20:4-6, 11-15)

ARTICLE V – CHURCH COVENANT

We engage by the aid of the Holy Spirit to walk together in Christian love; to strive for the advancement of this church in knowledge of the Word and holiness; to promote its prosperity and spirituality; to sustain its worship, ordinances, discipline and doctrines; to contribute cheerfully and regularly to the support of the ministry, the expenses of the church and the spread of the gospel throughout all nations. We further engage to watch over one another in brotherly love and to remember each other in prayer.

ARTICLE VI – MEMBERSHIP

Membership in the church is granted on application of those who through faith in God's Son our Lord Jesus Christ, have been born anew to a living hope, have been baptized by immersion, desire to live a Christian life, and promise to support the total ministry of the church and to share its fellowship obligations.

ARTICLE VII – OFFICERS OF THE CHURCH

Section 1 – The officers of the church shall be the Church Chairman, Church Vice-Chairman, Secretary, and Treasurer. Where the law requires action by "trustees" the Officers of the Church shall be known as the "Board of Trustees" and its members as "Trustees".

Section 2 – The Trustees shall organize themselves in a manner specified by the Bylaws.



BETHEL CHURCH CONSTITUTION AND BYLAWS

ARTICLE VIII – ELDERS

Section 1 – For purposes of this document, whenever the term "Elder" is used, it refers to both Bethel Elders and Campus Elders. When the term "Bethel Elders" is used it is specific to Bethel Elders only. When the term "Campus Elders" is used it is specific to Campus Elders only. Elders shall be male members.

Section 2 – Bethel Elders are responsible for spiritual guidance and direction of the church and shall have such powers as are granted in the Bylaws. Bethel Elders will provide oversight and protection to the Campus Elders with ultimate authority resting with the Bethel Elders.

Section 3 – Campus Elders receive authority from the Bethel Elders and shall have such powers as are granted in the Bylaws.

ARTICLE IX – DEACONS AND COMMISSIONS FOR MINISTRY

Section 1 – For purposes of this document, whenever the term "Deacon" is used, it refers to both Bethel Deacons and Campus Deacons. When the term "Bethel Deacon" is used it is specific to Bethel Deacons only. When the term "Campus Deacons" is used it is specific to Campus Deacons only.

Section 2 – Commissions for ministry shall be entrusted with the programs and ministries of the church in accordance with the duties established in the Bylaws, or by the congregation. They shall be composed of a Deacon elected by the congregation and an unspecified number of appointed members.

Section 3 – Bethel Deacons serve the church with authority over multiple campuses. Campus Deacons serve with authority over a single, specific campus. Deacons shall have such power as are granted in the Bylaws.

ARTICLE X – BUSINESS MEETINGS

Regular business meetings of the congregation shall be held at stated intervals as provided in the Bylaws.

ARTICLE XI – PROPERTY

Section 1 – All property, real or personal, while owned by the Corporation shall be, and hereby is, irrevocably dedicated to Christian purposes and use. Historically (as the Church is currently at the time of writing this revision), the Corporation has been affiliated with CB Northwest. Regardless if the affiliation is active or not, in the event of liquidation, dissolution or abandonment of the Corporation, such property shall be distributed to CB Northwest, unless it is not then recognized as a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code. In the event that CB Northwest is unable or unwilling to accept these assets, the assets will not inure to the benefit of any private person, but instead will be passed on to a fund, foundation, or corporation organized and operated for evangelical, religious purposes within the limits of those specified in Section 501(c)(3) of the Internal Revenue Code.

Section 2 – In the event of schism within the church, the title of all the church property, real or personal, shall remain with the group which abides by this Constitution as determined by the Executive Board of CB Northwest.

ARTICLE XII – AMENDMENTS

This Constitution and Bylaws may be amended at any regular or special business meeting, the notice of which includes a statement of the time and place of the meeting at which the amendments will be considered; provided such proposed amendment has been presented at an informational meeting held at least two (2) weeks prior, and providing a copy of the proposed amendment has been made available to the membership. The vote required to amend the Constitution or Bylaws is a three-fourths (3/4) majority vote of members present and voting.



BETHEL CHURCH CONSTITUTION AND BYLAWS

BYLAWS

ARTICLE I – MEMBERSHIP

Section 1 – Admission into Membership

- A. Application for Membership – A request for membership shall be submitted to an Elder. The individual shall complete the prescribed membership preparation process, after which they shall appear before an Elder to give a confession of their Christian faith, according to Article VII of the Constitution. When an Elder has reviewed their application and received their testimony favorably, the applicant will be approved for membership.
- B. Staff Membership – Any nonmember who accepts a job to become a member of the ministry staff shall complete the membership process within six (6) months of joining staff. The Senior Pastor and his spouse, and the Executive Pastor and his spouse, will become members upon acceptance of the job. This requirement does not apply to Kids Express Preschool staff or childcare workers.

Section 2 – Responsibility of Membership – Every member shall assume the responsibilities and obligations placed on them by the Word of God and the Bethel Membership Covenant.

Section 3 – Discipline

- A. Negligent Members – A member who has willfully neglected their duties or who has not participated in the ministry and the services of the church for one year may be admonished by the Elders for their apparent lack of interest. If this admonition is not heeded, their membership shall be subject to termination. The Elders have the authority to dismiss a negligent member.
- B. Erring Members – A member known to err in doctrine (according to the Statement of Faith of Constitution Article IV) or conduct shall be counseled according to the procedure outlined in Matthew 18:15-18 and I Corinthians 5. If they do not heed the reproof and counsel of those who appealed to them, the matter shall be brought to the attention of the Elders, who shall in meekness and gentleness seek to restore them. If they fail to heed the counsel of the Elders, the error shall be communicated to the church body with the announcement that the erring member will be removed from membership in two (2) weeks if they do not express sincere repentance by testimony to the Elders. Forgiveness and restoration of fellowship and membership will be offered to any dismissed member who expresses and demonstrates sincere repentance.

Section 4 – Termination of Membership

- A. Membership will be terminated when the member moves from the area and/or joins another church.
- B. The membership of one who has willfully neglected their duties towards the church shall be subject to termination (see Article I Section 3).
- C. Membership may be terminated as part of discipline for unrepentant sin (see Article I Section 3).
- D. Membership will be terminated upon death of the member.
- E. Membership will be terminated at the member's request.



BETHEL CHURCH CONSTITUTION AND BYLAWS

ARTICLE II – CHURCH STAFF

Section 1 – General – The church staff shall consist of a Senior Pastor, Executive Pastor, and ministry staff. In addition to qualification for their specific assignment, they shall have demonstrated appropriate Christian character and values.

Section 2 – Qualifications

- A. Senior Pastor – The Senior Pastor of the church shall be a man who has been called by God and is equipped by natural and spiritual gifts, to preach the Gospel and teach the Word of God. He shall meet the New Testament requirements of his office (I Timothy 3:2-7; Titus 1:5-9; I Peter 5:1-4).
- B. Executive Pastor – The Executive Pastor shall be a man who has been called by God and is equipped by natural and spiritual gifts, to oversee the general administration of the church.
- C. Ministry Staff – The ministry staff shall be those who have been called by God and equipped by natural and spiritual gifts according to requirements of the church and their position. The ministry staff shall possess the professional and spiritual qualifications and personal motivation and skills to accomplish their assigned responsibilities.

Section 3 – Duties

- A. Senior Pastor – The Senior Pastor shall be devoted to the service of the church, preaching and teaching the Word of God, administering the ordinances, and faithfully giving himself to Pastoral work. All staff and deacons shall be subject to his supervision. He shall have the discretion to delegate his supervisory duties, as is necessary to allow him to perform his other duties. He shall be a member of the Bethel Elders, but may not serve as its Chairman, nor serve as any other church officer. He shall be a member of any commission for ministry or special committee(s) of his choosing.
- B. Executive Pastor – The Executive Pastor is responsible for the daily administration of the church. He shall be a member of any commission for ministry or special committee(s) of his choosing. He shall be responsible for motivation, supervision and direction of the ministry staff. He shall annually report on their performance to the Bethel Elders. He shall serve as Church Chairman and report to the Senior Pastor and/or Bethel Elders at the discretion of the Bethel Elders. Additional duties include:
 - 1. Ensure normal church operation in the absence of the Senior Pastor.
 - 2. Submit unforeseen expenditures not provided for in the budget to the Bethel Elders for approval, provided such approval will not cause the church to incur any additional indebtedness.
 - 3. Approve non-elected members of church wide (multi-campus) commissions and committees. Non-elected members of campus specific commissions and committees are approved by the respective Campus Pastor.
 - 4. Provide oversight of ongoing programs of the commissions for ministry.
 - 5. Submit proposed changes in church policy within the limits of the Constitution and Bylaws for Bethel Elder approval.
 - 6. Appoint a nominating committee for ministry staff excluding the Senior Pastor position.



BETHEL CHURCH CONSTITUTION AND BYLAWS

7. Supervise the performance of the ministry staff or designated ministry staff member to carry out such duties.
- C. Ministry Staff – The ministry staff shall consist of Pastors (other than the Senior Pastor and Executive Pastor), Directors, and others that the church employs to carry out the ministries of the church. The Executive Pastor or his designated ministry staff member shall supervise the performance of the ministry staff. Ministry staff shall be members of any commissions functioning in their areas of ministry.

Section 4 – Hiring

- A. The Senior Pastor shall be recommended by the Bethel Elders to the members at a regular or special church business meeting, the purpose of which shall be announced in writing at least two (2) weeks in advance. As a requirement for hiring, he shall be chosen by ballot with three fourths (3/4) majority vote of members present.
- B. The Executive Pastor shall be hired upon the recommendation of the Bethel Elders. A public forum shall be held for an Executive Pastor candidate who is not a member of the church prior to hiring.
- C. Campus Pastors and Senior Directors shall be hired by the Bethel Elders. All other ministry staff shall be hired by the Executive Pastor. A public forum shall be held for Campus Pastors, Senior Directors, and Directors who are not a member of the church prior to hiring.

Section 5 – Terminations

- A. Senior Pastor – Should a situation occur in which accusations arise against the Senior Pastor, such accusations must be supported by two or three witnesses and be presented in writing to the Bethel Elders. Should it be proved that he has erred in doctrine or conduct, he shall be lovingly admonished by the Bethel Elders. If this does not resolve the matter, the matter shall be presented to the church by the Bethel Elders at the annual or a special business meeting called for that purpose. Notice of such meeting shall be given from the pulpit on at least two (2) consecutive Sundays immediately prior to said meeting. The vote required to dismiss a Senior Pastor is a three fourth (3/4) majority of members present and voting.
- B. Executive Pastor – The Executive Pastor may be terminated by the Bethel Elders.
- C. Ministry Staff – Ministry staff may be terminated by the staff person assigned administrative authority over them with the approval of the Senior Pastor and Executive Pastor, or by the Bethel Elders. The termination of Campus Pastors and Senior Directors shall be approved by the Bethel Elders. The termination of other Pastors or Directors shall be reported to the Elders.

ARTICLE III – AUTHORITY OF THE CONGREGATION

Section 1 – Ultimate authority and responsibility for church decisions reside in the congregation, acting in a lawful business meeting as described in Article VIII of the Bylaws. The congregation may review, reverse, or modify any action or decision of the Elders, the Senior Pastor, the Executive Pastor, or any commission, committee, or officer of the church. The congregation shall have sole authority to:

- A. Adopt and amend the church budget.
- B. Authorize the incurring of indebtedness on the part of the church.



BETHEL CHURCH CONSTITUTION AND BYLAWS

- C. Elect Bethel Deacons and Bethel Elders (Campus Deacons are elected by the members of the respective campus).
- D. Hire or terminate the Senior Pastor.
- E. Establish or discontinue permanent commissions for ministry.
- F. Acquire or dispose of church real property or interest therein.
- G. Amend the Constitution and Bylaws.
- H. Resolve issues referred by the Bethel Elders.

ARTICLE IV – OFFICERS

Officers of the church shall consist of a Church Chairman, a Church Vice-Chairman, a Treasurer, and a Secretary. The Executive Pastor shall be the Church Chairman. The Chairman of the Bethel Elder Board shall be Church Vice Chairman. The Treasurer and Secretary shall be appointed by the Bethel Elders.

Section 1 – Church Chairman Duties – The Church Chairman’s duties shall include:

- A. Preside at all church business meetings.
- B. Preserve all official correspondence and legal documents of the church.

Section 2 – Church Vice-Chairman Duties – The Church Vice-Chairman’s duties shall include:

- A. Assist the Church Chairman in his duties.
- B. Assume the duties of the Church Chairman in his absence.

Section 3 – Treasurer Duties – The Treasurer’s duties shall include:

- A. Work with the appropriate staff to oversee the receiving, recording, and depositing of all funds contributed to the church.
- B. Work with the appropriate staff to prepare and distribute statements of contributions to the contributors at least annually.
- C. Work with the appropriate staff to oversee all disbursements as authorized by the church.
- D. Be a member of any ministry commission or directorship pertaining to church finances.
- E. Provide financial reports to the Elders as directed.
- F. Work with the Executive Pastor to submit an annual budget for approval.
- G. Submit a summary written financial report at each regular church business meeting.



BETHEL CHURCH CONSTITUTION AND BYLAWS

Section 4 – Secretary Duties – The Secretary’s duties shall include:

- A. Be responsible for maintaining and preserving the minutes of all business meetings of the church.
- B. Conduct and preserve all official correspondence as is delegated to them.
- C. Assist the Church Chairman to preserve all official correspondence and legal documents of the church.
- D. Maintain permanent church records, such as membership, terms and status of elected officers, baptisms, weddings, etc.
- E. Carry out duties as assigned by the Church Chairman or Church Vice-Chairman.

ARTICLE V – ELDERS

Section 1 – Bethel Elder Election – Bethel Elders are elected by church members. Names of prospective Bethel Elder candidates shall be submitted by any member of the church to a Bethel Elder at least two (2) months prior to a business meeting. The Bethel Elders will consider all names, and interview selected candidates. The Bethel Elders will then present selected candidates to the body two (2) weeks prior to said business meeting. The candidates must be approved at the business meeting by a three-fourths (3/4) majority vote of members present and voting.

Section 2 – Bethel Elder Number and Term – Bethel Elders shall serve a three (3) year term in such a manner that the terms of approximately one-third (1/3) of the Bethel Elders expire each year. There shall be a minimum of four (4) elected Bethel Elders, not more than one-half (1/2) of which are paid staff. The number of Bethel Elders shall be determined by the Bethel Elders. The Senior Pastor remains a Bethel Elder and is not subject to the three (3) year term.

Section 3 – Campus Elders Election – Campus Elders are appointed by the Bethel Elders. Names of prospective Campus Elder candidates shall be submitted by any member of the church to a Campus Elder on the candidate’s respective campus. The Campus Elders will consider all names and submit selected candidates to the Bethel Elders. The Bethel Elders will consider all names, and interview selected candidates. Approved candidates will then be presented by the Bethel Elders to the local campus for an affirmation vote by that campus’ members. This affirmation vote may take place at an all-church business meeting. The results of the affirmation vote will be considered by the Bethel Elders prior to appointment.

Section 4 – Campus Elder Number and Term – Campus Elders shall serve for terms of three years in such a manner that the terms of approximately one-third (1/3) of each campus’ Elders shall expire each year. The number of Campus Elders will be determined by the Bethel Elders based on the needs of the specific campus, not more than one-half (1/2) of which are paid staff.

Section 5 – Elder Board Chairman – Each Elder board shall select from among their members the Chairman of the Elder Board. The Chairman of the Bethel Elder Board will also serve as the Church Vice-Chairman. The Chairmen shall prepare the meeting agendas, direct the meeting discussion, and appoint sub-committees as needed. The Senior Pastor, Executive Pastor, and ministry staff cannot serve as Chairman of any Elder board.

Section 6 – Qualifications – Elders must meet the spiritual qualifications for their office contained in the Word of God (I Timothy 3:1-7; Titus 1:5-9; I Peter 5:1-4; Hebrews 13:17). Elders shall be male members.



BETHEL CHURCH CONSTITUTION AND BYLAWS

Section 7 – Meetings – In addition to frequent informal meetings for prayer and evaluation of the life of the congregation, the Elders shall conduct official meetings with minutes not less than once a month.

Section 8 – Quorum – If an Elder board consists of two (2) people, both must be present for a quorum. If an Elder board consists of three (3) or four (4) people, a minimum of three (3) must be present for a quorum. If an elder board consists of five (5) or more people, two-thirds (2/3) of the board must be present for a quorum.

Section 9 – Decisions and Voting – All Elder board decisions or actions must be by unanimous vote. Campus Elders may vote to refer a matter to the Bethel Elders. Bethel Elders may vote to refer a matter to the church members. An absent Elder may vote by proxy.

Section 10 – Bethel Elder Duties – The Bethel Elder Board shall fulfill the duties conferred on it by the Constitution and Bylaws including the following:

- A. Oversee the spiritual life of the congregation and provide pastoral care when needed.
- B. Develop and share with the congregation goals and plans relating to the ongoing life and ministry of the church.
- C. Supervise the church membership process and inform the congregation concerning discipline or removal of existing members.
- D. Review, evaluate, and encourage the ministry of the Senior Pastor and Executive Pastor.
- E. Make the final decision for hiring and termination of the Executive Pastor, Campus Pastors, and Senior Directors. Provide input for the hiring and termination of ministry staff.
- F. Monitor all commissions for ministry in areas where spiritual matters are concerned.
- G. Keep the staff and congregation informed of actions and decisions of the Elders.
- H. Approve policies as submitted by the Executive Pastor.
- I. Appoint Campus Elders.
- J. Delegate duties as required to the Campus Elders in order to maximize the spiritual health of the church.

ARTICLE VI – ELDER EMERITUS

The title of Elder Emeritus may be conferred upon a former Bethel Elder who is sixty five (65) years of age or more, has served a minimum of ten (10) years as a Bethel Elder, left the Bethel Elder Board in good standing, and has a desire to continue to serve the body in the role and with the authority of Elder Emeritus. Selection is by unanimous vote of the Bethel Elder Board to a three (3) year term. The term starts when the vote is affirmed by the Bethel Elders. Elder Emeritus status may be renewed at the end of each term following another vote by the Bethel Elders. Elder Emeritus status may be removed at any time by unanimous vote by the Bethel Elders. The requirements of the position include continuing the lifestyle of an elder as specified biblically and fulfilling the responsibilities of the Bethel Membership Covenant. Duties and privileges include receiving on-going confidential communication, praying with Elder authority corporately or privately, representing the church as an Elder in regard to spiritual matters, and other functions agreed on by both the Elder Emeritus and Bethel Elders. An Elder Emeritus does not have Bethel Elder decision-making authority.



BETHEL CHURCH CONSTITUTION AND BYLAWS

ARTICLE VII – DEACONS AND COMMISSIONS FOR MINISTRY

Section 1 – Deacon Requirements – Every commission for ministry established by the congregation shall have a Deacon serving as Chair. There may be additional Deacons who do not serve as the Chair of a commission. Deacons shall be men and women (Deaconess) of evident Christian commitment in both their personal and public lives, and must meet the qualifications for the office set forth in I Timothy 3:8-13 and Acts 6:2-6, as well as meet the requirements of the Bethel Membership Covenant.

Section 2 – Bethel Deacon Election and Term – Names of prospective Bethel Deacon candidates shall be submitted to the Executive Pastor one month prior to the annual business meeting by any member of the church. All names will be considered by the Executive Pastor and Bethel Elder Board. The selected candidate for each Bethel Deacon position will then be presented to the members two (2) weeks prior to a business meeting where they will be voted on. Approval is by a simple majority of those members present and voting. Bethel Deacons shall be elected to a three (3) year renewable term.

Section 3 – Campus Deacon Election and Term – Names of prospective Campus Deacon candidates shall be submitted to the appropriate Campus Pastor one month prior to the annual business meeting by any member of the respective campus. All names will be considered by the Campus Pastor and Campus Elder Board. The selected candidate for each Campus Deacon position will then be presented to the respective campus members two (2) weeks prior to a business meeting where they will be voted on. Approval is by a simple majority of those members present and voting. Campus Deacons shall be elected to a three (3) year renewable term.

Section 4 – Duties – The Deacon’s duties shall include:

- A. Chair the assigned commission, if applicable.
- B. Develop and implement programs and ministries to carry out assigned tasks.
- C. Meet as required with commission members (if applicable) and appropriate staff to carry out assigned tasks.
- D. If serving as Chair of a commission, appoint members to the commission as needed subject to the approval of the Executive Pastor for Bethel commissions or the appropriate Campus Pastor for campus commissions.

Section 5 – Removal from Office – If a Bethel Deacon or commission member willingly neglects their duties or is guilty of conduct that impairs their service in office, the Executive Pastor, with approval of the Bethel Elders, may remove such a person from their position. If a Campus Deacon or commission member willingly neglects their duties or is guilty of conduct that impairs their service in office, the respective Campus Pastor, with approval of the respective Campus Elders, may remove such a person from their position.

Section 6 – Vacancies – Vacancies in Deacon positions may be filled through appointment by the Executive Pastor and Bethel Elders for Bethel Deacons or by the respective Campus Pastor and the respective Campus Elders for Campus Deacons. This appointment shall expire at the next annual business meeting.

ARTICLE VIII – BUSINESS CONDUCT

Section 1 – Fiscal Year – The fiscal year shall be from August 1st through July 31st.

Section 2 – Regular Business Meetings – The regularly scheduled business meeting of the church will occur no later than two weeks prior to the end of the current fiscal year. As a minimum, the meeting will include election



BETHEL CHURCH CONSTITUTION AND BYLAWS

of officers, approval of the following year's budget, and an oral report on the previous year's activities and future goals by the Senior Pastor.

Section 3 – Special Business Meetings – Special business meetings may be called by the Senior Pastor, Executive Pastor, the Bethel Elders or by written request to the Bethel Elders by fifteen percent (15%) of the eligible voting membership of the church. Notice of such meeting and the purpose for which it is called must be given from the pulpit at least one (1) week prior to said meeting.

Section 4 – Quorum & Physical Presence – Twenty-five percent (25%) of the eligible voting membership shall constitute a quorum for the transaction of business. Voting by absentee ballot is allowed when approved by the Bethel Elders on a case-by-case basis. Absentee voting counts towards the minimum number of members present and voting for any decision outlined in the Constitution and Bylaws.

Section 5 – Voting Eligibility – The minimum age shall be eighteen (18) years.

Section 6 – Secret Ballot – The secret ballot shall be used for hiring or termination of a Senior Pastor, for the annual election of officers, at the discretion of the Church Chairman, or at the request of a majority of voting members at any congregational business meeting.

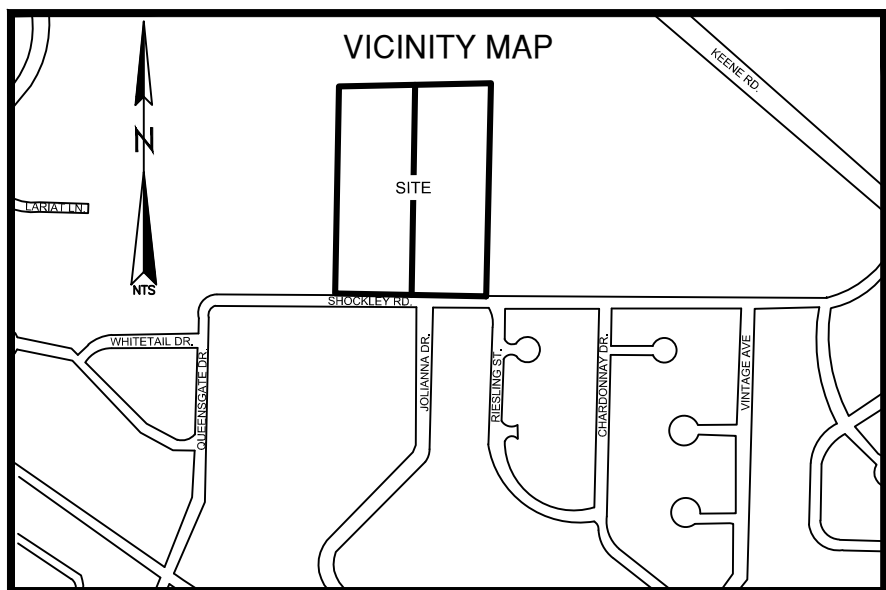
Section 7 – Majority Rule – Unless specified elsewhere in the Constitution and Bylaws, a simple majority of members present and voting shall be sufficient to decide any question.

Section 8 – Order – All questions of order shall be guided by customary rules governing deliberative bodies as given in *Robert's Rules of Order, Revised*.

Exhibit 2

PRELIMINARY PLAT
OF FAIRHAVEN

PORTION OF THE S.W. 1/4 OF SECTION 22,
TOWNSHIP 9 NORTH, RANGE 28 EAST, WILLAMETTE MERIDIAN,
CITY OF RICHLAND, BENTON COUNTY, WASHINGTON



SURVEYOR'S NOTES

- DATE OF SURVEY/MONUMENTS VISITED: 12/15/2020
- BASIS OF BEARING: NAD83(11) WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE.
- UNITS OF MEASURE: US SURVEY FEET GRID DISTANCES. MULTIPLY GRID DISTANCES BY A COMBINED SCALE FACTOR OF 1.00095201 TO ACHIEVE GROUND DISTANCES. REFERENCE SURVEY AND LOT AREAS ARE GROUND DISTANCES. MULTIPLY GROUND DISTANCES BY A COMBINED SCALE FACTOR OF 0.99990488 TO ACHIEVE SURVEYED GRID DISTANCES.
- EQUIPMENT/PROCEDURES: TOPCON GR3 GNSS, RTK METHOD. LINEAR CLOSURES MEET OR EXCEED STANDARDS CONTAINED IN WAC 332-130-090.
- FOUND AS NOTED.
- SET 5/8" REBAR & CAP STAMPED "PERMIT 54534"
- SET 2.5" BRASS CAP IN MONUMENT CASE "54534"
- CALCULATED POINT, NOT FOUND OR SET. REFERENCE SURVEY: RECORD OF SURVEY NO. 5204, AUDITOR'S FILE NO. 2019-020239.
- CONTOURS: 1" CONTOURS DERIVED FROM GROUND SURVEY WITH AN ACCURACY OF 1/10TH THE CONTOUR INTERVALS.
- THE PURPOSE OF THIS SURVEY IS FOR A PRELIMINARY PLAT APPLICATION. A BOUNDARY SURVEY WAS CONDUCTED AS PART OF THIS PRELIMINARY PLAT.
- VERTICAL DATUM: NAVD83 CITY OF RICHLAND DATUM.

NOTES

- OWNER: BETHEL CHURCH OF RICHLAND, A WASHINGTON NON-PROFIT CORPORATION
 - 600 SHOCKLEY RD, RICHLAND, WASHINGTON
 - PARCEL NO. 122983000006002 & 122983000006003
 - DEVELOPING AREA: 10.2 ACRES
 - ZONING: R-3 MULTIPLE-FAMILY RESIDENTIAL
 - EXISTING USE: VACANT
 - PROPOSED USE: SINGLE-FAMILY RESIDENTIAL SUBDIVISION
- DEVELOPER**
STAN NUXALL
PHONE NUMBER: (509)539-6323
EMAIL: STAN@NUXALL.COM
ADDRESS: 101 N MORAIN ST #100,
KENNEWICK, WA 99336
GREEN PLAN CONSTRUCTION, LLC

ENGINEER

CALEB STROMSTAD, PE
PRINCIPAL ENGINEER, AQTERA ENGINEERING
PHONE NUMBER: (509)845-0208
ADDRESS: 2705 SAINT ANDREWS LOOP, SUITE C,
PASCO WA, 99301

DESCRIPTION

PARCEL A
THE WEST 286.37 FEET OF THE EAST 1131.63 FEET OF THAT PORTION OF THE WEST 2054.40 FEET OF THE SOUTHWEST QUARTER OF SECTION 22, TOWNSHIP 9 NORTH, RANGE 28 EAST, W.M., BENTON COUNTY, WASHINGTON, LYING SOUTH OF THE FOLLOWING DESCRIBED LINE:

BEGINNING AT A POINT ON THE WEST LINE OF SAID SECTION DISTANT 797.55 FEET NORTH OF THE SOUTHWEST CORNER THEREOF;
THENCE EAST PARALLEL WITH THE SOUTH LINE OF SAID SECTION 733 FEET;
THENCE EASTERLY IN A STRAIGHT LINE TO A POINT ON THE EAST LINE OF SAID WEST 2054.40 FEET WHICH IS 827.10 FEET NORTH OF THE SOUTH LINE OF SAID SECTION AND THE TERMINUS OF SAID DESCRIBED LINE;
EXCEPT THE SOUTH 30 FEET THEREOF FOR ROAD.

(DEPICTED AS PARCEL 2 ON RECORD OF SURVEY NO. 960)

PARCEL B
THE WEST 284.02 FEET OF THE EAST 845.31 FEET OF THAT PORTION OF THE WEST 2054.40 FEET OF THE SOUTHWEST QUARTER OF SECTION 22, TOWNSHIP 9 NORTH, RANGE 28 EAST, W.M., BENTON COUNTY, WASHINGTON, LYING SOUTH OF THE FOLLOWING DESCRIBED LINE:

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(DEPICTED AS PARCEL 3 ON RECORD OF SURVEY NO. 960)

Line Table		
Line #	Length	Direction
L1	5.54	S00°04'26"E
L2	6.20	S00°29'53"W
L3	6.20	S00°29'53"W
L4	14.13	N00°16'04"E
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L9	14.15	N37°12'11"E
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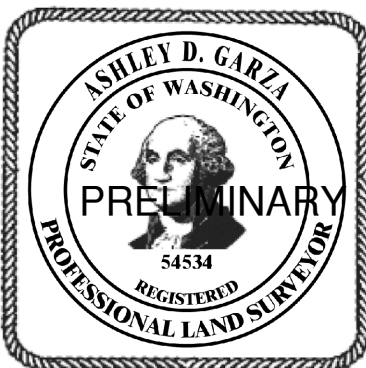
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CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD DISTANCE	CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD DISTANCE
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C6	15.65	77.00	11°38'51"	S45°14'39"E	15.63	C20	78.54	50.00	90°00'00"	N44°13'14"E	70.71
C7	33.68	77.00	25°03'34"	S26°53'27"E	33.41	C21	26.55	77.00	19°45'13"	S79°20'38"W	26.42
C8	44.80	50.00	51°20'09"	S25°24'01"E	43.32	C22	20.56	77.00	15°17'54"	S61°49'04"W	20.50
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SURVEYOR'S CERTIFICATION

I, ASHLEY D. GARZA, A REGISTERED LAND SURVEYOR, HEREBY CERTIFY THAT THE PLAT AS SHOWN HEREON IS BASED ON AN ACTUAL FIELD SURVEY OF THE LAND DESCRIBED AND THAT ALL CORNERS AND DIMENSIONS ARE CORRECTLY SHOWN AND THAT SAID PLAT IS STAKED ON THE GROUND AS INDICATED HEREON.

ASHLEY D. GARZA
CERTIFICATE NO. 54534

DATE



PERMIT SURVEYING NC
2245 Robertson Drive
Richland, Washington 99354
OFFICE 509-375-4123
FAX 509-371-0999

PROJECT NO. 20181

DRAWN BY: SDA

CHECKED BY: ADC

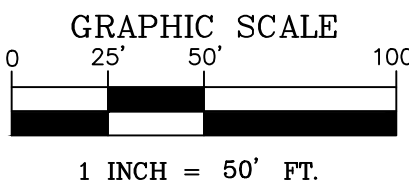
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04/21/2021

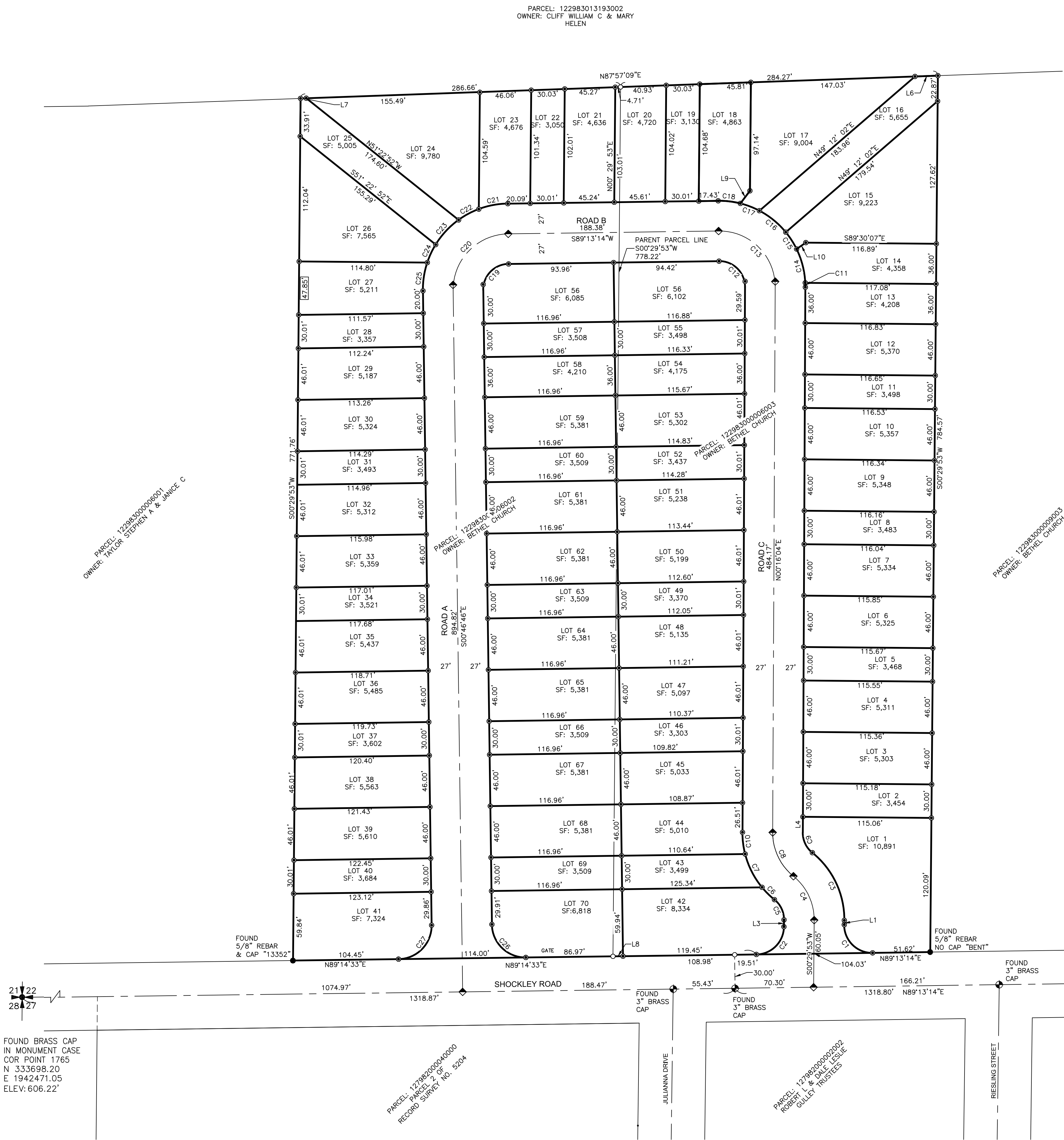
SHEET 1 OF 1

STAN NUXALL

PRELIMINARY PLAT OF FAIRHAVEN RICHLAND, WASHINGTON

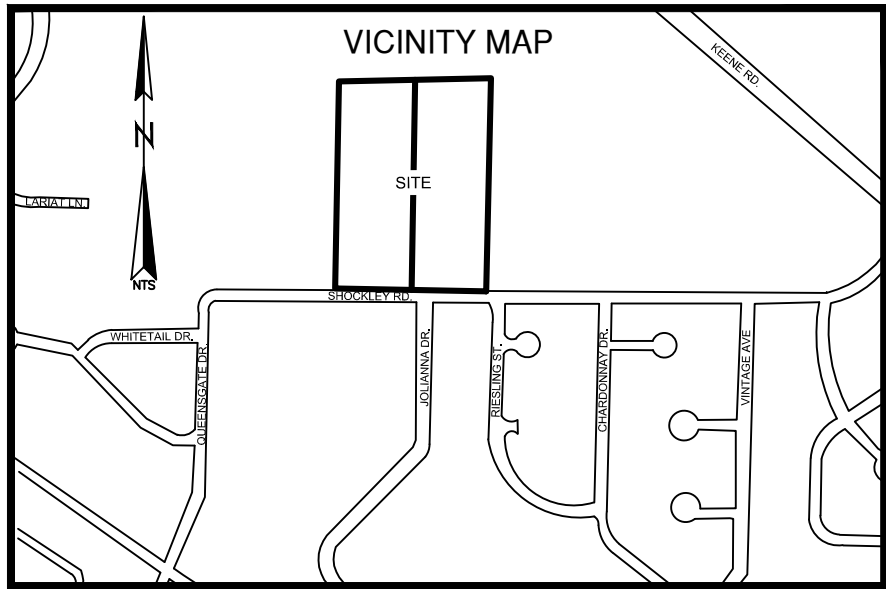


1 INCH = 50' FT.



PRELIMINARY PLAT
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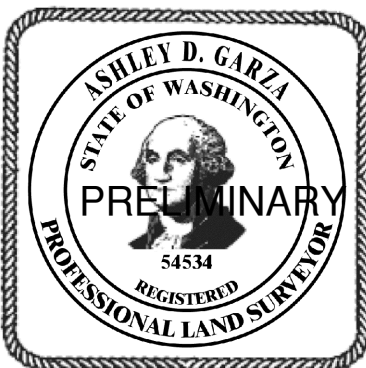
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ASHLEY D. GARZA
CERTIFICATE NO. 54534

DATE



PERMIT SURVEYING NC
2245 Robertson Drive
Richland, Washington 99354
OFFICE 509-375-4123
FAX 509-371-0999

PROJECT NO. 20181

DRAWN BY: SDA

CHECKED BY: ADG

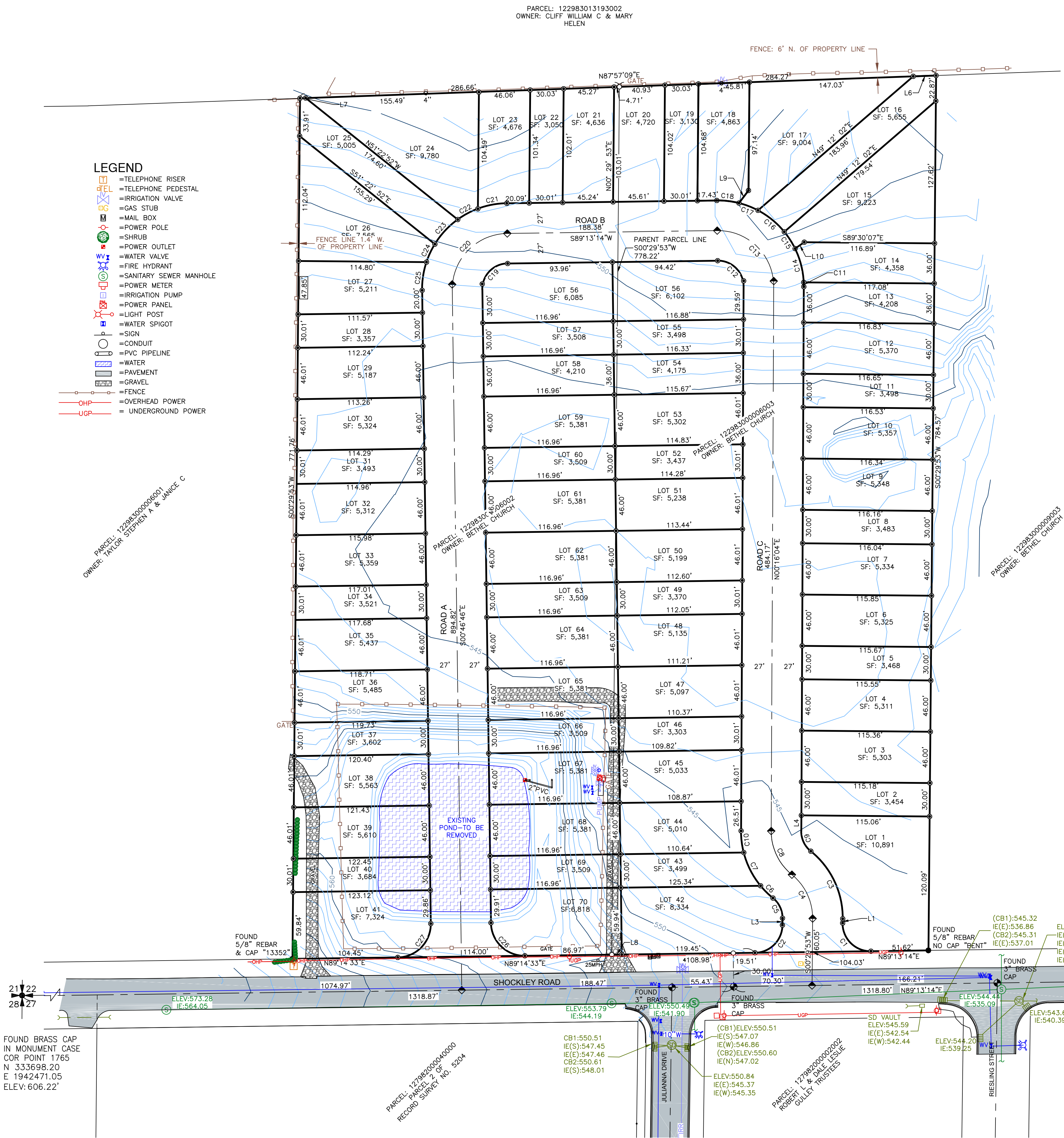
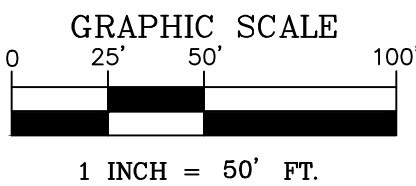
SCALE: 1" = 50'

04/21/2021

SHEET 1 OF 1

STAN NUXALL

PRELIMINARY PLAT OF FAIRHAVEN, RICHLAND, WASHINGTON





510 N. COLORADO ST., STE B
KENNEWICK, WA 99336 Phone: 509-783-0661 Fax: 509-783-2256

**SUBDIVISION GUARANTEE
SECOND REPORT**

SCHEDULE A

Office File Number BF11967 Ref. No.:	Policy Number SGW-08004235	Date of Policy March 22, 2021 at 8:00 AM	Amount of Insurance \$450.00	Premium \$0.00
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NAME OF ASSURED:

Green Plan Construction

THE ASSURANCES REFERRED TO ON THE FACE PAGE ARE:

THAT, ACCORDING TO THOSE PUBLIC RECORDS WHICH, CONSTRUCTIVE NOTICE OF MATTERS RELATIVE TO THE DESCRIPTION OF WHICH IS FULLY SET FORTH IN UNDER THE RECORDING LAWS, IMPART FOLLOWING DESCRIBED REAL PROPERTY:

SEE ATTACHED EXHIBIT "A"

TITLE TO SAID REAL PROPERTY IS VESTED IN:

Bethel Church of Richland, Washington Non-Profit Corporation

SUBJECT TO THE MATTERS SHOWN BELOW UNDER EXCEPTIONS, WHICH EXCEPTIONS ARE NOT NECESSARILY SHOWN IN THE ORDER OF THEIR PRIORITY.

EXCEPTIONS:

1. GENERAL TAXES AND ASSESSMENTS, IF ANY, NO SEARCH HAVING BEEN MADE THEREOF; ALSO, TAXES OR ASSESSMENTS WHICH ARE NOT SHOWN AS EXISTING LIENS BY THE RECORDS OF ANY TAXING AUTHORITY THAT LEVIES TAXES OR ASSESSMENTS ON REAL PROPERTY OR BY THE PUBLIC RECORDS.
2. UNPATENTED MINING CLAIMS, RESERVATIONS OR EXCEPTIONS IN THE UNITED STATES PATENTS OR IN ACTS AUTHORIZING THE ISSUANCE THEREOF; WATER RIGHTS, CLAIMS OR TITLE TO WATER.
3. TITLE TO ANY PROPERTY BEYOND THE LINES OF THE REAL PROPERTY EXPRESSLY DESCRIBED HEREIN, OR TITLE TO STREETS, ROADS, AVENUES, LANES, WAYS OR WATERWAYS ON WHICH SUCH REAL PROPERTY ABUTS, OR THE RIGHT TO MAINTAIN THEREIN VAULTS, TUNNELS, RAMPS, OR ANY OTHER STRUCTURE OR IMPROVEMENT; OR ANY RIGHTS OR EASEMENTS THEREIN UNLESS SUCH PROPERTY, RIGHTS OR EASEMENTS ARE EXPRESSLY AND SPECIFICALLY SET FORTH IN SAID DESCRIPTION.

ADDITIONAL EXCEPTIONS:

1. GENERAL TAXES FOR 2021 IN THE ORIGINAL AMOUNT OF \$1,741.69. TAX ACCOUNT NO. 1-2298-300-0006-002. (AREA CODE R3 , FIRST HALF TAXES ARE DELINQUENT MAY 1. LAST HALF TAXES ARE DELINQUENT NOVEMBER 1.)
2. GENERAL TAXES FOR 2021 IN THE ORIGINAL AMOUNT OF \$2,689.95. TAX ACCOUNT NO. 1-2298-300-0006-003. (AREA CODE R3, FIRST HALF TAXES ARE DELINQUENT MAY 1. LAST HALF TAXES ARE DELINQUENT NOVEMBER 1.)
3. KENNEWICK IRRIGATION DISTRICT FOR 2021 IN THE ORIGINAL AMOUNT OF \$972.90. TAX ACCOUNT NO. 1-2298-300-0006-002. (FIRST HALF IS DELINQUENT MAY 1. LAST HALF IS DELINQUENT NOVEMBER 1.)
4. KENNEWICK IRRIGATION DISTRICT FOR 2021 IN THE ORIGINAL AMOUNT OF \$972.08. TAX ACCOUNT NO. 1-2298-300-0006-003. (FIRST HALF IS DELINQUENT MAY 1. LAST HALF IS DELINQUENT NOVEMBER 1.)
5. DELINQUENT KENNEWICK IRRIGATION DISTRICT FOR 2020 IN THE SUM OF \$525.15, PLUS INTEREST. TAX ACCOUNT NO. 1-2298-300-0006-002.
(FIRST HALF IS DELINQUENT MAY 1. LAST HALF IS DELINQUENT NOVEMBER 1.)
6. DELINQUENT KENNEWICK IRRIGATION DISTRICT FOR 2020 IN THE SUM OF \$524.75, PLUS INTEREST. TAX ACCOUNT NO. 1-2298-300-0006-003.
(FIRST HALF IS DELINQUENT MAY 1. LAST HALF IS DELINQUENT NOVEMBER 1.)
7. LIABILITY TO FUTURE ASSESSMENT BY KENNEWICK IRRIGATION DISTRICT.
8. EASEMENT, INCLUDING THE TERMS, COVENANTS AND PROVISIONS THEREOF;
RECORDED: FEBRUARY 21, 1957
RECORDING NO.: 368616
IN FAVOR OF: BENTON RURAL ELECTRIC ASSOCIATION
FOR: ELECTRIC POWER
9. RESERVATIONS BY THE UNITED STATES OF AMERICA IN PATENT RECORDED UNDER AUDITOR'S FILE NO. 514550, AS FOLLOWS:

EXCEPTING AND RESERVING, ALSO, TO THE UNITED STATES ALL THE OIL AND GAS IN THE LAND SO PATENTED, AND TO IT, OR PERSONS AUTHORIZED BY IT THE RIGHT TO PROSPECT FOR, MINE AND REMOVE SUCH DEPOSITS FROM THE SAME UPON COMPLIANCE WITH THE CONDITIONS AND SUBJECT TO THE PROVISIONS AND LIMITATIONS OF THE ACT OF JULY 17, 1914 (38 STAT. 509).

THERE IS ALSO RESERVED A RIGHT OF WAY FOR A FEDERAL AID HIGHWAY UNDER 23 U.S.C. 317.
10. TERMS, COVENANTS AND PROVISIONS OF THAT CERTAIN EASEMENT, AS DISCLOSED BY INSTRUMENT;
RECORDED: JUNE 2, 1969
RECORDING NO.: 601958
IN FAVOR OF: V. DEAN ALLEN AND BARBARA JEAN ALLEN
FOR: IRRIGATION WATER
11. TERMS, COVENANTS AND PROVISIONS OF THAT CERTAIN EASEMENT, AS RESERVED BY Subdivision Guarantee

Policy Number: **SGW-08004235**

INSTRUMENT;

RECORDED: APRIL 30, 1990

RECORDING NO.: 90-6812

IN FAVOR OF: LOREN COSENS AND THELMA LORRAINE COSENS

FOR: IRRIGATION

12. RIGHT-OF-WAY FOR SHOCKLEY ROAD, IF ANY, AND ANY EASEMENT RIGHTS OF ADJOINING PROPERTIES OR THE PUBLIC TO THAT PORTION OF THE LAND INCLUDED WITHIN SUCH ROAD.

13. MUNICIPAL SEWER FACILITIES ACT AGREEMENT AND THE TERMS AND CONDITIONS THEREOF:

REGARDING: A DOMESTIC SEWER MAIN

RECORDED: December 03, 2004

AUDITOR'S FILE NO.: 2004-042290

14. MUNICIPAL SEWER FACILITIES ACT AGREEMENT AND THE TERMS AND CONDITIONS THEREOF:

REGARDING: A DOMESTIC SEWER MAIN

RECORDED: December 03, 2004

AUDITOR'S FILE NO.: 2004-042291

15. MUNICIPAL SEWER FACILITIES ACT AGREEMENT AND THE TERMS AND CONDITIONS THEREOF:

REGARDING: A DOMESTIC SEWER MAIN

RECORDED: December 03, 2004

AUDITOR'S FILE NO.: 2004-042292

16. MUNICIPAL SEWER FACILITIES ACT AGREEMENT AND THE TERMS AND CONDITIONS THEREOF:

REGARDING: A DOMESTIC SEWER MAIN

RECORDED: March 09, 2005

AUDITOR'S FILE NO.: 2005-007279

17. EASEMENT AND THE TERMS AND CONDITIONS THEREOF:

GRANTEE: BETHEL CHURCH

PURPOSE: INGRESS AND EGRESS

RECORDED: December 12, 2005

AUDITOR'S FILE NO.: 2005-042552

18. DEED OF TRUST AND THE TERMS AND CONDITIONS THEREOF:

GRANTOR: BETHEL CHURCH

TRUSTEE: TRI-CITY TITLE & ESCROW

BENEFICIARY: BANNER BANK

AMOUNT: \$1,800,000.00

DATED: November 07, 2013

RECORDED: November 13, 2013

AUDITOR'S FILE NO.: 2013-037750 (INCLUDES OTHER PROPERTY)

MODIFICATION OF DEED OF TRUST AND THE TERMS AND CONDITIONS THEREOF:

DATED: May 03, 2016

RECORDED: May 06, 2016

AUDITOR'S FILE NO.: 2016-012418

PROVIDING FOR: ADDITIONAL ADVANCE

19. ASSIGNMENT OF LEASES AND/OR RENTS:

ASSIGNOR: BETHEL CHURCH

ASSIGNEE: BANNER BANK

RECORDED: November 13, 2013

Policy Number: **SGW-08004235**

AUDITOR'S FILE NO.: 2013-037751

20. FINANCING STATEMENT AND THE TERMS AND CONDITIONS THEREOF:

DEBTOR: BETHEL CHURCH OF RICHLAND, WASHINGTON

SECURED PARTY: BANNER BANK

RECORDED: November 13, 2013

AUDITOR'S FILE NO.: 2013-037752

21. AGREEMENT, INCLUDING THE TERMS, COVENANTS AND PROVISIONS THEREOF, ENTERED INTO;

BETWEEN: CITY OF RICHLAND

AND: BETHEL CHURCH

RECORDED: November 01, 2019

RECORDING NO.: 2019-034312

PURPOSE: PROPERTY USE AND DEVELOPMENT

22. MATTERS SHOWN ON RECORD SURVEY NO. 960.

END OF SCHEDULE A EXCEPTIONS.

Policy Number: **SGW-08004235**

NOTES:

AT THE REQUEST OF THE ASSURED THE FOLLOWING INFORMATION IS PROVIDED:

- a. THE ADDRESS OF THE SUBJECT PROPERTY IS:
VACANT LAND
BENTON COUNTY, WA
- b. ACCORDING TO THE RECORDS OF BENTON COUNTY ASSESSOR, THE CURRENT VALUE OF SAID PREMISES IS AS FOLLOWS:

TAX ACCOUNT NO.:	1-2298-300-0006-002
LAND:	\$151,000.00
IMPROVEMENTS:	\$0.00
TOTAL:	\$151,000.00

TAX ACCOUNT NO.:	1-2298-300-0006-003
LAND:	\$233,940.00
IMPROVEMENTS:	\$0.00
TOTAL:	\$233,940.00

- c. THE FOLLOWING ABBREVIATED LEGAL DESCRIPTION IS PROVIDED AS A COURTESY TO ENABLE THE DOCUMENT PREPARER TO CONFORM WITH THE REQUIREMENTS OF RCW 65.04.045, PERTAINING TO STANDARDIZATION OF RECORDED DOCUMENTS.

ABBREVIATED LEGAL DESCRIPTION: PTN SW 22-9-28

- a. GENERAL TAXES FOR 2020 IN THE SUM OF \$1,642.59, ARE PAID IN FULL. TAX ACCOUNT NO. 1-2298-300-0006-002. (FIRST HALF TAXES ARE DELINQUENT MAY 1. LAST HALF TAXES ARE DELINQUENT NOVEMBER 1.)
- b. GENERAL TAXES FOR 2020 IN THE SUM OF \$2,855.61, ARE PAID IN FULL. TAX ACCOUNT NO. 1-2298-300-0006-003. (FIRST HALF TAXES ARE DELINQUENT MAY 1. LAST HALF TAXES ARE DELINQUENT NOVEMBER 1.)

BENTON FRANKLIN TITLE COMPANY

Privacy Policy Notice

PURPOSE OF THIS NOTICE

Title V of the Gramm-Leach-Bliley Act (GLBA) generally prohibits any financial institution, directly or through its affiliates, from sharing nonpublic personal information about you with a nonaffiliated third party unless the institution provides you with a notice of its privacy policies and practices, such as the type of information that it collects about you and the categories of persons or entities to whom it may be disclosed. In compliance with the GLBA, we are providing you with this document, which notifies you of the privacy policies and practices of **BENTON FRANKLIN TITLE COMPANY**

We may collect nonpublic personal information about you from the following sources:

- Information we receive from you such as on applications or other forms.
- Information about your transactions we secure from our files, or from [our affiliates or] others.
- Information we receive from a consumer reporting agency.
- Information that we receive from others involved in your transaction, such as the real estate agent or lender.

Unless it is specifically stated otherwise in an amended Privacy Policy Notice, no additional nonpublic personal information will be collected about you.

We may disclose any of the above information that we collect about our customers or former customers to our affiliates as permitted by law.

WE DO NOT DISCLOSE ANY NONPUBLIC PERSONAL INFORMATION ABOUT YOU WITH ANYONE FOR ANY PURPOSE THAT IS NOT SPECIFICALLY PERMITTED BY LAW.

We restrict access to nonpublic personal information about you to those employees who need to know that information in order to provide products or services to you. We maintain physical, electronic, and procedural safeguards that comply with federal regulations to guard your nonpublic personal information.

ORT 287-C 5/07/01

EXHIBIT "A"

PARCEL A

THE WEST 286.37 FEET OF THE EAST 1131.63 FEET OF THAT PORTION OF THE WEST 2054.40 FEET OF THE SOUTHWEST QUARTER OF SECTION 22, TOWNSHIP 9 NORTH, RANGE 28 EAST, W.M., BENTON COUNTY, WASHINGTON, LYING SOUTH OF THE FOLLOWING DESCRIBED LINE:

BEGINNING AT A POINT ON THE WEST LINE OF SAID SECTION DISTANT 797.55 FEET NORTH OF THE SOUTHWEST CORNER THEREOF;
THENCE EAST PARALLEL WITH THE SOUTH LINE OF SAID SECTION 733 FEET;
THENCE EASTERLY IN A STRAIGHT LINE TO A POINT ON THE EAST LINE OF SAID WEST 2054.40 FEET WHICH IS 827.10 FEET NORTH OF THE SOUTH LINE OF SAID SECTION AND THE TERMINUS OF SAID DESCRIBED LINE;
EXCEPT THE SOUTH 30 FEET THEREOF FOR ROAD.

(DEPICTED AS PARCEL 2 ON RECORD SURVEY NO. 960)

PARCEL B

THE WEST 284.02 FEET OF THE EAST 845.31 FEET OF THAT PORTION OF THE WEST 2054.40 FEET OF THE SOUTHWEST QUARTER OF SECTION 22, TOWNSHIP 9 NORTH, RANGE 28 EAST, W.M., BENTON COUNTY, WASHINGTON, LYING SOUTH OF THE FOLLOWING DESCRIBED LINE:

BEGINNING AT A POINT ON THE WEST LINE OF SAID SECTION DISTANT 797.55 FEET NORTH OF THE SOUTHWEST CORNER THEREOF;
THENCE EAST PARALLEL WITH THE SOUTH LINE OF SAID SECTION 733 FEET;
THENCE EASTERLY IN A STRAIGHT LINE TO A POINT ON THE EAST LINE OF SAID WEST 2054.40 FEET WHICH IS 827.10 FEET NORTH OF THE SOUTH LINE OF SAID SECTION AND THE TERMINUS OF SAID DESCRIBED LINE;
EXCEPT THE SOUTH 30 FEET THEREOF FOR ROAD.

(DEPICTED AS PARCEL 3 ON RECORD SURVEY NO. 960)



CITY OF RICHLAND NOTICE OF APPLICATION, PUBLIC HEARING AND OPTIONAL DNS (S2021-103 & EA2021-121)

Notice is hereby given that Bethel Church c/o Green Plan Construction, LLC, has filed an application for a 70-lot residential subdivision named the Preliminary Plat of Fairhaven. The site is located immediately north of Shockley Road; approximately 1,700 feet west of Keene Road.

The Richland Hearings Examiner will conduct a virtual public hearing and review of the application at 6:00 p.m., Monday, June 14, 2021. All interested parties are invited to participate in the virtual public hearing by visiting the City of Richland website (www.ci.richland.wa.us).

Environmental Review: The proposal is subject to environmental review. The City of Richland is lead agency for the proposal under the State Environmental Policy Act (SEPA) and has reviewed the proposed project for probable adverse environmental impacts and expects to issue a determination of non-significance (DNS) for this project. The optional DNS process in WAC 197-11-355 is being used. This may be your only opportunity to comment on the environmental impacts of the proposed development. The environmental checklist and related file information are available to the public and can be viewed at www.ci.richland.wa.us.

Any person desiring to express their views or to be notified of any decisions pertaining to this application should notify Shane O'Neill, Senior Planner, 625 Swift Boulevard, MS-35, Richland, WA 99352. Comments may also be faxed to (509) 942-7764 or emailed to soneill@ci.richland.wa.us. Written comments received before 5:00 p.m. on Friday, June 4, 2021 will be incorporated into the staff report. Comments received after that time will be entered into the record during the hearing.

The application will be reviewed in accordance with the regulations in RMC Title 19 Development Regulations Administration and Title 24 Plats and Subdivisions. Appeal procedures of decisions related to the above referenced application are set forth in RMC Chapter 19.70. Contact the Richland Planning Division at the above referenced address with questions related to the available appeal process.



AFFIDAVIT OF POSTING

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

COMES NOW, **Shane O'Neill**, who, being first duly sworn upon oath deposes and says:

1. I am an employee in the Planning Division of the Development Services Department for the City of Richland.

2. On the 4th day of May, 2021, I posted the attached NOTICE OF PUBLIC HEARING, File Number S2021-103 (Preliminary Plat of Fairhaven) in the following location:

The north side of Shockley Road, approximately 1,700 feet west of the intersection of Shockley Road and Keene Road; immediately north of Jolianna Drive

St. Hill

Signed: Shane O'Neill

SIGNED AND SWORN to before me this 5th day of May, 2021, by Shane O'Neill.



B. C. Gi
Signature of Notary

Briana C. Ghbein
Printed Name

Notary Public in and for the State of Washington,
Residing in Benton county
My appointment expires: 4-25-23

AFFIDAVIT OF MAILING

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

COMES NOW, Briana Ghbein, who, being first duly sworn upon oath deposes and says:

1. I am an employee in the Planning & Development Department for the City of Richland.

2. On the 6th day of May, 2021, I mailed a copy of the attached NOTICE OF APPLICATION, PUBLIC HEARING AND OPTIONAL DNS (S2021-103 & EA2021-121) to the attached list of individuals via regular USPS on the date indicated above. The Richland Hearing Examiner will conduct a virtual public hearing at 6:00 PM on Monday, June 14, 2021.


Signed: Briana Ghbein

SIGNED AND SWORN to before me this 6th day of May, 2021 by Briana Ghbein.




Notary Public in and for the State of Washington,

Jennifer Schuster
Print Name
Residing at 625 Swift Blvd, Richland
My appointment expires: 4-25-23

AFFIDAVIT OF MAILING - 1
Notice of Application, Public Hearing, and Optional DNS attached.
Address list attached.

owner	addr_line1-mail	addr_state	addr_city	addr_zip
BERNIER CHERYL A	602 CHATEAU CT	WA	RICHLAND	99352
BETHEL CHURCH	600 SHOCKLEY RD	WA	RICHLAND	99352
CLIFF WILLIAM C & MARY HELEN	2109 KEENE RD	WA	RICHLAND	99352-7726
DICKINSON MICHAEL G & MICHELE R	609 CHATEAU CT	WA	RICHLAND	99352
FRIENDSHIP ENTERPRISES LLC	68 CANYON ST	WA	RICHLAND	99352-9420
GULLEY TRUSTEES ROBERT L & DALE LESLIE	665 SHOCKLEY RD	WA	RICHLAND	99352
PIPER R KIM & KATHRYN A	780 SHOCKLEY RD	WA	RICHLAND	99352-0000
R3T VENTURES LLC	2410 N 4TH AVE	WA	PASCO	99301
SON KYONGHO & KIM HYEONSEO	610 CHATEAU CT	WA	RICHLAND	99352
TAYLOR STEPHEN A & JANICE C	720 SHOCKLEY RD	WA	RICHLAND	99352-6715
TRAN PETER HOA	2001 PATTERSON RD	WA	PROSSER	99350
WATTS TRUSTEE KERRY LINDON	68 CANYON ST	WA	RICHLAND	99352
WY SOCK ANDREA QUINN	609 CHATEAU CT	WA	RICHLAND	99352

THANK YOU for your legal submission!

Your legal has been submitted for publication. Below is a confirmation of your legal placement. You will also receive an email confirmation.

ORDER DETAILS**Order Number:**

IPL0023185

Order Status:

Submitted

Classification:

Legals & Public Notices

Package:

TRI - Legal Ads

Final Cost:

135.78

Payment Type:

Account Billed

User ID:

IPL0024915

ACCOUNT INFORMATION

CITY OF RICHLAND/LEGALS IP

625 SWIFT BLVD. MS-11

RICHLAND, WA 99352

509-942-7547

AccountsPayable@ci.richland.wa.us

CITY OF RICHLAND/LEGALS

TRANSACTION REPORT**Date**

May 10, 2021 4:53:44 PM EDT

Amount:

135.78

SCHEDULE FOR AD NUMBER IPL00231850

May 16, 2021

Tri-City Herald

PREVIEW FOR AD NUMBER IPL00231850

**CITY OF RICHLAND
NOTICE OF APPLICATION,
PUBLIC HEARING, AND
OPTIONAL DNS**

Bethel Church c/o Green Plan Construction, LLC, has filed an application for a 70-lot residential subdivision named the Preliminary Plat of Fairhaven. The site is located immediately north of Shockley Road, approximately 1,700 feet west of Keene Road. The Richland Hearing Examiner will conduct a virtual public hearing and review of the application on Monday, June 14, 2021 at 6:00 p.m. All interested parties are invited to participate in the virtual public hearing by visiting the City of Richland website at www.ci.richland.wa.us. Environmental Review: The proposal is subject to environmental review. The City of Richland is lead agency for the proposal under the State Environmental Policy Act (SEPA) and has reviewed the proposed project for probable adverse environmental impacts and expects to issue a determination of non-significance (DNS) for this project. The optional DNS process in WAC 197-11-355 is being used. This may be your only opportunity to comment on the environmental impacts of the proposed development. The environmental checklist and related file information are available to the public and can be viewed at www.ci.richland.wa.us. Any person desiring to express their views or to be notified of any decisions pertaining to this application should notify Shane O'Neill, Senior Planner, 625 Swift Boulevard, MS-35, Richland, WA 99352. Comments may also be faxed to (509) 942-7764 or emailed to sonell@ci.richland.wa.us. Written comments should be received no later than 5:00 p.m. on Friday, June 4, 2021 to be incorporated into the staff report. Comments received after that date will be entered into the record at the hearing. Published: Sunday, May 16, 2021
W00000000
Publication Dates

[<< Click here to print a printer friendly version >>](#)

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background **[HELP]**

1. Name of proposed project, if applicable:

Fairhaven Townhome Estates

2. Name of applicant:

Green Plan Construction, LLC

3. Address and phone number of applicant and contact person:

Stanley L Nuxall, Jr.

(509) 539-6323

101 N Morain, Suite 100

Kennewick, WA 99336

4. Date checklist prepared:

March 18, 2021

5. Agency requesting checklist:

City of Richland

6. Proposed timing or schedule (including phasing, if applicable):

Begin Construction: July, 2021

End Construction: December 2021

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No planned additions.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

None.

See attached wetland assessment report

wetland report
referenced below
3.a.1

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No.

10. List any government approvals or permits that will be needed for your proposal, if known.

Building permits will be required from the City of Richland. city final plat approval, grading permit approval
stormwater permit approval, right-of-way construction approval

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11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

Parcels 1-2298-300-0006-002 and 1-2298-300-0006-003, a total of 10.2 acres, which will be subdivided and developed into approximately 70 lots for zero lot line townhomes with roads, utilities, etc. that comply with the City of Richland standard specifications and details.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you

are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

Parcels 1-2298-300-0006-002 and 1-2298-300-0006-003

Address 600 Shockley Road, Richland, WA

Portion of the S.W. ¼ of Section 22, Township 9 North, Range 28 East, Willamette Meridan, City of West Richland, Benton County, Washington

B. Environmental Elements [\[HELP\]](#)

1. Earth [\[help\]](#)

a. General description of the site:

(circle one): ☒ Flat, rolling, hilly, steep slopes, mountainous, other _____

Generally flat, sloping north to south towards Shockley Road with about 10 to 15 feet of elevation change overall.

b. What is the steepest slope on the site (approximate percent slope)?

Approximately 10% at its steepest.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Silt with fine sand, generally greyish brown, loose to medium dense, and dry to moist.

Warden silt loam - Warden very fine sandy loam, slopes from 0 to 15% (USDA Soils map <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>)

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Site will be graded to create level building pads, and to balance cut and fill quantities.

Approximately 12,000 to 24,000 cubic yards of cut/fill

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Unlikely, however erosion could occur during construction due to rain or wind on unstabilized soils.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Approximately 30%.

**h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: **

Best management practices such as silt fences and water trucks will be used on site during construction.

All disturbed areas will be stabilized on completion.

2. Air [\[help\]](#)

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

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per Stan

Nuxall

Emissions include dust and exhaust from construction activities.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

The site will be kept damp to mitigate airborne dust.

3. **Water** [\[help\]](#)

a. Surface Water: [\[help\]](#)

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Kennewick Irrigation District had previously operated a retention pond on the site. KID will retire this pond prior to the start of construction. The pond's earthen embankment walls will be graded flat and compacted. A wetlands assessment was recently conducted and concluded there are no wetland features or aquatic features associated with the site.

- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

None. Kennewick Irrigation District will retire the irrigation pond prior to any construction activities.

- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

None.

- 4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No.

- 5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No.

- 6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground Water: [\[help\]](#)

- 1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

No.

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

All sewage will be discharged to the City of Richland sewer system.

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Storm water will be retained on site.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.

No.

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

No.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Features will be included in the future civil design of the development. These will include grading, road sloping, and other engineered features as be required.

4. Plants [help]

a. Check the types of vegetation found on the site:

- ☐ deciduous tree: alder, maple, aspen, other
☐ evergreen tree: fir, cedar, pine, other
☒ shrubs
☒ grass
☐ pasture
☐ crop or grain
☐ Orchards, vineyards or other permanent crops.
☐ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
☐ water plants: water lily, eelgrass, milfoil, other
☒ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Surface vegetation will be removed as part of grading the site.

Approximately 5-acres of dense mostly non-woody shrubs will be removed; approx. 3-acres of Russian Olive trees will also be removed; some sagebrush will be removed. Also, see attached wetland report.

c. List threatened and endangered species known to be on or near the site.

None.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

None indicated

None.

e. List all noxious weeds and invasive species known to be on or near the site.

None.

5. Animals [\[help\]](#)

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: hawk, heron, eagle, songbirds, other:

mammals: deer, bear, elk, beaver, other:

fish: bass, salmon, trout, herring, shellfish, other _____

Songbirds, hawks. Rhodents

b. List any threatened and endangered species known to be on or near the site.

None.

c. Is the site part of a migration route? If so, explain.

Yes, it is part of the Pacific Flyway, as is most of Washington State.

d. Proposed measures to preserve or enhance wildlife, if any:

None.

e. List any invasive animal species known to be on or near the site.

None.

6. Energy and Natural Resources [\[help\]](#)

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Electric for residential home heating and cooling.

b. Would your project affect the potential use of solar energy by adjacent properties?

If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal?

List other proposed measures to reduce or control energy impacts, if any:

Future homes will comply with the recently updated Energy Code requirements.

7. Environmental Health [\[help\]](#)

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal?

If so, describe.

- 1) Describe any known or possible contamination at the site from present or past uses.

None.

- 2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

None.

- 3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Construction equipment will have gasoline, diesel, anti-freeze, and hydraulic fluids.

- 4) Describe special emergency services that might be required.

None.

- 5) Proposed measures to reduce or control environmental health hazards, if any:

None.

b. Noise

- 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

None.

- 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Typical construction noises during construction.

- 3) Proposed measures to reduce or control noise impacts, if any:

None.

8. Land and Shoreline Use [\[help\]](#)

- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

Property is currently vacant and zoned residential. The project will not affect the land use of the adjacent properties. North & west - Agriculture, east - R-1-12 Single-family residential (church on-site) south - R-1-10 Single-family residential (single family residential neighborhood)

- b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

No.

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

No.

c. Describe any structures on the site.

Kennewick Irrigation District had previously operated a retention pond on the site. KID will remove all equipment prior to the start of construction, and the pond will be leveled to grade.

d. Will any structures be demolished? If so, what?

No.

e. What is the current zoning classification of the site?

R-3.

f. What is the current comprehensive plan designation of the site?

HDR.

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project?

Once townhomes are constructed, an estimated 200 people will reside there.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Project will be completed in accordance with all City of Richland codes and requirements.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Not applicable.

9. Housing [\[help\]](#)

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

The project will developed approximately 70 lots, which would allow 70 mid-level homes to be constructed.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable.

10. Aesthetics [\[help\]](#)

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Homes will constructed to the Richland City municipal code and will be less than 35 feet in height.

b. What views in the immediate vicinity would be altered or obstructed?

None.

d. Proposed measures to reduce or control aesthetic impacts, if any:

None.

11. Light and Glare [\[help\]](#)

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Street lighting will be included with the project and in accordance with Richland City code. Lights will on during night time hours.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No.

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

Street lights will be shielded.

12. Recreation [\[help\]](#)

a. What designated and informal recreational opportunities are in the immediate vicinity?

There will be sidewalks along the perimeter road.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

None.

13. Historic and cultural preservation [\[help\]](#)

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

No.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation?

This may include human burials or old cemeteries. Are there any material evidence, artifacts,

or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

No.

- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

None.

- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

If any items of historic, cultural, or archaeological significance are uncovered during construction, the work will be stopped and the appropriate authorities notified.

14. Transportation [\[help\]](#)

- a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

Shockley Road is public road along the site's southern border which will provide access to the site.

- b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

Yes, there is a bus stop on Shockley Road.

- c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

Each residential lot will provide a minimum of 2 off-street parking spaces. No parking will be eliminated.

- d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

Yes, there will be a new sidewalk along the north side of Shockley Road.

- e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

- f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

Per ITE Code 210, single-family residences generate an average of 9.44 trips per days. With approximately 70 developed lots, this would generate approximately 660 trips per day.

- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

No.

h. Proposed measures to reduce or control transportation impacts, if any:
None.

15. Public Services [help]

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.
Yes, the project will increase needs typically associated with residential areas, including fire, police, emergency, healthcare and schools.
- b. Proposed measures to reduce or control direct impacts on public services, if any.
None.

16. Utilities [help]

- a. Circle utilities currently available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system,
other _____
Electricity.
- b. Describe the utilities that are proposed for the project, the utility providing the service,
and the general construction activities on the site or in the immediate vicinity which might
be needed.
Sewer and Water will be provided by the City of Richland. Electricity will be provided by ~~Benton~~
~~PUD~~. Irrigation will be provided by Kennewick Irrigation District.

Richland Energy Services
will provide service

C. Signature [HELP]

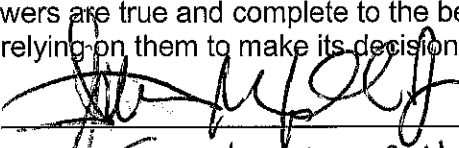
The above answers are true and complete to the best of my knowledge. I understand that the
lead agency is relying on them to make its decision.

Signature: _____

Name of signer _____

Position and Agency/Organization _____

Date Submitted: _____


STAN NUXALL JR.
OWNER/OPERATOR
3/29/21 GREEN PLAN

D. Supplemental sheet for nonproject actions [HELP]

(IT IS NOT NECESSARY to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction
with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of
activities likely to result from the proposal, would affect the item at a greater intensity or

at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Proposed measures to avoid or reduce such increases are:

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

3. How would the proposal be likely to deplete energy or natural resources?

Proposed measures to protect or conserve energy and natural resources are:

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Proposed measures to protect such resources or to avoid or reduce impacts are:

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Proposed measures to avoid or reduce shoreline and land use impacts are:

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Proposed measures to reduce or respond to such demand(s) are:

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Wetlands Assessment Report

(Pertaining to Benton County Parcels # 122983000006003 and
122983000006002)

[Located in the SW ¼ of Section 22, Township 9 North, Range 28 East]



October 2017

Prepared for: Richland School District
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Richland, WA 99352

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- Attachment 2 - Vicinity Map
- Attachment 3 - Photo Inventory
- Attachment 4 - National Wetland Inventory (NWI) Map
- Attachment 5 - Department of Natural Resources (DNR) Water Typing Map
- Attachment 6 - United States Department of Agriculture (USDA) Soil Survey Maps
- Attachment 7 - Badger Mountain USGS Quad Map

Introduction

This wetlands assessment report was authorized by the Richland School District, in order to properly define any wetland areas contained within Benton County Parcels # 122983000006003 and 122983000006002. The School District is looking into potentially purchasing these parcels to contain a future administration building. The Aerial Property Exhibit (Attachment 1) illustrates the approximate extents of the aforementioned parcels, which front Shockley Road. The two defined subject parcels encompass approximately 10 acres. The subject parcels are located within the southwest ¼ of Section 22, Township 9 North, Range 28 East, in Benton County, Washington (see Vicinity Map, Attachment 2). A Kennewick Irrigation District (KID) pond [#159] is located within the southwest corner of the western most subject parcel (see Photo Inventory, Attachment 3, specifically photo #1). This wetlands assessment was performed to determine the presence or absence of wetland areas and any associated buffer areas within the defined subject parcels. This assessment was conducted in accordance with the Richland Municipal Code (RMC) Title 22.10 with respect to defining any wetland areas and associated buffer areas contained within the subject parcels.

Methods

The subject property was walked and assessed on September 28, 2017, by Vincent Barthels, Biologist for J-U-B ENGINEERS, Inc. and a Qualified Wetland Specialist. A general site assessment was conducted, and photographs were taken to document the dominant plant communities and habitat present (see Attachment 3, Photo Inventory). The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), Department of Natural Resources (DNR) Water Typing Map, and U.S. Department of Agriculture (USDA)/Natural Resource Conservation Service (NRCS) Soil maps were referenced in order to identify any mapped waterway/aquatic systems within or adjacent to the subject parcels (see Attachments 4 through 6). No professional surveying services or geo-technical/subsurface explorations were provided by J-U-B ENGINEERS, Inc.

Discussion

Topography

The subject parcels consist of land that gently slopes approximately 2 to 15% toward a central crease. The elevation at the subject property is approximately 575 feet above sea level, plus or minus 20 feet (NGVD 29) [see Badger Mountain USGS Quad Map, Attachment 7].

Climate

The climate data used for this report was collected from the Richland, WA WETS weather station. Based on the climate data collected, the area has an average annual temperature of 53.6 degrees Fahrenheit. The average annual rainfall is 6.53 inches, and the average annual snowfall is 6.7 inches.

Plant Communities

Plant communities in the vicinity of the subject parcels primarily consist of assorted herbaceous plants and a couple shrubs/trees. The following table lists the wetland indicator status of the vegetative species that were encountered within the subject parcels (Lichvar 2016).

Table 1. Plant Species observed in proximity of the subject parcels.

Common Name	Scientific Name	Wetland Indicator Status
Bermuda grass	<i>Cynodon dactylon</i>	FACU
Cheat grass	<i>Bromus tectorum</i>	UPL
Creeping thistle	<i>Cirsium arvense</i>	FAC
Field mint	<i>Mentha arvensis</i>	FAC
Hard stem bulrush	<i>Scirpus acutus</i>	FACW
Horseweed	<i>Conyza canadensis</i>	FACU
Kochia	<i>Bassia scoparia</i>	FAC
Prickly lettuce	<i>Lactuca serriola</i>	FACU
Ragweed	<i>Ambrosia trifida</i>	FAC
Russian olive	<i>Elaeagnus angustifolia</i>	FAC
Russian thistle	<i>Salsola kali</i>	FACU
Siberian elm	<i>Ulmus pumila</i>	UPL
Skeleton weed	<i>Lygodesmia juncea</i>	UPL
Spotted knapweed	<i>Centaurea stoebe</i>	UPL
Stork's bill	<i>Erodium cicutarium</i>	UPL
Tall sagebrush	<i>Artemisia tridentata</i>	FACU
Virginia creeper	<i>Parthenocissus quinquefolia</i>	UPL
Witch grass	<i>Panicum capillare</i>	FAC

Hydrology

The western parcel (i.e. # 122983000006002) contains a constructed KID irrigation pond #159. No other aquatic features, wetlands, canal, or streams were observed.

Soils

Three different soil types make up the composition of the mapped soils within the two parcels. Approximately half of the soil in the subject parcels is Warden silt loam, 2 to 5 percent slopes (50.5%). The remaining soil composition is Warden silt loam, 8 to 15 percent slopes (45.9%) and Warden very fine sandy loam, 2 to 8 percent slopes, eroded (3.6%). The hydric rating for each soil type is 0 percent (see Attachment 6).

NWI Map and Wetland Classifications

No wetland features or other aquatic features are identified to be contained within the subject parcels on the NWI Map or the DNR Water Type Map (see Attachments 4 and 5). On the DNR Water Type Map, the nearest waterbody exists to the south of the subject parcels and is classified as "U" channel, which correlates to the Badger East Canal (a KID operated irrigation canal).

Findings

The KID pond coupled with the dense stands of Russian olive trees and the slight central depression (or crease) located west to east on the subject parcels are the contributing factors that triggered this wetland assessment. Per the site walk and a closer observation of the plant community present and topographic relief, it was determined that the subject parcels do not contain any wetland features. Moreover, the KID pond does not meet the definition of a wetland feature in accordance with RMC Title 22.10. The KID pond is a developed and established irrigation feature. Other than the hard stem bulrush that lines the outer limits of the KID pond, the vegetation assemblages contained within the subject parcels can be characterized as a FAC to FACU community. A high percentage of the vegetation assemblages observed were non-native, invasive, weedy species. The habitat within the subject parcels is considered to be highly disturbed. Irrigation practices associated with the Bethel Church (toward the east), a horse pasture (toward the west) and residential developments (toward the north) help to contribute lateral seepage and run-off (from higher adjacent elevations) to the subject parcels, which aids in the survival of the vegetation assemblages observed.

Conclusion

This wetland assessment was conducted to assist the Richland School District with the potential future site development plans contained on the subject parcels. The subject parcels do not contain any wetland features. It should be noted, however, that final authority with regard to the identification and categorization of the wetland area rests with the appropriate regulatory agencies.

Respectfully submitted by:



10/6/17

Vincent J. Barthels, Biologist
J-U-B ENGINEERS, Inc.

References

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Geotechnical Exploration Summary

Bethel Church Property
Shockley Road
Richland School District
Richland, Washington

PREPARED FOR:

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Richland School District
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November 28, 2017

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Geotechnical Exploration Summary

Bethel Church Property
Shockley Road
Richland School District
Richland, Washington

INTRODUCTION

Our evaluation's purpose is to assess the site's subsurface conditions and prepare this report outlining preliminary geotechnical considerations to aid the Richland School District (RSD) with planning and establishing project design concepts for an Administrative Complex. This complex has long been sought by the RSD to consolidate and upgrade RSD administrative operations. The project area is shown on the attached Plate 1, *Exploration Map*. We performed our services referencing our proposal, dated September 20, 2017. The following text describes our project understanding, scope of services, as well as presents our exploration findings and test results.

SCOPE OF SERVICE

To initiate our geotechnical engineering evaluation with exploration and this preliminary summary, we accomplished the following:

1. Coordinated exploration with the Washington Utility Notification Center and RSD before performing exploration.
2. Explored the subsurface soil conditions via 6 soil borings and 8 exploratory test pits distributed at select locations across the site. Approximate exploration locations are shown on Plate 1.
3. Performed 2 field infiltration tests to evaluate the near surface soils' infiltration characteristics.
4. Installed 3 piezometers between 25 and 30 feet below the surface in the anticipated building areas.
5. Accomplished laboratory testing referencing *ASTM International* (ASTM) procedures to estimate soil engineering parameters.
6. Prepared and provided this geotechnical deliverable, summarizing our findings and preliminary opinions, including exploration logs and laboratory test results. Based on this data and the project concept, we provide preliminary geotechnical opinions to assist project concept development, including but not limited to:
 - α Potential geologic hazards
 - α Earthwork construction considerations
 - α Applicable foundation and construction considerations
 - α Site drainage and stormwater management considerations
 - α Development concepts and construction considerations
 - α Additional recommended services

We remain available to advance final design and consult with your team as necessary during planning and schematic design processes.

PROJECT UNDERSTANDING

Existing Conditions

RSD is in the process of purchasing an approximate 10-acre parcel (Parcel #s: 122983000006002 & 122983000006003) adjacent to Shockley Road in Richland, Washington. The parcel is being purchased

from the Bethel Church. This site is presumed undeveloped and contains moderate to significant vegetation and a pond. The pond appears to have been constructed between 1996 and 2003 based on a review of Google Earth aerial photograph and is believed to be associated with irrigation. Some grading occurred around 2009 near the site's center/east side when an adjacent structure on the Bethel Church property was constructed.

The site slopes north to south towards Shockley Road with about 10 to 15 feet of elevation change overall. A dry drainage channel exists on the southern third of the property, north of the irrigation pond. The extent water traverses through this drainage seasonally or during significant rain events is unknown. Some yard waste and organic debris has been wasted in this area.

Proposed Improvements

RSD desires to construct their administrative offices, maintenance facilities, and consolidate its various functions on this single site. Design has not advanced for specific structures or their location on the property. Further, grading plans are not established. It appears extensive cutting and filling (estimated 40,000 cubic yards) will be required to facilitate a relatively level site. Some grading concepts may require substantial import materials to achieve design grades. We expect development plans may ultimately include, but are certainly not limited to:

- α Single to 2-story structures comprised of wood or metal frames with masonry veneer, conventional foundations, and concrete slabs-on-grade.
- α Limited, if any, below grade useable space.
- α Maintenance facilities with floor drains and possibly hoists or lifts with below grade hydraulics.
- α Asphalt pavement to provide access and support for buses, landscape equipment, and passenger vehicles.
- α Storage areas for school materials.
- α Utilities will extend from Shockley Road and stormwater will be disposed via infiltration facilities (i.e. swales or drywells).
- α Stormwater across the property will need to be addressed and rerouted to avoid the potential for impounding water on adjacent properties.

FIELD EXPLORATION

GPI accomplished exploration on November 8 and 9, 2017, by observing 6 exploratory soil borings extending between 11 and 35 feet deep, throughout the site but with deeper borings positioned along the northern half where buildings are expected. Soil borings were accomplished with a track-mounted CME 850 drill equipped with hollow stem augers and standard penetration test (SPT) sampling equipment. During exploration, our geotechnical engineer visually classified, described, and logged the soil encountered the *Unified Soil Classification System* (USCS). We collected select in-place soil samples from various depths and locations for subsequent laboratory testing.

While on site, we performed infiltration testing in borings B-1 and B-2 and installed piezometers in borings B-3, B-4, and B-5. Infiltration testing was accomplished referencing the Boring Method outlined in Appendix 6B of the *Washington State Department of Ecology* (Ecology) Stormwater Management Manual for Eastern Washington. Piezometers each received 10 feet of screen and sand pack at the base with the balance of the piezometer established with solid pipe, bentonite plug, and a flush mount surface casing.

Piezometers will be monitored occasionally while the property is being evaluated. The balance of borings were loosely backfilled with site soil and a bentonite cap immediately following exploration.

Test pits were advanced with a Deere 35D, mini-excavator. Test pits advanced 8 to 11 feet below the surface while our geoprofessional logged and visually described the soil encountered. Select samples were collected during excavation for subsequent laboratory testing. Test pits were loosely backfilled with excavated soil.

The USCS is presented in *Appendix A* along with exploration logs and should be used to interpret the soil conditions in this report and on the individual exploration logs.

LABORATORY TESTING

We performed laboratory testing in reference to ASTM standards on select soil samples obtained during exploration. Laboratory testing included:

- α In-situ moisture content and unit weight (ASTM D 2216)
- α Atterberg limits (ASTM D 4318)
- α Grain size distribution for coarse grained soil (ASTM D 422)
- α Moisture density relationship- Proctor (ASTM D1557)
- α California Bearing Ratio (ASTM D3080)
- α pH resistivity and sulfates (ASTM G 51, G 57, D 516)

Laboratory test results are provided in Appendix B, and on the exploratory logs in Appendix A.

SUBSURFACE CONDITIONS

We encountered topsoil containing some to significant vegetation and organics extending 6 to 12 inches in the locations explored. Beneath topsoil we encountered the following soil units.

- α **Uncontrolled Fill: Mixed Silt and Sand (ML/SM):** grey brown, loose to medium dense, dry to moist. We encountered apparent fill near the east-central area of the site in test pits TP-2, 3 and 7. The approximate area where fill was encountered is delineated on Plate 1. Where encountered, fill wxtending between 3 and 6 feet below the surface. Significant debris or deleterious materials were not observed within the fill. From a review of aerial photographs, it appears these fill deposits coincide with a grading event potentially associated with the construction of a structure on the adjacent Bethel church property.
- α **Alluvium: Silt with Fine Sand (ML):** greyish brown, loose to medium dense, and dry to moist. We encountered alluvium in each exploration beneath fill or topsoil extending 5 to 13 feet below the surface. A layer of silt was also encountered in B-4 below Silty Sand (see below) about 30 feet below the surface. This low unit weight silt exhibits a high consolidation potential, though consolidation tests did not delineate a significant collapse potential.
- α **Alluvium: Silty Fine Sand (SM):** brown, medium dense to dense, and moist. We encountered this unit below silt in each exploration, generally extending to the termination depths excluding B-4. In B-4, the silty fine sand contained trace amounts of medium gravel about 26 feet below the surface before grading back to silt with fine sand at the termination depths.

We did not encounter bedrock or groundwater within our exploration locations at the time of exploration, but installed piezometers in borings B-3, B-4, and B-5 between 25 and 30 feet below the surface to help document future groundwater conditions. Since exploration, our monitoring detected groundwater at B-3 at 22.7 feet below the surface; the other 2 remain dry. To obtain additional subsurface information, we researched well logs within the project site vicinity published on the *Washington State Department of Ecology* (Ecology) website. These logs indicate basalt bedrock in the area may be located 50 to 100 feet below the existing ground surface, with consistent, static groundwater levels from 30 feet and deeper. However, localized perched groundwater tables may be encountered depending on variations in precipitation, irrigation, and infiltration characteristics over time and may be encountered at shallower or deeper depths.

PRELIMINARY GEOTECHNICAL CONSIDERATIONS

Potential Geologic Hazards

The following text presents our evaluation of potential geologic hazards for consideration by RSD as the project concept is refined. This summary is not exhaustive, but rather presents some common geologic hazards which should be considered by RSD and Design West Architects, project architect, based on our site exploration, mapping research, and preliminary project understanding. The items discussed below can provide RSD with a reasonable basis for progressing project design concepts.

Uncontrolled Fill

Uncontrolled fill was encountered near the east-central portion of the site extending 3 to 6 feet below the surface. The fill material is consistent with soil in the area, and barring other sources of the fill origin, we attribute the fill to grading on an adjacent Bethel Church project. Our estimate of the lateral fill extents based on test pit exploration and aerial photograph interpretation is outlined on Plate 1. Where fill is encountered, uncontrolled fill must be removed from beneath planned structures or improvements consistent with geotechnical practice standards.

Depending on how structures are sited on the property, we do not expect uncontrolled fill will have significant impacts to this project. Pending site grading concepts, it is conceivable that fill will be removed as part of achieving site grades. However, project grading concepts must be developed to remove fill below any building or parking area.

Slope Instability Potential

Although the existing ground surface slopes from north to south, the slope is gentle and the elevation difference is slight. During exploration, we traversed the site and observed no evidence of large or small-scale, current or prehistoric landslides. Therefore, our opinion is slope instability potential at this site will be directly related to site grading and drainage design, earthwork construction quality and ongoing constructed slope maintenance procedures. Finished or permanent slopes in native soil can typically remain stable with respect to deep-seated global failure at slope inclinations up to 2.5H:1V when the soil remains in a dry condition. However, 2.5H:1V slopes are typically prone to shallow erosional and surface failures during wet seasons, especially given the silt observed near the surface. Therefore, we recommend civil grading design utilize 3H:1V slopes.

Site Grading & Drainage

We presume site grading for this project will cut soil from the north and place it in lower areas on the south side of the project site; providing a gentle approach to Shockley Road. The process of placing and compacting fill in the low areas of the site will theoretically impede a natural drainage that traverses from northwest to southeast across the property. The adjacent Bethel Church property likely advanced some minor grading that flattened their site for a playfield and subtly filled in the shallow drainage. It is likely this drainage seldom carries any significant water. However, impeding the drainage would, in our opinion, create a geologic hazard off the property for adjacent land owners. The drainage exists because water occasionally, maybe even rarely flows through it. Should water be impounded once the drainage is blocked, it will be a hazard and a liability to RSD.

If site grading is advanced as envisioned, it would be wise to facilitate a culvert that conveys overland flow from west to east across the property. Further, we suspect the existing drainage acts as a pseudo infiltration gallery wherein most overland flow infiltrates into the subsurface naturally with limited surface flow. Thus, a subsurface drainage gallery could be constructed that provides infiltration and conveyance simultaneously. Either approach may require an easement with the Bethel Church for any water conveyed towards their property. A conceptual alignment of such a culvert or stormwater infiltration gallery is outlined on the attached site map (Plate 1) for civil design's consideration.

Cut and Fill Transitions

We expect the catch point between cut and fill will be near the site's center. If grading design can facilitate placing buildings entirely on cut soil, we expect they will perform better as it relates to differential settlement. Where structures span dissimilar materials (i.e. cuts into native soil vs. fill embankments) they have a higher propensity for realizing settlement at the transition between varying materials. Pending final structure position, building loads, the depths of cuts and fills and other criteria, foundations may require improvements to facilitate acceptable performance. We will evaluate these requirements once final site layout is complete.

Site Seismicity and Liquefaction Potential

Significant seismic activity has not been recorded in the area in geologically recent time. The presence of faults, fault rupture, or other such features were not observed via our field reconnaissance. Our geologic research of available *United States Geologic Survey* (USGS) data suggests at least 2 historically active faults are located within 5 miles from the project site. Engineering fault parameters from the USGS are provided in Table 1 below.

Table 1. Nearest Fault Parameters, Bethel Church Site (USGS 2008)

Fault	Characteristic Earthquake Magnitude	Recurrence Interval (years)
Horse Heaven Hills Structure	6.5 to 7.44	390-50,000
Wallula/Rattlesnake Hills Structure	6.5 to 7.14	250-12,500

Reference: <http://earthquakes.usgs.gov/hazards/qfaults>

Given the extremely low recurrence interval for seismic activity along these nearby faults, our opinion is probable seismic activity within the design period (approximately 2,475 years) prescribed by the 2015 *International Building Code* (IBC) will primarily be associated with regional background seismicity.

Subsurface conditions encountered during our exploration consist of silt and fine sand soil. We did not encounter basalt bedrock or groundwater in our explorations to about 30 feet below the site. Seismically induced settlement (i.e., due to soil densification from seismic vibration) could be realized on the order of 2 to 3.5 inches during a significant earthquake. For liquefaction to occur, soil profile must be saturated, the potential for such a seismic event to occur during the project's useful life, without groundwater near the surface, is relatively low. With the information we have presently, we estimate that an IBC Site Class D is appropriate.

Earthwork Construction Considerations

We expect earthwork for this project will be typical, without the need for special techniques or equipment. Earthwork construction should initiate by stripping an average of 0.7 feet of topsoil containing vegetation and organics. Depending on site layout, 3 to about 6 feet of uncontrolled fill will need removed near the site's east-central portion. Site stripping outside the fill area will expose native soil and the topsoil may be stockpiled for reuse or disposed offsite. After topsoil and fill (if necessary) stripping, the resulting subgrade comprising native alluvial silt with fine sand can be used to support typical site infrastructure or other developments pending final site civil design and loading conditions. We anticipate site soil may be reused as structural fill for site grading applications, but will require significant moisture conditioning to compact effectively and economically during good weather. The site soil is expected to realize significant shrinkage when excavated and recompacted as structural fill; potentially 24 to 30 percent. The soil will bulk when excavated and wasted between 16 and 22 percent.

Imported structural fill products will also be required for project construction. We recommend imported fill products reference *Washington State Department of Transportation (WSDOT) Standards for Road Bridge and Municipal Construction (Standards) for Select Borrow, Common Borrow, Crushed Surfacing*, or other products as needed.

Foundation and Development Considerations

For final design, important criteria such as the building's frame, number of stories, loading, foundation bearing elevations and other factors are necessary to help develop final geotechnical recommendations. The preliminary information below is based on speculative foundation loading conditions and provides only preliminary shallow foundation design and construction considerations for RSD and the design team. We do not recommend this data be relied upon for final foundation design or construction.

Founding as many of the buildings as possible on cut soil will improve the structure's performance and more efficient foundation design criteria can be provided. Conventional spread and continuous foundations appear appropriate based on what we anticipate from the planned development.

Preliminary Shallow Foundation Design Criteria

We expect allowable bearing pressures ranging from 1,500 to 3,000 pounds per square foot (psf) will be appropriate for shallow spread footing design. Granular soil improvements may be required if the structure spans cut and fill soil profiles. Conventional foundation systems should conform to the following design criteria and the current IBC addition:

1. Frost protection embedment depth: 24 inches below finished exterior surface
2. Estimated vertical settlement tolerances (to be verified by structural design):
 - a. Total settlement: 1-inch
 - b. Differential settlement: 0.75 inches in 30-foot, horizontal span
 - c. The site soil is low density and consolidation tests outline it is prone to large settlement at relatively light structural loads.
3. Lateral load resistance:
 - a. Foundation base friction coefficient 0.30 for foundations cast on native soil
 - b. Lateral passive resistance is available on foundation sides ranging from 200 to 350 pounds per cubic foot (pcf) equivalent fluid pressure (EFP), depending on backfill used and where/if $\frac{3}{4}$ inches of lateral movement can be tolerated.
4. Soil Corrosivity
 - a. Laboratory test results indicate the site soil exhibits a moderate to high corrosive environment:
 - i. pH = 8.1
 - ii. Resistivity = 909 ohms-cm
 - iii. Sulfates = 72 parts per million
 - b. Structural designers shall account for moderate corrosion potential in reinforcing steel spacing and clearances.
 - c. Soil is not expected to induce negative reactions with concrete. Concrete mix designs should demonstrate that aggregate does not have the potential for alkali-silica reactivity.
5. Site Class - 2015 IBC Section 1613
 - a. Based on our field exploration and current knowledge of the upper 100 feet of the soil profile, a Site Class D is appropriate for preliminary structural frame seismic design. A site-specific study of seismic response was not performed.

Surface Grading & Drainage

Site grading design should be accomplished such that runoff from precipitation, snowmelt, seeps, or springs is not allowed to infiltrate slopes, below foundations, pavement, and slab subgrades. Runoff or water migrating along the ground surface must be conveyed away from slopes and structures by an appropriately designed series of ditches, culverts, swales, or other surface water management procedures. This is especially important given the silt and fine sand is highly frost susceptible. This means that the presence of water in the soil can induce significant frost action (heave and contraction) during freeze-thaw cycles. As development plans advance, we recommend consideration to excavating the soil at entrances (entryways, maintenance doors, etc.) to the frost depth and replace it with non-frost-susceptible soil. This process should extend laterally at the exterior at least 5 feet.

Slope the ground surface outside structures to meet *Americans with Disabilities Act* (ADA) requirements at entrances and at least 5 percent away for a minimum of 10 feet in other areas to rapidly convey surface water or roof runoff away from foundations. Remaining landscapes should slope at least 2 percent away from structures. Provide roof gutters connected to downspouts, connect them to solid pipes placed away from the structure, and do not allow to infiltrate into the soil underlying the structure.

Wall and Foundation Drainage

Design and construct buildings with adequate drainage systems to reduce the potential for surface water to infiltrate beneath the structure and cause instability, leakage, or seepage. This is typically accomplished by installing a perimeter foundation drain system surrounding the building. Foundation drains should be installed with positive drainage and dispose of collected water in suitable locations at least 50 feet from structures. Historically, foundation drains have been deleted by RSD as part of final design. For buildings situated on the northern portion of the site, such deletion is a reasonable exchange of water intrusion risks for project cost savings. However, structures positioned within proximity of the existing drainage that may be filled, should consider the risks of eliminating foundation drainage.

At this time, we do not expect below-grade structures or retaining walls for this project. Thus, we do not elaborate on the specifications for below-grade wall drain systems.

Stormwater Management Considerations

Stormwater management concepts are not yet established for the project, but as is common in the area, will likely be managed via near surface infiltration swales with drywell overflows and possibly subsurface infiltration galleries. We recommend these facilities be established along the site's east and south sides. Design stormwater management facilities in accordance with Ecology's *Eastern Regional Stormwater Management Manual* (Stormwater Manual) and the City of Richland requirements.

The soil profile encountered in explorations was classified under the USCS as silt and fine sand. Infiltration tests in B-1 and B-2 during exploration yielded unfactored infiltration rates between 9 and 14 inches per hour. These are relatively good infiltration rates for soil of this type, although can be impacted at different times during the year depending on saturated and frozen conditions. Further, stormwater facility construction practices can impact the site soil's ability to infiltrate water. Thus, civil design should consider applying prescriptive safety factors between 4 and 6 to the measured infiltration rate based on infiltration facility configuration and the designer's experience with stormwater disposal in the region. It should be noted, that a highly permeable soil unit that may be desirable to establish drywell overflow disposal was not encountered. We recommend additional infiltration tests be advanced during the next round of exploration, ideally in specific anticipated stormwater disposal locations.

ADDITIONAL RECOMMENDED SERVICES

Final Geotechnical Design

This evaluation was performed to provide RSD with preliminary geotechnical site characteristics to assist project concept development. This deliverable does not constitute a final geotechnical engineering evaluation specific to earthwork, foundation design or construction, or any other site feature. Once these and other critical project design concepts are established, GPI will provide additional geotechnical engineering evaluation specific to actual design concepts. At this time, we expect the exploration and laboratory testing accomplished is adequate to advance final design.

Geotechnical Design Continuity

We base this report's information on our exploration results and observations, as well as preliminary site improvement concepts provided to us by RSD. Significant design concepts are yet to be established. The site layout, building configuration, final floor elevations, loading conditions, and many other aspects can significantly alter our opinions and design recommendations. This may be particularly important to help

the project team evaluate the existing drainage and ramifications to filling it as well as positioning buildings on the site to avoid cut and fill transitions. Therefore, it is critical that GPI provide geotechnical continuity for final planning and design for the planned construction as individual aspects become available during design development phases.

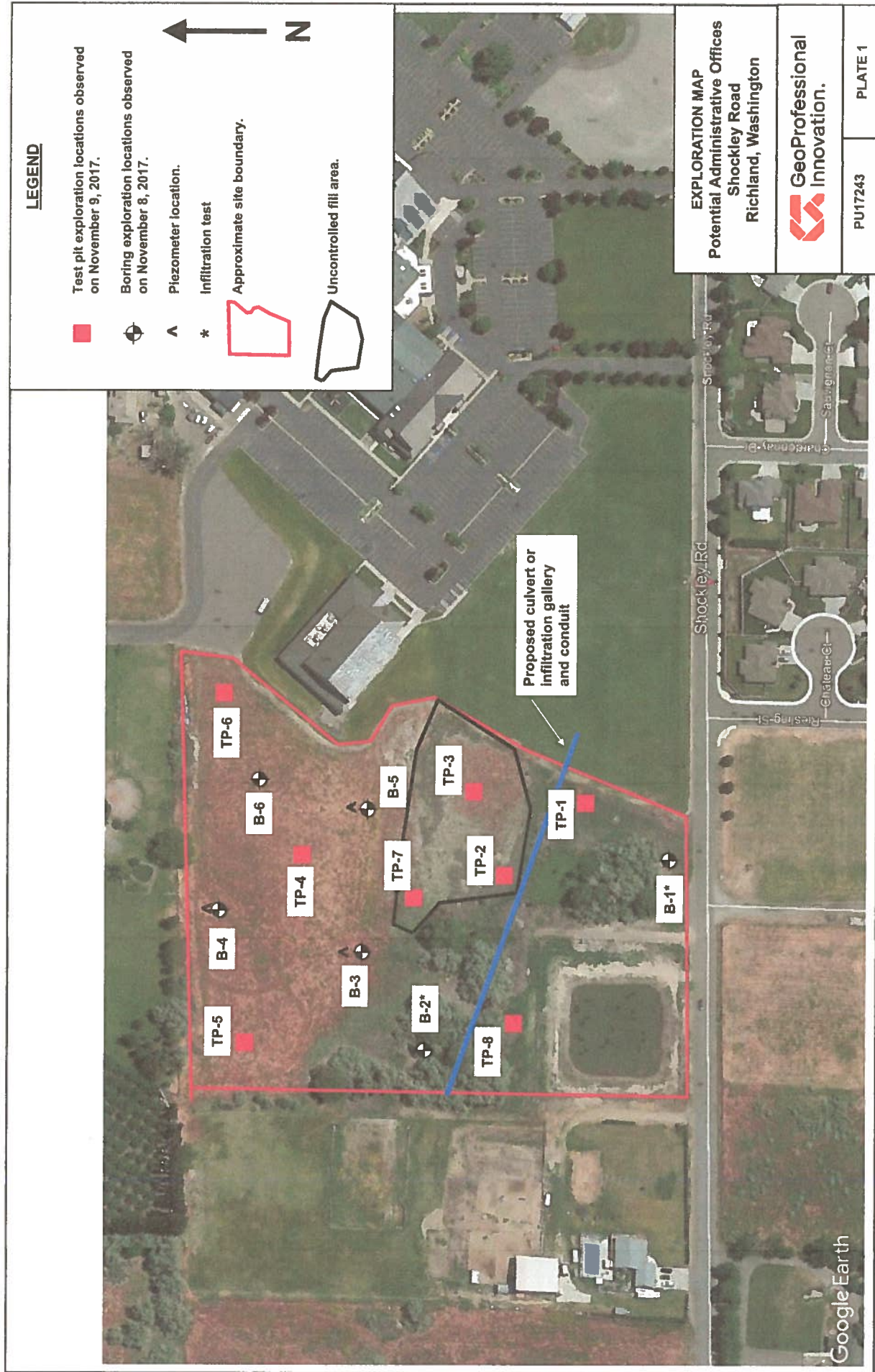
Our experience with similar projects suggests providing geotechnical continuity throughout design and construction is critical to project success. Often, precluding geotechnical involvement throughout the design process creates lost opportunities for efficiency between design iterations, project specifications, and plan drawing development.

EVALUATION LIMITATIONS

We provide the preliminary geotechnical considerations in this report to assist RSD with considering potential site development and design concepts. This information and the services we provided to date do not comprise a final geotechnical engineering evaluation for site or subgrade performance as it pertains to any future development or construction. Rather, we provide these considerations based on exploration advanced to date, experience with similar RSD developments, and typical earthwork standards of care that exist in the area at this time. Project design and construction professionals must apply appropriate judgment to the exploration findings presented herein to facilitate prudent design concept development. This acknowledgment is in lieu of any express or implied warranties.

The following accompany this report:

- Plate 1: Exploration Map
- Appendix A: Unified Soil Classification System (USCS) and Exploratory Boring Logs
- Appendix B: Laboratory Test Results



Reference: Google Earth Aerial Imagery, June 30, 2015. Not to scale.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE GRAINED SOIL	GRAVEL	CLEAN GRAVEL		GW	WELL-GRADED GRAVEL, GRAVEL-SAND MIXTURES.
				GP	POORLY-GRADED GRAVEL, GRAVEL-SAND MIXTURES.
		GRAVEL WITH FINES		GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURES.
				GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURES.
	SAND	CLEAN SAND		SW	WELL-GRADED SAND, GRAVELLY SAND.
				SP	POORLY-GRADED SAND, GRAVELLY SAND.
		SAND WITH FINES		SM	SILTY SAND, SAND-SILT MIXTURES.
FINE GRAINED SOIL	SILT AND CLAY LIQUID LIMIT LESS THAN 50%			ML	INORGANIC SILT, SANDY OR CLAYEY SILT.
				CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, SANDY OR SILTY CLAY.
				CL-ML	INORGANIC MIXED CLAY AND SILT.
				OL	ORGANIC SILT AND CLAY OF LOW PLASTICITY.
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	INORGANIC SILT, MICA-CEOUS SILT, PLASTIC SILT.
				CH	INORGANIC CLAY OF HIGH PLASTICITY, FAT CLAY.
				OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY.
				PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS.

BORING LOG SYMBOLS

STANDARD 2 INCH OD
SPLIT SPOON SAMPLE



CALIFORNIA MODIFIED 3 INCH
OD SPLIT SPOON SAMPLE



ROCK CORE



SHELBY TUBE 3 INCH OD
UNDISTURBED SAMPLE



TEST PIT LOG SYMBOLS

GRAB BAG SAMPLE

BG

BULK SAMPLE

BK

RING SAMPLE

RG

GROUNDWATER SYMBOLS

GROUND WATER AFTER 24
HOURS



GROUND WATER AT TIME OF
DRILLING



GROUND WATER AT THE END OF
DRILLING

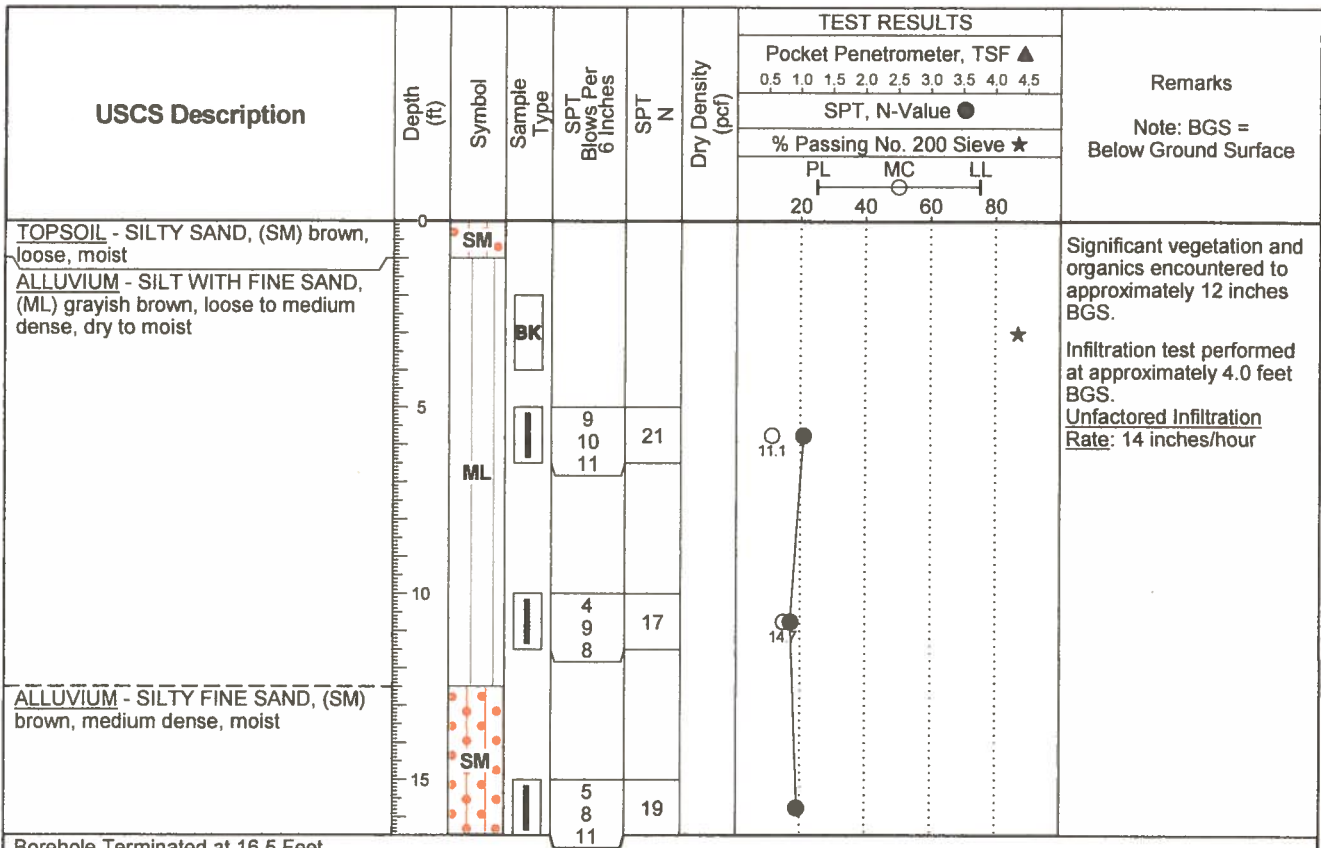


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GPI BORING - STRATA.GDT - 11/27/17 14:21 - \\STRPULS1\\MAIN\\ENGINEERING\\GINT FILES\\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	Symbol	Sample Type	SPT Blows Per 6 inches	SPT N	Dry Density (pcf)	TEST RESULTS				Remarks
							Pocket Penetrometer, TSF ▲				
							0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5				
							SPT, N-Value ●				
							% Passing No. 200 Sieve ★				
							PL	MC	LL		
							20	40	60	80	
TOPSOIL - SILTY SAND, (SM) brown, loose, moist	0	SM									Significant vegetation and organics encountered to approximately 12 inches BGS. Infiltration test performed at approximately 4.0 feet BGS. <u>Unfactored Infiltration</u> <u>Rate:</u> 9 inches/hour
ALLUVIUM - SILT WITH FINE SAND, (ML) grayish brown, loose, dry to moist	5	ML	BK	3 3 4	7						
ALLUVIUM - SILTY FINE SAND, (SM) brown, medium dense, moist	10	SM		2 5 6	11						
Borehole Terminated at 11.5 Feet.											Boring backfilled and plugged with bentonite.

Client: Richland School District	Boring Number: B-1		EXPLORATORY BORING LOG
Project: PU17243	Date Drilled: 11-08-2017		
Drill Rig: CME-850	Borehole Diameter: 8"		
Depth to Groundwater: N.E.	Logged By: TJW		
			Sheet 1 Of 1



Borehole Terminated at 16.5 Feet.

Boring backfilled and plugged with bentonite.

Client: Richland School District

Boring Number: B-2

Project: PU17243

Date Drilled: 11-08-2017

Drill Rig: CME-850

Borehole Diameter: 8"

Depth to Groundwater: N.E.

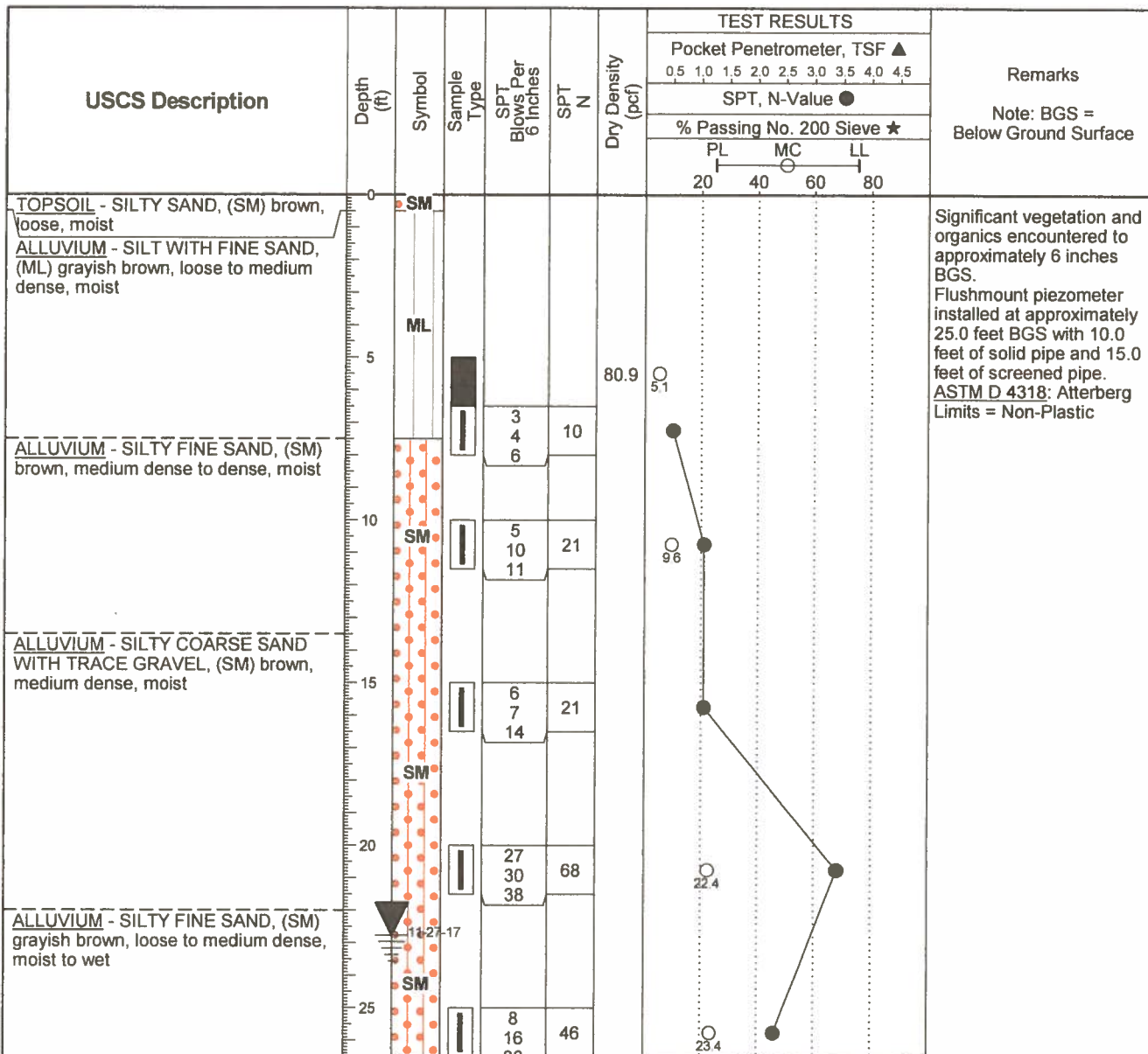
Logged By: TJW



**EXPLORATORY
BORING LOG**

Sheet 1 Of 1

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Borehole Terminated at 26.5 Feet.

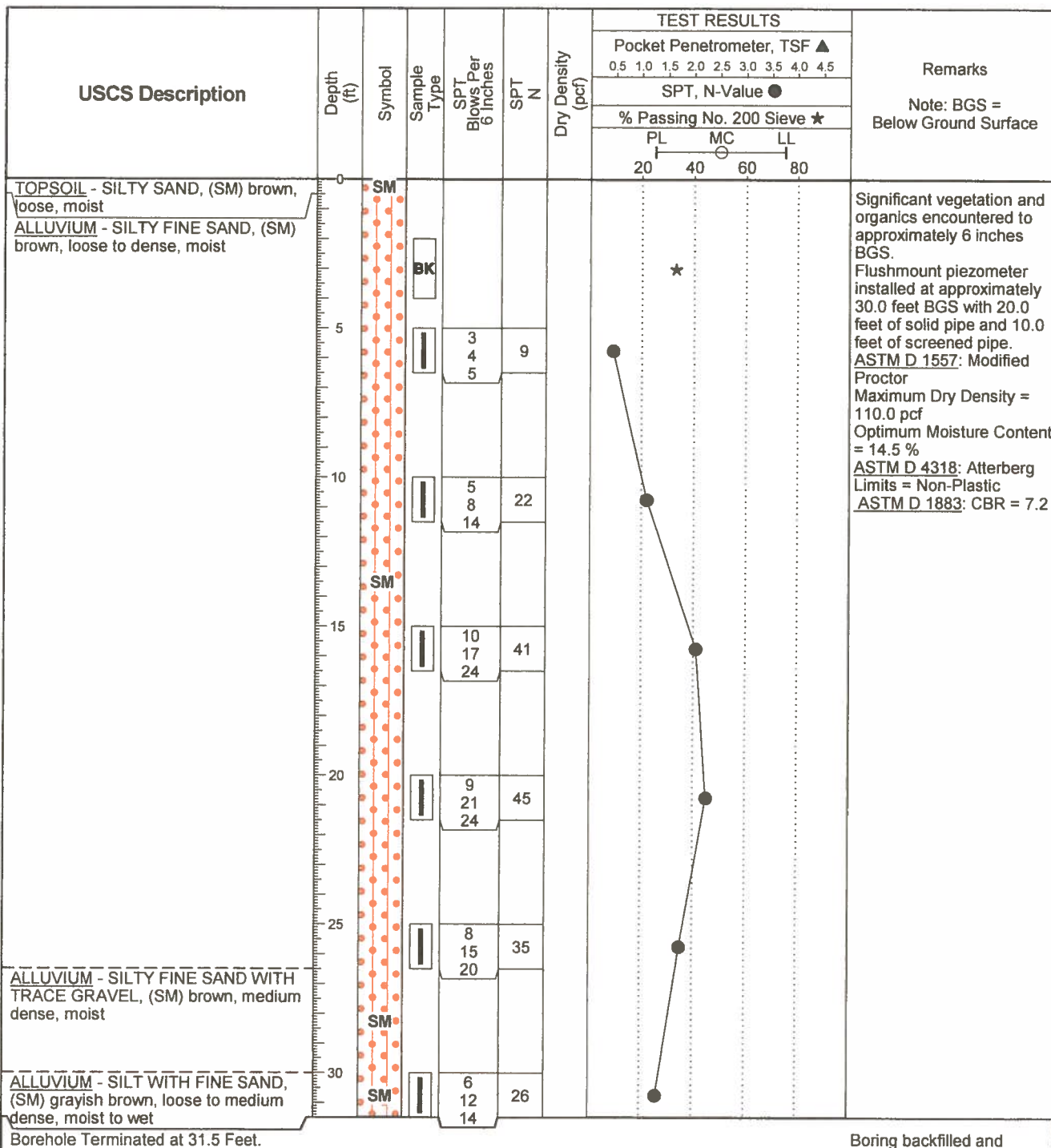
Boring backfilled and plugged with bentonite.

Client: Richland School District	Boring Number: B-3
Project: PU17243	Date Drilled: 11-08-2017
Drill Rig: CME-850	Borehole Diameter: 8"
Depth to Groundwater: N.E.	Logged By: TJW



EXPLORATORY BORING LOG

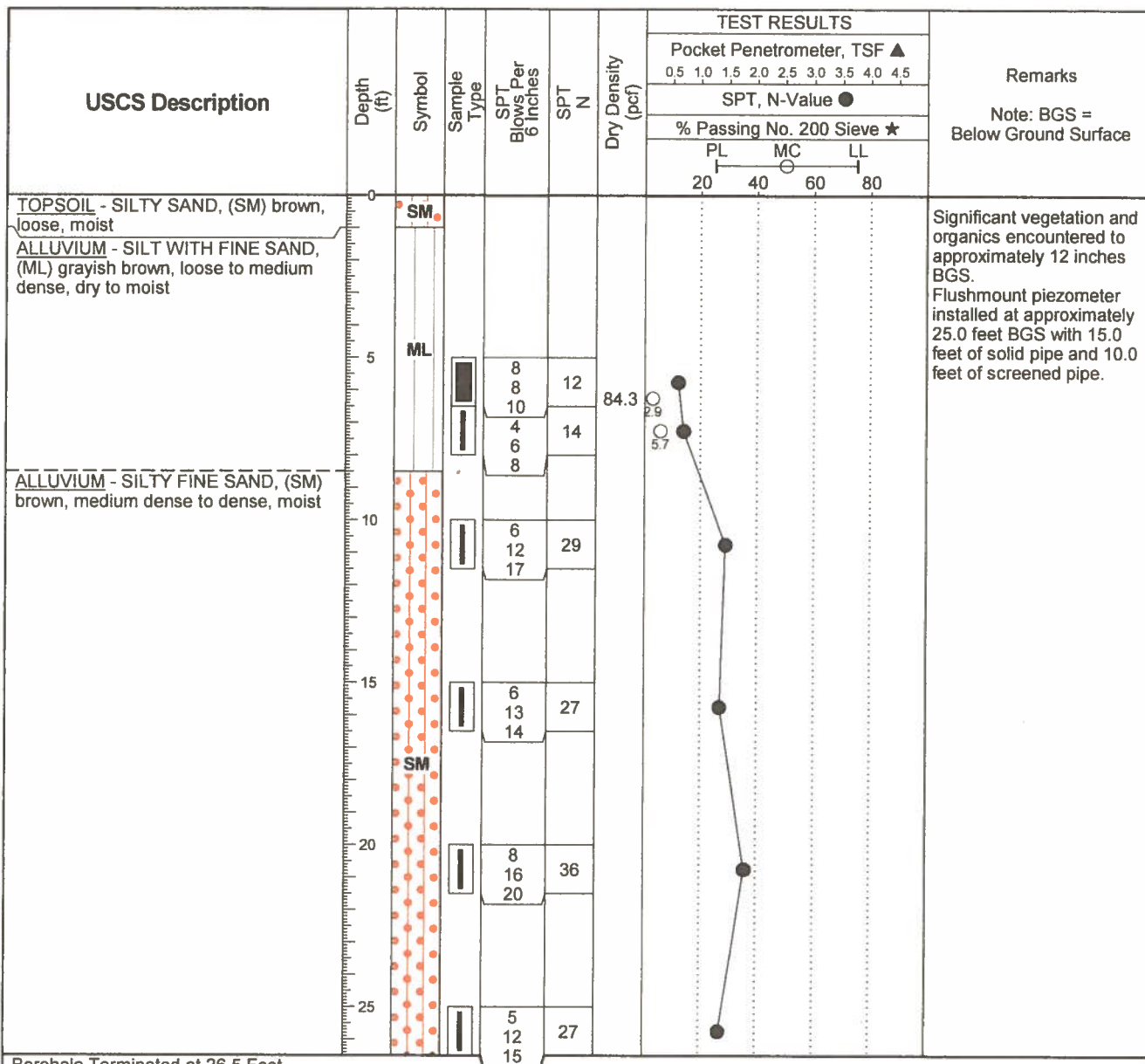
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Borehole Terminated at 31.5 Feet. Boring backfilled and plugged with bentonite.

Client: Richland School District	Boring Number: B-4		EXPLORATORY BORING LOG
Project: PU17243	Date Drilled: 11-08-2017		
Drill Rig: CME-850	Borehole Diameter: 8"		
Depth to Groundwater: N.E.	Logged By: TJW		
			Sheet 1 Of 1

GPI BORING - STRATA.GDT - 11/27/17 14:21 - \\STRPULS1\\MAIN\\ENGINEERING\\GINT FILES\\PU17243 BETHEL LOGS GPJ



Borehole Terminated at 26.5 Feet.

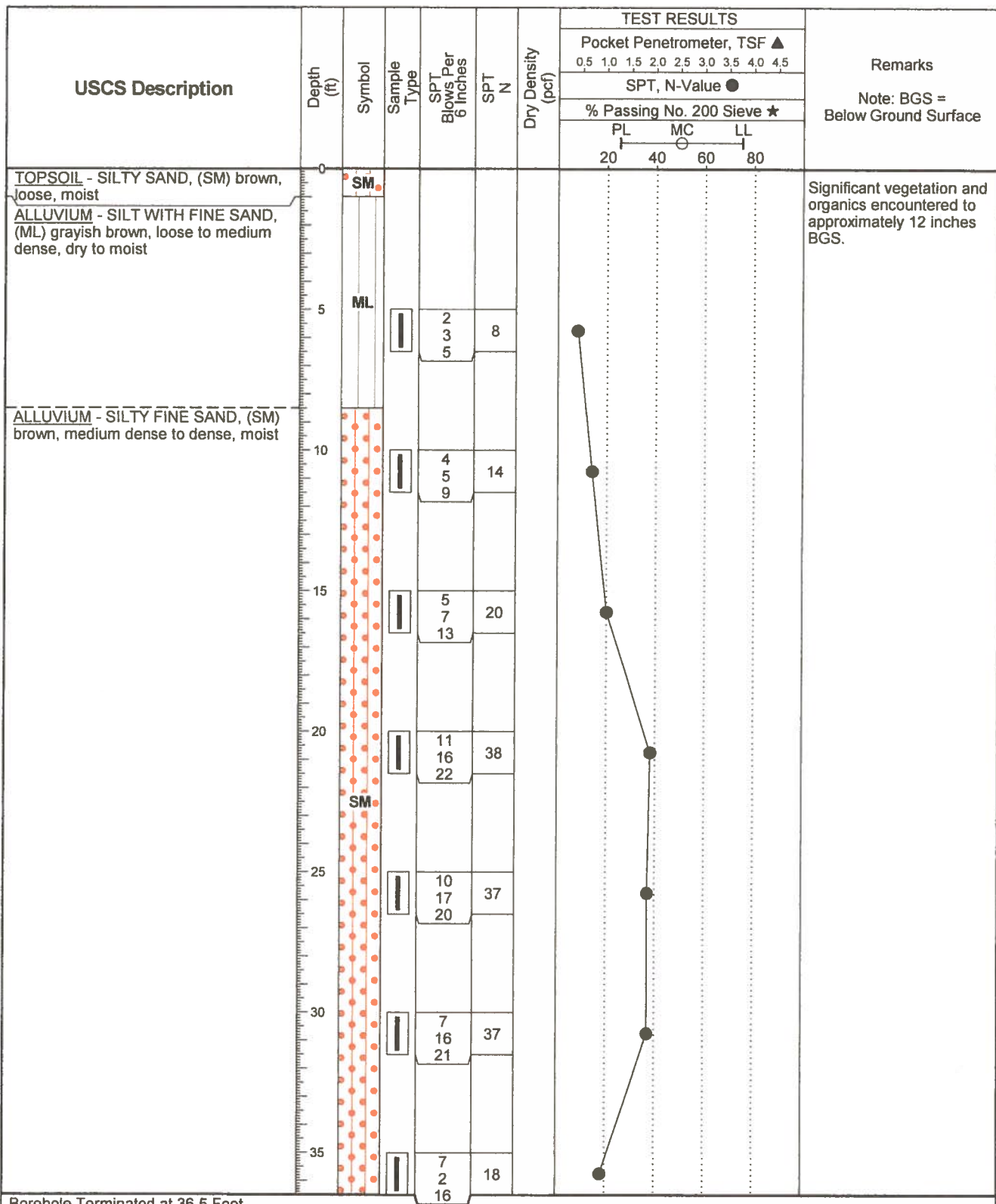
Boring backfilled and plugged with bentonite.

Client: Richland School District	Boring Number: B-5
Project: PU17243	Date Drilled: 11-08-2017
Drill Rig: CME-850	Borehole Diameter: 8"
Depth to Groundwater: N.E.	Logged By: TJW



EXPLORATORY BORING LOG

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Borehole Terminated at 36.5 Feet.

Boring backfilled and plugged with bentonite.

Client: Richland School District

Boring Number: B-6

Project: PU17243

Date Drilled: 11-08-2017

Drill Rig: CME-850

Borehole Diameter: 8"

Depth to Groundwater: N.E.

Logged By: TJW



**EXPLORATORY
BORING LOG**

Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 11/27/17 11:30 - \\STRPULS1\MAIN\ENGINEERING\GINT FILES\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits	Remarks
									LL PI	Note: BGS = Below Ground Surface
TOPSOIL - SILTY SAND, (SM) brown, loose, moist	0	SM								Significant vegetation and organics encountered to approximately 12 inches BGS.
ALLUVIUM - SILT WITH FINE SAND, (ML) grayish brown, loose to medium dense, dry	5	ML								
ALLUVIUM - SILTY FINE SAND, (SM) brown, medium dense, moist		SM								
Test Pit Terminated at 9.5 Feet.										Test pit loosely backfilled with site soil.

Client: Richland School District	Test Pit Number: TP-1		EXPLORATORY TEST PIT LOG
Project: PU17243	Date Excavated: 11-09-2017		
Backhoe: DEERE 35D	Bucket Width: 24"		
Depth to Groundwater: N.E.	Logged By: TJW		
			Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 11/27/17 11:30 - \\STRPULS1\\MAIN\\ENGINEERING\\GINT FILES\\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits	Remarks
									LL PI	Note: BGS = Below Ground Surface
TOPSOIL - SILTY SAND, (SM) brown, loose, moist	0	SM								Significant vegetation and organics encountered to approximately 6 inches BGS.
UNCONTROLLED FILL - MIXED SILT AND SAND, (ML-SM) gray brown, loose to medium dense, dry to moist		ML-SM								
ALLUVIUM - SILTY FINE SAND, (SM) brown, medium dense, moist	5	SM								
Test Pit Terminated at 9.0 Feet.										Test pit loosely backfilled with site soil.
Client: Richland School District		Test Pit Number: TP-2					EXPLORATORY TEST PIT LOG			
Project: PU17243		Date Excavated: 11-09-2017								
Backhoe: DEERE 35D		Bucket Width: 24"								
Depth to Groundwater: N.E.		Logged By: TJW								
									Sheet 1 Of 1	

GP1 TEST PIT - STRATA.GDT - 11/27/17 11:30 - \\STRPULS1\\MAIN\\ENGINEERING\\GINT FILES\\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits	Remarks
									LL PI	Note: BGS = Below Ground Surface
TOPSOIL - SILTY SAND, (SM) brown, loose, moist	0	SM								Moderate vegetation and organics encountered to approximately 6 inches BGS.
UNCONTROLLED FILL - MIXED SILT AND SAND, (ML-SM) gray brown, loose to medium dense, dry to moist	5	ML-SM								
ALLUVIUM - SILTY FINE SAND, (SM) brown, medium dense, moist	10	SM								

Test Pit Terminated at 10.0 Feet.

Test pit loosely backfilled with site soil.

Client: Richland School District	Test Pit Number: TP-3
Project: PU17243	Date Excavated: 11-09-2017
Backhoe: DEERE 35D	Bucket Width: 24"
Depth to Groundwater: N.E.	Logged By: TJW



EXPLORATORY TEST PIT LOG

Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 11/27/17 11:30 - \\STRPULS1\\MAIN\\ENGINEERING\\GINT FILES\\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits	Remarks
TOPSOIL - SILTY SAND, (SM) brown, loose, moist ALLUVIUM - SILT WITH FINE SAND, (SM) grayish brown, medium dense, dry to moist	0	SM							LL PI	Note: BGS = Below Ground Surface
	5	SM								Moderate vegetation and organics encountered to approximately 6 inches BGS.
Test Pit Terminated at 10.5 Feet.										Test pit loosely backfilled with site soil.
Client: Richland School District Project: PU17243 Backhoe: DEERE 35D Depth to Groundwater: N.E. Test Pit Number: TP-4 Date Excavated: 11-09-2017 Bucket Width: 24" Logged By: TJW  EXPLORATORY TEST PIT LOG Sheet 1 Of 1										

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks Note: BGS = Below Ground Surface
TOPSOIL - SILTY SAND, (SM) brown, loose, moist	0	SM								Moderate vegetation and organics encountered to approximately 6 inches BGS. <u>Cond. Meter, ASA:</u> Resistivity = 909 ohms-cm <u>Electrode, ASA 12-2.6:</u> pH = 8.1 <u>IC: Sulfate = 72 ppm</u>
ALLUVIUM - SILT WITH FINE SAND, (ML) grayish brown, medium dense, dry		ML								
ALLUVIUM - SILTY FINE SAND, (SM) brown, medium dense, moist	5	SM		BK	29.0		38.0			
Test Pit Terminated at 9.0 Feet.										Test pit loosely backfilled with site soil.

Client: Richland School District	Test Pit Number: TP-5	 GeoProfessional Innovation.	EXPLORATORY TEST PIT LOG
Project: PU17243	Date Excavated: 11-09-2017		
Backhoe: DEERE 35D	Bucket Width: 24"		
Depth to Groundwater: N.E.	Logged By: TJW		
			Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 11/27/17 11:30 - \\STRPULS1\MAIN\ENGINEERING\GINT FILES\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits	Remarks
TOPSOIL - SILTY SAND, (SM) brown, loose, moist ALLUVIUM - SILT WITH FINE SAND, (ML) grayish brown, medium dense, dry to moist	0 5 10	SM ML	 	 	 	 	 	 	LL PI	Note: BGS = Below Ground Surface Moderate vegetation and organics encountered to approximately 6 inches BGS.

Test Pit Terminated at 10.5 Feet.

Test pit loosely backfilled with site soil.

Client: Richland School District	Test Pit Number: TP-6
Project: PU17243	Date Excavated: 11-09-2017
Backhoe: DEERE 35D	Bucket Width: 24"
Depth to Groundwater: N.E.	Logged By: TJW



EXPLORATORY TEST PIT LOG

GPI TEST PIT - STRATA.GDT - 11/27/17 11:30 - \\STRPULS1\MAIN\ENGINEERING\GINT FILES\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits	Remarks
									LL PI	Note: BGS = Below Ground Surface
TOPSOIL - SILTY SAND, (SM) brown, loose, moist	0	SM								Moderate vegetation and organics encountered to approximately 6 inches BGS.
UNCONTROLLED FILL - MIXED SILT AND SAND, (ML-SM) gray brown, loose to medium dense, dry to moist		ML-SM								
ALLUVIUM - SILT WITH FINE SAND, (ML) grayish brown, loose to medium dense, dry to moist	5	ML								
ALLUVIUM - SILTY FINE SAND, (SM) brown, medium dense, moist		SM								
Test Pit Terminated at 9.5 Feet.										Test pit loosely backfilled with site soil.
Client: Richland School District		Test Pit Number: TP-7					EXPLORATORY TEST PIT LOG			
Project: PU17243		Date Excavated: 11-09-2017								
Backhoe: DEERE 35D		Bucket Width: 24"								
Depth to Groundwater: N.E.		Logged By: TJW					Sheet 1 Of 1			

G:\TEST PIT - STRATA.GDT - 11/27/17 11:30 - \\STRPULS\MAIN\ENGINEERING\GINT FILES\PU17243 BETHEL LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits	Remarks
TOPSOIL - SILTY SAND, (SM) brown, loose, moist ALLUVIUM - SILT WITH FINE SAND, (ML) grayish brown, medium dense, dry to moist ALLUVIUM - SILTY FINE SAND, (SM) brown, medium dense, moist	0 5	SM ML SM							LL PI	Note: BGS = Below Ground Surface Trace vegetation and organics encountered to approximately 6 inches BGS.
Test Pit Terminated at 8.0 Feet.										Test pit loosely backfilled with site soil.
Client: Richland School District		Test Pit Number: TP-8					EXPLORATORY TEST PIT LOG			
Project: PU17243		Date Excavated: 11-09-2017								
Backhoe: DEERE 35D		Bucket Width: 24"								
Depth to Groundwater: N.E.		Logged By: TJW								
										Sheet 1 Of 1

Project No.: PU17243A
 Project Name: Bethel Church Property
 Client: Richland School District

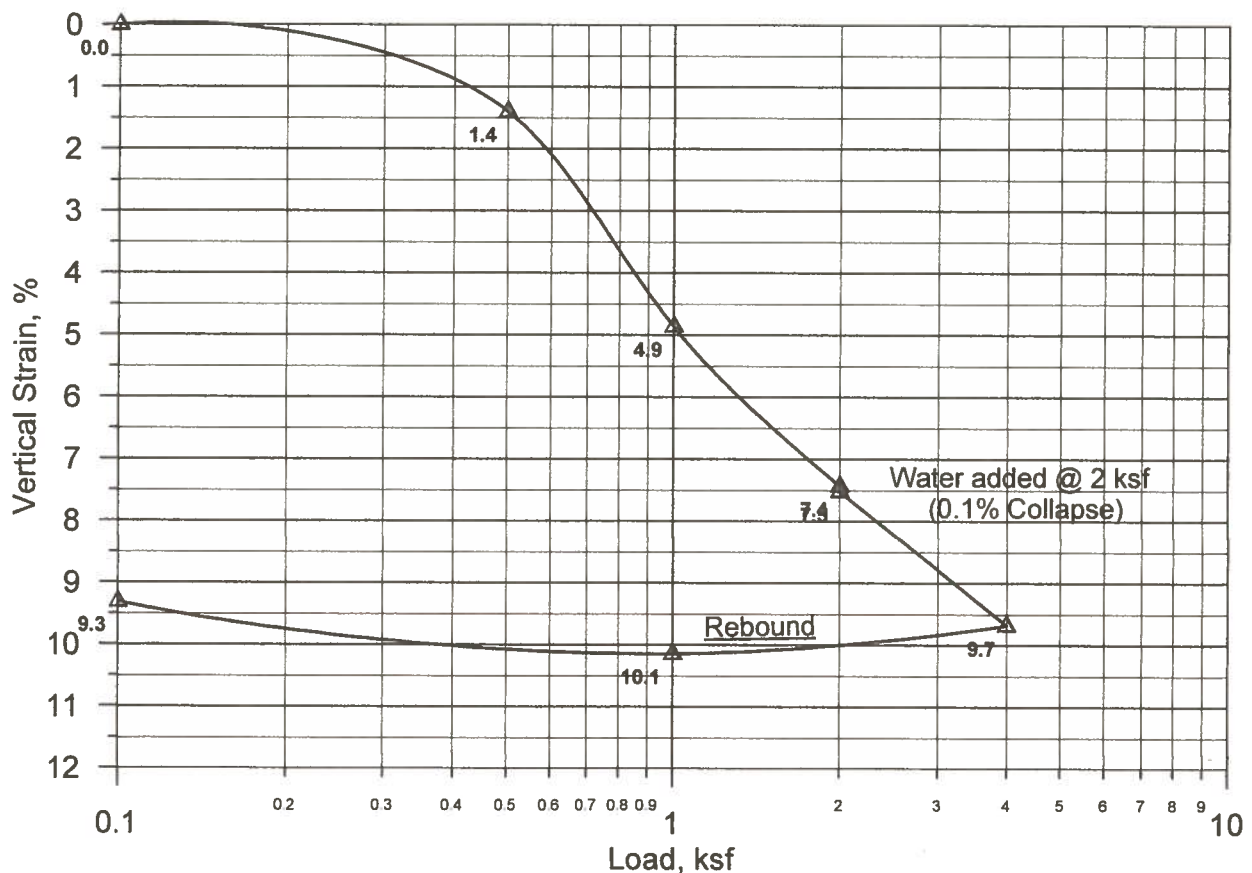
Report Date: 11/27/2017

Test Results Summary													
Test Pit (TP) Boring (B)	Depth (feet)	Lab Number	Description (U.S.C.S. Classification)	In situ Moisture, %	In situ Density, pcf	Max Dry Density, pcf	Optimum Moisture, %	Atterberg Limits	#200 Sieve Passing, %	CBR	Resistivity Ohms-cm	pH	Sulfate ppm
B-1	2.0-4.0	PUL17-0332A	Silt with Fine Sand (ML)	-	-	-	-	-	83	-	-	-	-
B-2	2.0-4.0	PUL17-0333B	Silt with Fine Sand (ML)	-	-	-	-	-	87	-	-	-	-
B-2	5.0-6.5	PUL17-0332E	Silt with Fine Sand (ML)	11.1	-	-	-	-	-	-	-	-	-
B-2	10.0-11.5	PUL17-0332H	Silt with Fine Sand (ML)	14.7	-	-	-	-	-	-	-	-	-
B-3	5.0-6.0	PUL17-0334	Silt with Fine Sand (ML)	5.1	80.9	-	-	Non-plastic	-	-	-	-	-
B-3	10.0-11.5	PUL17-0332F	Silty Fine Sand (SM)	9.6	-	-	-	-	-	-	-	-	-
B-3	20.0-21.5	PUL17-0332G	Silty Coarse Sand with Trace Gravel (SM)	22.4	-	-	-	-	-	-	-	-	-
B-3	25.0-26.5	PUL17-0332J	Silty Fine Sand (SM)	23.4	-	-	-	-	-	-	-	-	-
B-4	2.0-4.0	PUL17-0332B	Silty Fine Sand (SM)	-	-	110.0	14.5	Non-plastic	33	7.2	-	-	-
B-5	5.5-6.0	PUL17-0332C	Silt with Fine Sand (ML)	2.9	84.3	-	-	-	-	-	-	-	-
B-5	6.5-8.0	PUL17-0332I	Silt with Fine Sand (ML)	5.7	-	-	-	-	-	-	-	-	-
TP-5	2.0-4.0	PUL17-0332D	Silty Fine Sand (SM)	-	-	-	-	-	29	-	909	8.1	72

Reviewed by: 

CONSOLIDATION TEST RESULTS ASTM D 2435 (Method A)

Project: Bethel Church Property
Client: Richland School District
File Name: PU17243A
Lab Number: PUL17-0334
Sample Identification: B-3 @ 5.0-6.0 Feet BGS
Sample Classification: Silt with Fine Sand (ML)
Sample: In-Situ Tube (Condition: Good)
Date Tested: 11/13/17 By: JBM
Sample Dry Unit Weight: 80.9 pcf
In-Situ Moisture Content: 5.1%
Atterberg Limits: Non-plastic



Reviewed By: _____



GeoProfessional
Innovation.

CALIFORNIA BEARING RATIO ASTM D 1883

Project: Bethel Church Property
Client: Richland School District
Sample Identification: B-4 @ 2.0-4.0 feet BGS
Sample Classification: Silty Fine Sand (SM)

Project Number: PU17243A
Lab Number: PUL17-0332B
Date Tested: 11/19/17 By: MCM

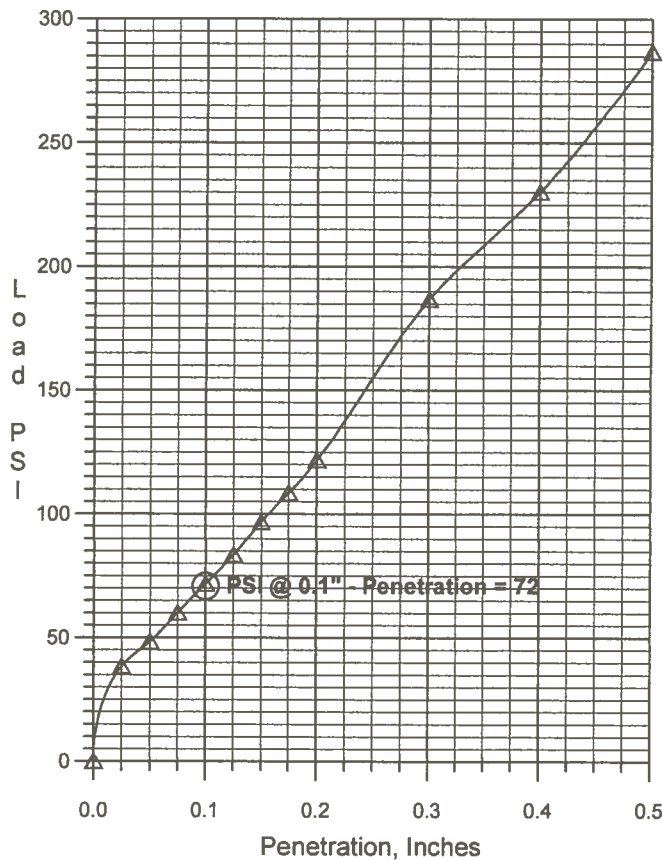
SOIL CONSTANTS

CBR = 7.2
Fines Classification: ML
Test Dry Density = 99.0 pcf
Test Specimen Remolded @ 14.7% Moisture
Remold Percentage of Proctor = 90%
Test Performed @ 21.9% Moisture (Top 1")
Percent Collapse = 0.4
Soak Time = 100 hrs
Surcharge = 50 psf

GRADING ANALYSIS

SCREEN SIZE	% PASSING
No. 200.....	33

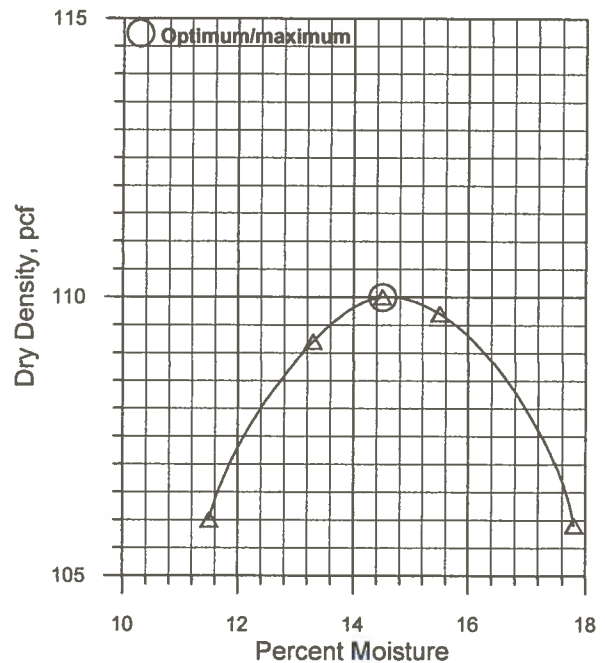
CBR CURVE



MOISTURE-DENSITY CURVE

ASTM D-1557 Method A

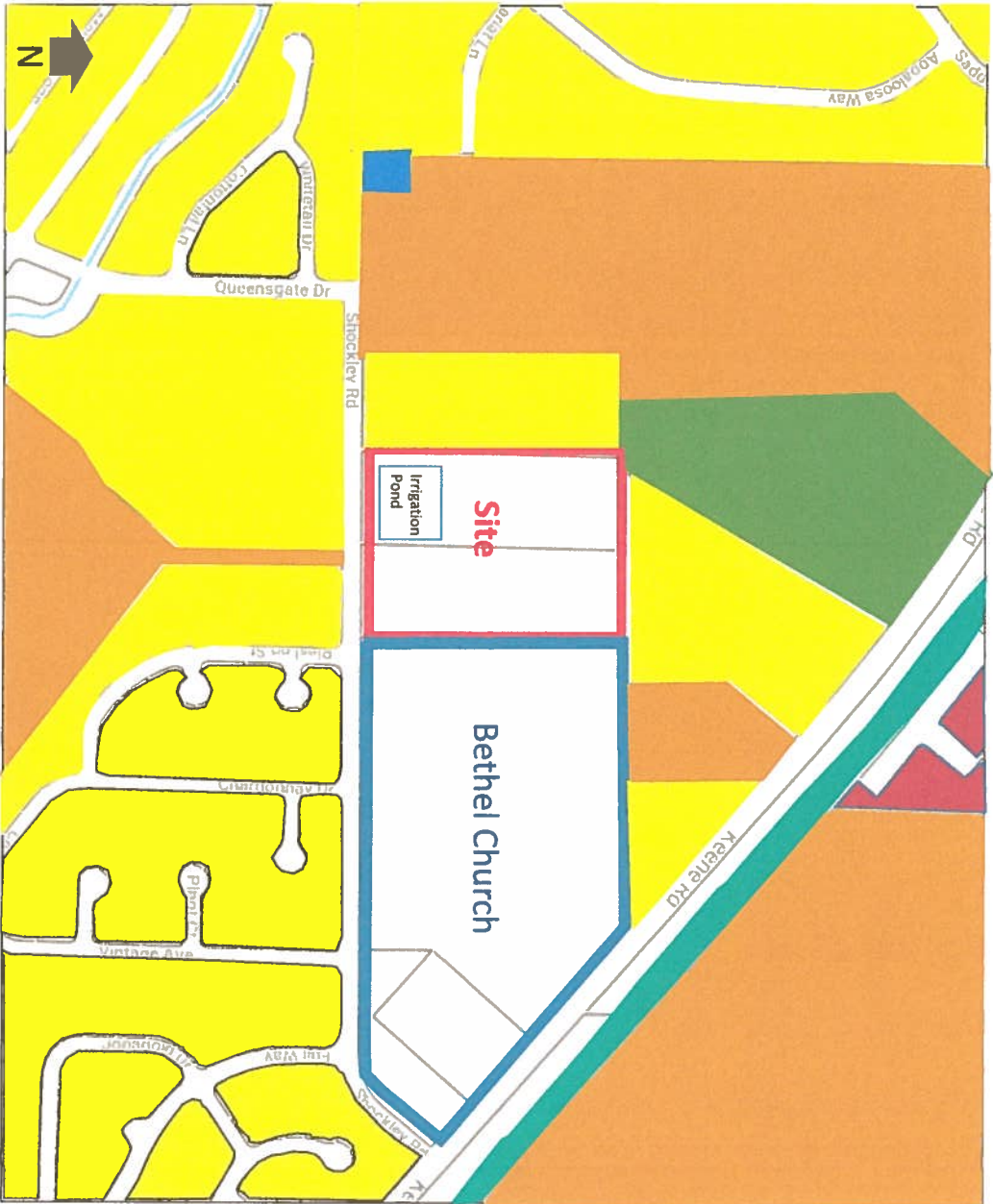
Maximum Dry Density, pcf: 110.0
Optimum Moisture Content, %: 14.5



Reviewed by: 



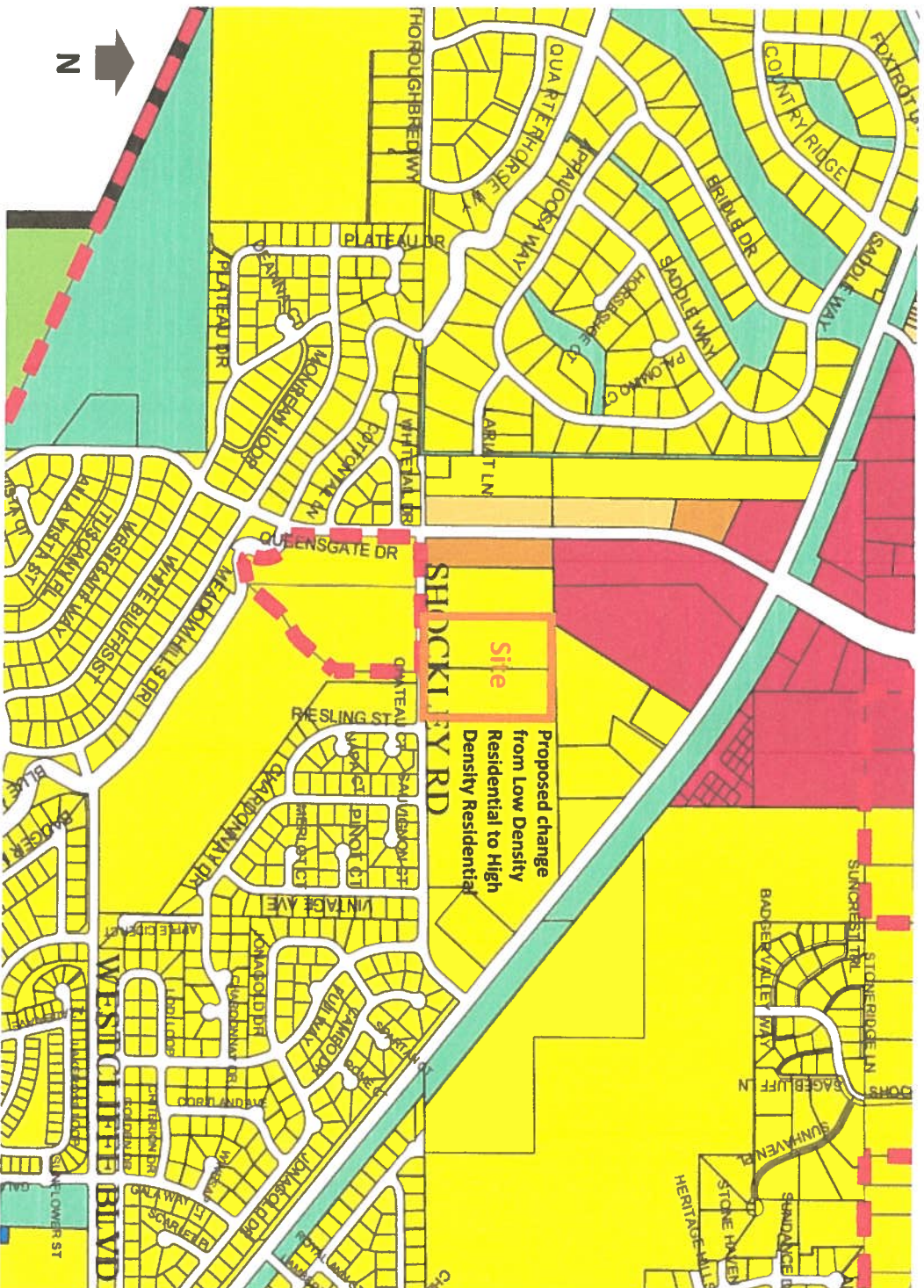
ATTACHMENT J
VICINITY MAP



ATTACHMENT K

EXISTING LAND USE

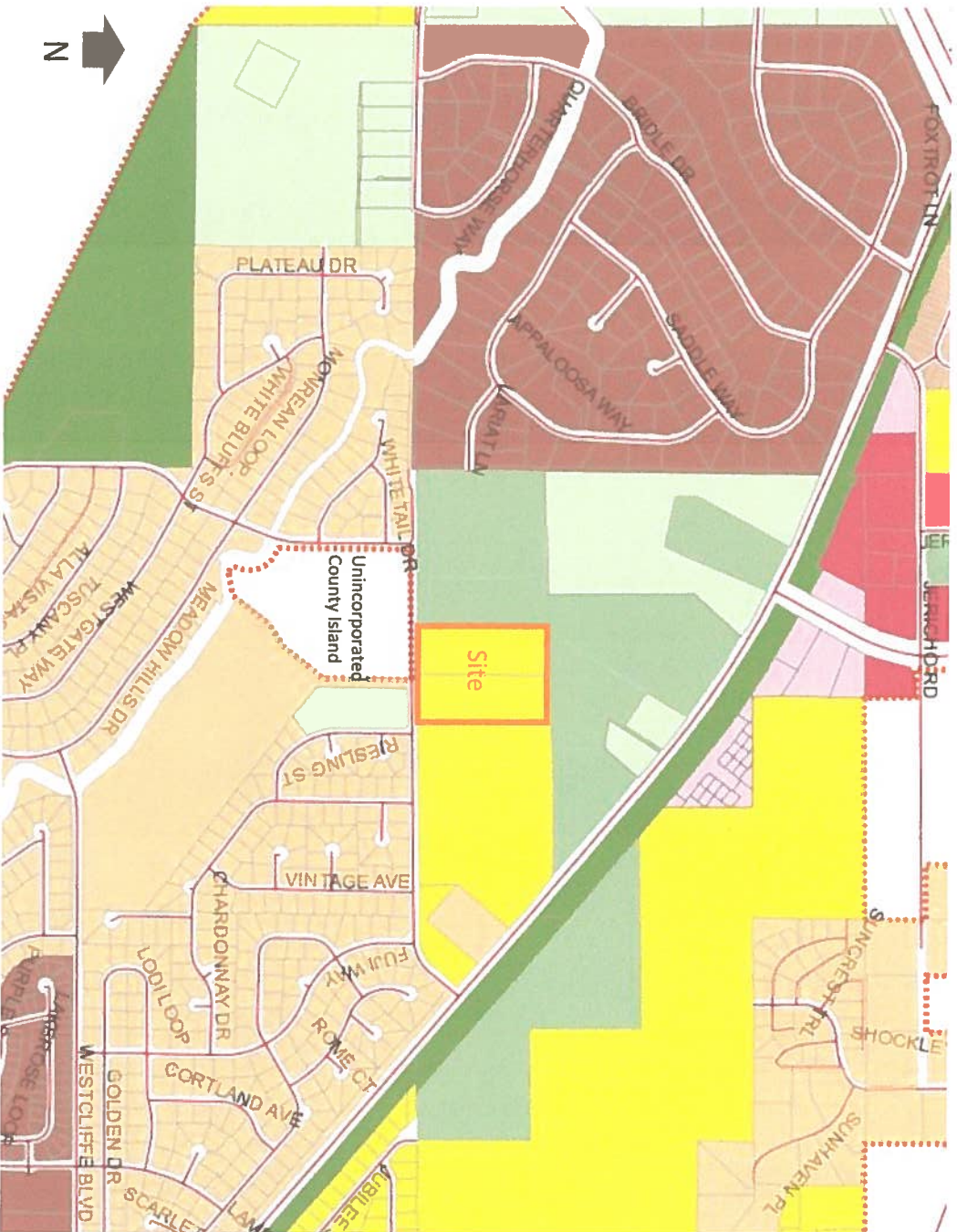
- Single Family Residential
- Undeveloped
- Agriculture
- Public Trail
- Public Facility
- Commercial



ATTACHMENT L

COMPREHENSIVE PLAN DESIGNATIONS

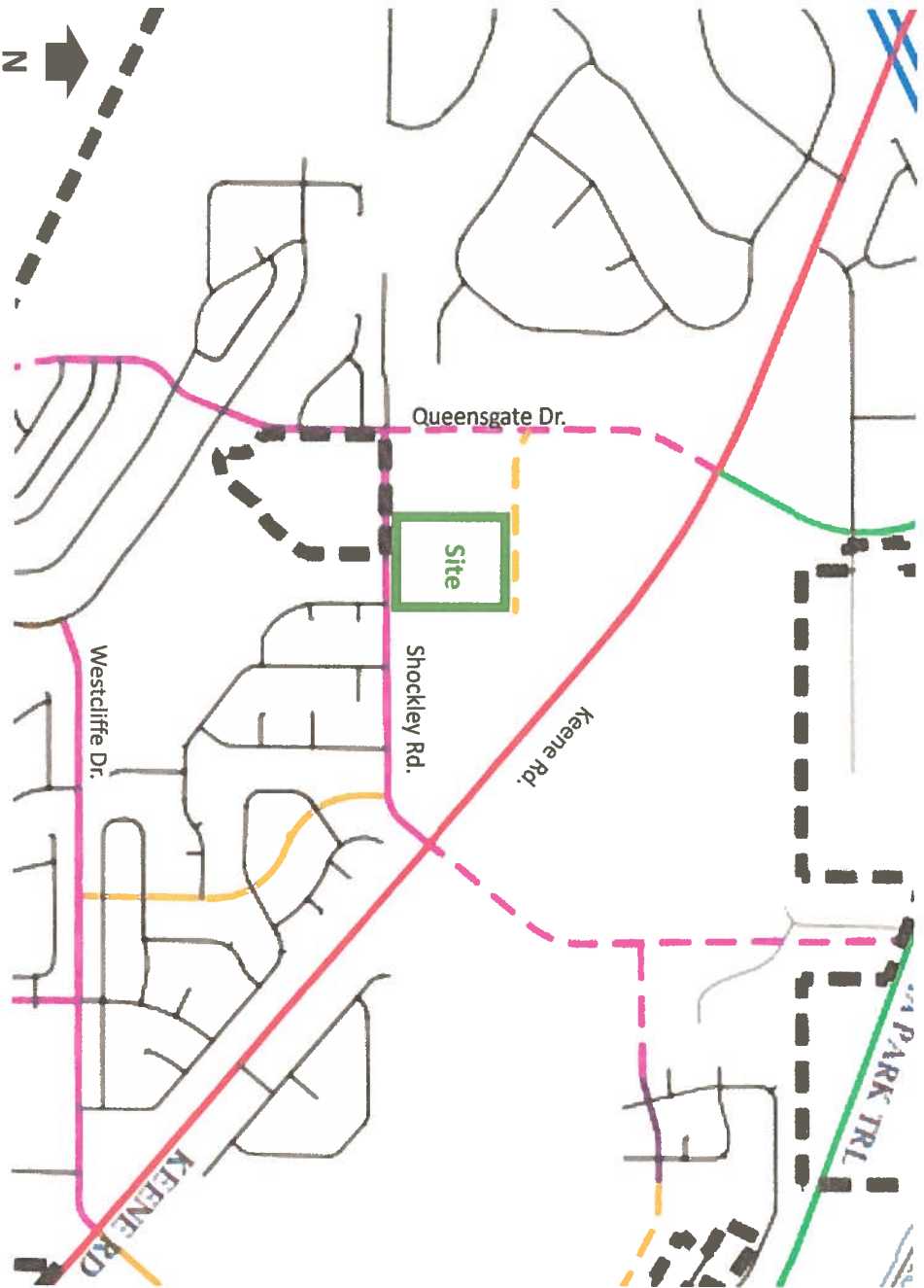
- 
- LDR – Low Density Residential**
 - MDR – Medium Density Residential**
 - RES-OFF Multifamily Residential Office**
 - COM - Commercial**
 - DOS – Developed Open Space**



ATTACHMENT M

ZONING

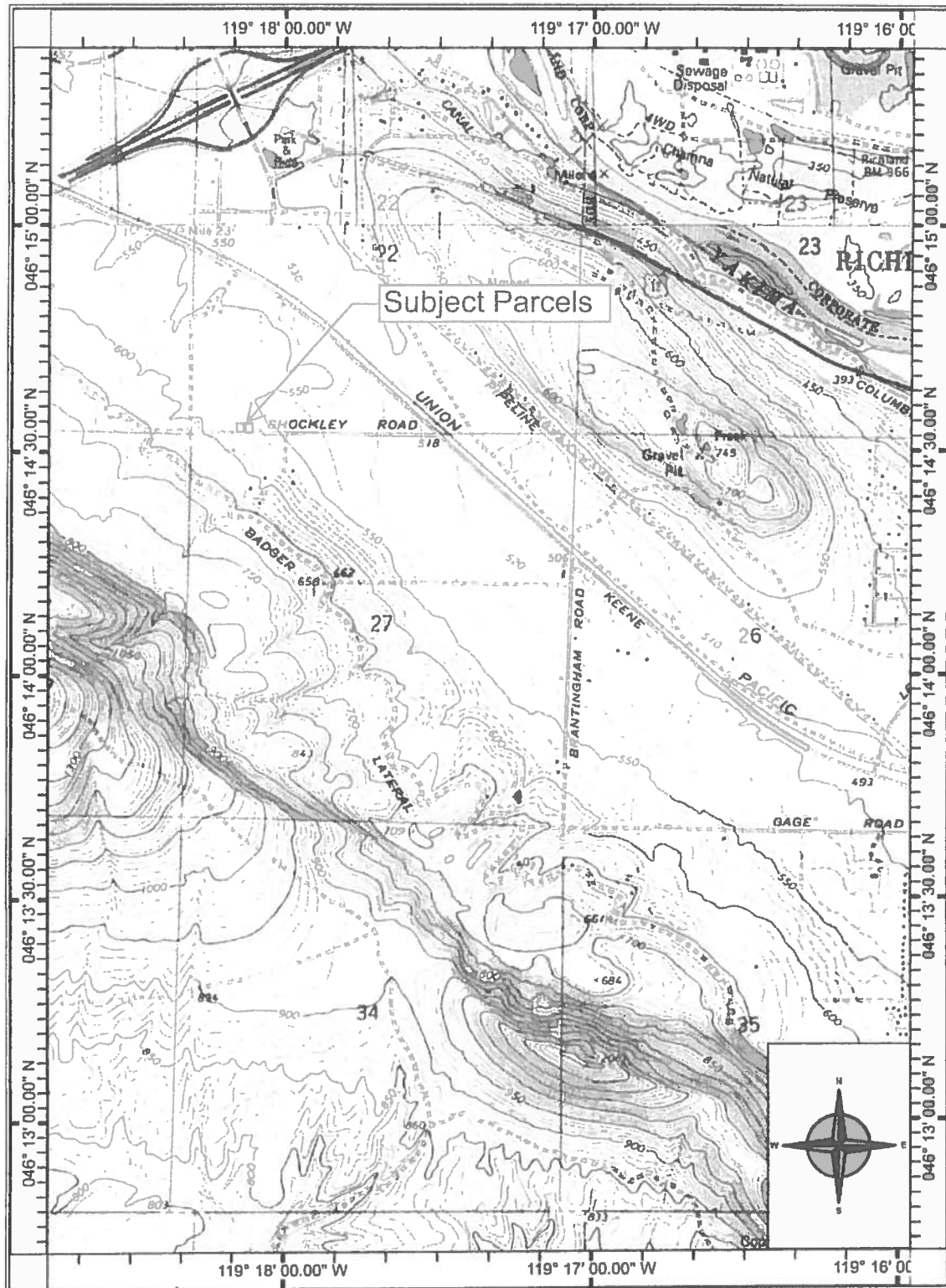
	R1-12 Single Family Residential
	R1-10 Single Family Residential
	PUD – Planned Unit Development
	SAG – Suburban Agriculture
	AG - Agricultural
	PPF – Parks & Public Facilities
	C-1 Neighborhood Retail Business
	C-2 Retail Business
	C-3 General Business



ATTACHMENT N

Street Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Arterial Collector
- - - Proposed Arterial Collector
- Neighborhood Collector
- - - Proposed Neighborhood Collector



HORIZONTAL DATUM: NAD27

MAP: BADGER MT

 JUB J-U-B ENGINEERS, INC.	 0 1000 2000 3000 4000 FEET 1 inch = 2,000 ft. CONTOUR INTERVAL: 10 Feet	VICINITY MAP
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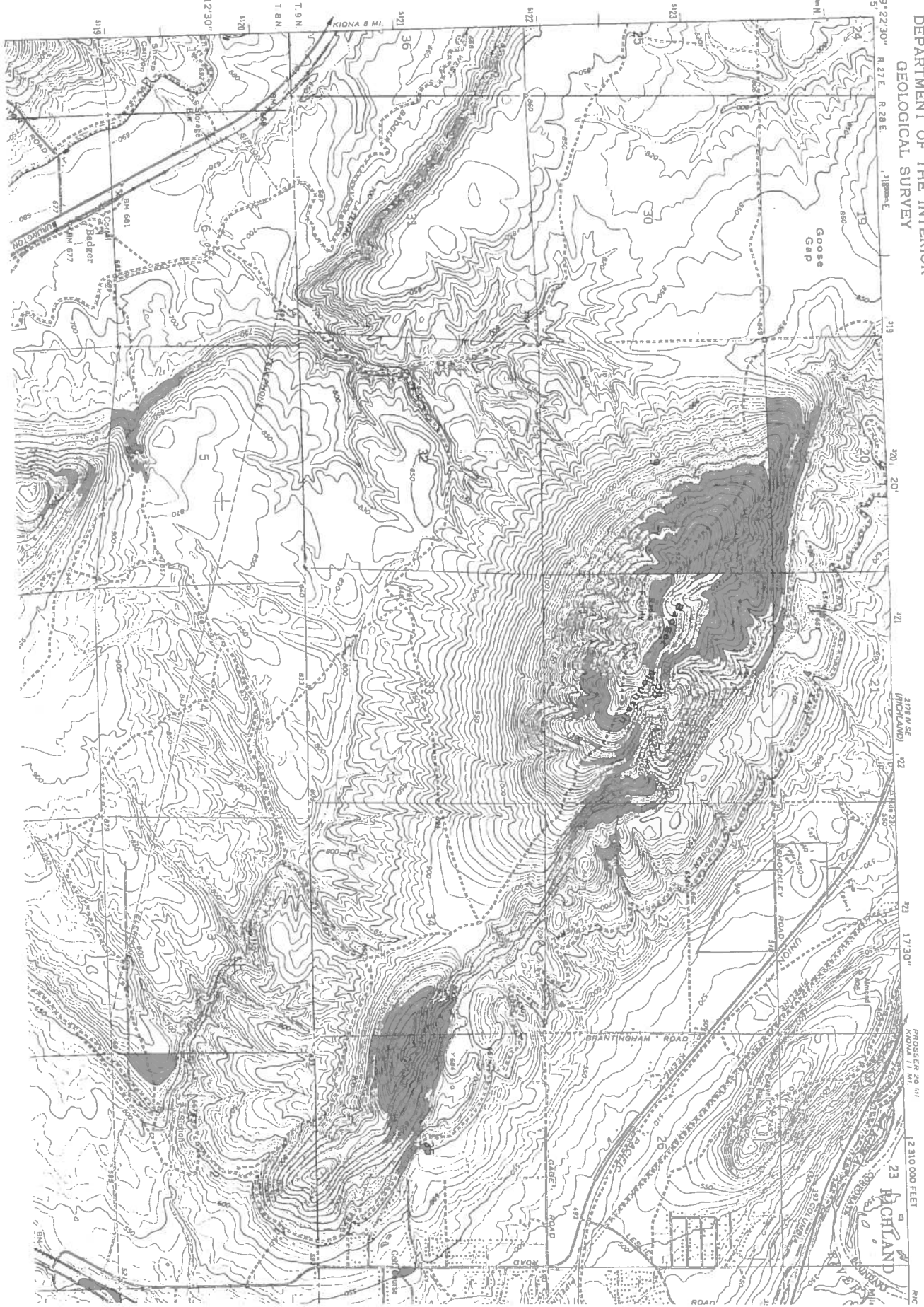
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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

46°15' 119°22'30" R. 27 E. R. 28 E.
1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000

Scale 1" = 2,000'

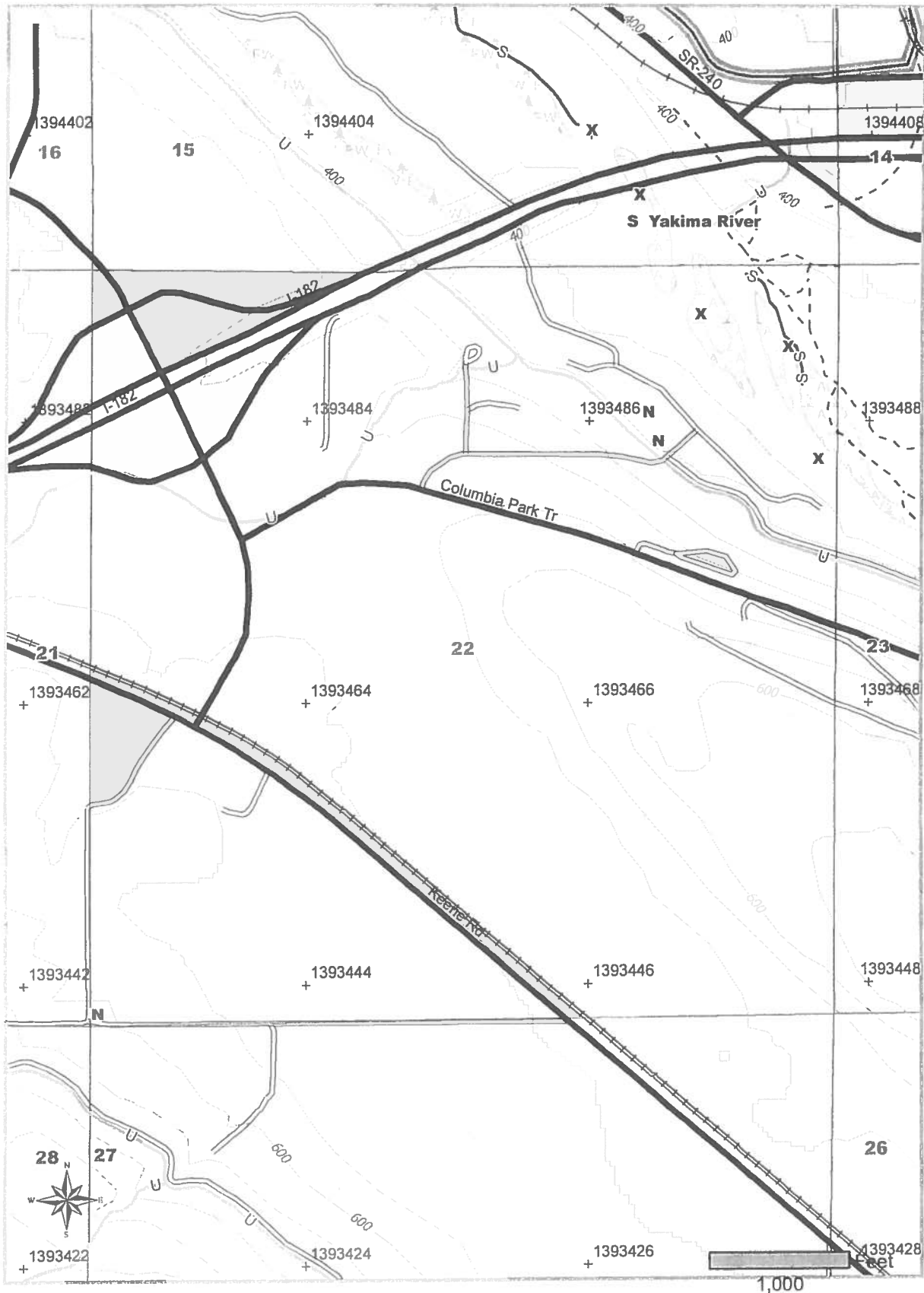
DALVELL 18114. 41
WASHINGTON-B
7.5 MINUTE SERIES
NEA BADGER MTH. 15



FOREST PRACTICE WATER TYPE MAP

TOWNSHIP 09 NORTH HALF 0, RANGE 28 EAST (W.M.) HALF 0, SECTION 22

Application #: _____





CITY OF RICHLAND
Determination of Non-Significance

Description of Proposal: Preliminary Plat of Fairhaven Townhomes

Proponent: Green Plan Construction, LLC

Location of Proposal: The north side of Shockley Road, approximately 1,700 feet west of the intersection of Shockley Road and Keene Road; immediately north of Jolianna Drive, tax parcel #'s 1-22983000006003 & 1-22983000006002

Lead Agency: City of Richland

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

() There is no comment for the DNS.

() This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for fourteen days from the date of issuance.

(X) This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

Responsible Official: Mike Stevens

Position/Title: Planning Manager

Address: 625 Swift Blvd., MS #35, Richland, WA 99352

Date: June 4, 2021

Signature 

Exhibit 7



2015 South Ely Street
Kennewick, WA 99337
Customer Service 509-586-9111
Business 509-586-6012
FAX 509-586-7663
www.kid.org

May 26, 2021

Shane O'Neill
City of Richland – Development Services
625 Swift Blvd. MS-35
Richland, WA 99352

Subject: Review Comments Pre Plat S2021-103

Dear Mr. O'Neill:

This letter provides Kennewick Irrigation District (KID) review comments on Pre Plat No. S2021-103 submitted by Green Plan Construction LLC on behalf of Bethel Church, 600 Shockley Rd., Richland, WA ("Applicant"¹). **These comments are preliminary and subject to KID Board Action on June 1st, 2021. A final comment letter will be provided to the City on June 2nd, 2021.** The properties are generally located at the intersection of Shockley Rd and Jolianna Dr. and includes the following parcels:

- 1-2298-300-0006-003 (**4.82** irrigable acres)
- 1-2298-300-0006-002 (**4.98** irrigable acres)

The properties identified on the proposed preliminary plat are located within the KID boundaries. The properties within this preliminary plat are classified as irrigable land and consist of 9.80 irrigable acres. Accordingly, KID provides the following comments to be included as required conditions of approval by the legislative authority under RCW 58.17.310(2):

- 1) The plat shall include the following irrigation easements consistent with KID requirements:
 - a. Dedicate to KID an irrigation easement 10 feet in width via a recorded deed to match irrigation system components, centered on an irrigation pipe line.
 - b. On all lots within the plat, dedicate to KID an irrigation easement 10 feet in width, or five (5) feet in width if adjacent to a utility easement, located along the road frontage of each lot. An irrigation easement may be included within the 'sidewalk and utility' easement if one is proposed, denoting the easement as a "Sidewalk, Utility, and Irrigation Easement."

¹ Reference to the "Applicant" throughout this comment letter shall refer to the property owner and/or developer of the proposed plat.

- 2) The Applicant is required to install an irrigation system that conforms to the most recent edition of the KID Standard Specifications pursuant to Resolution 86-15-A. This includes providing distribution pipelines adequate to provide individual pressurized irrigation services to each lot within the preliminary plat. This system will be dedicated to the KID upon completion, at the time of final plat.
- a. KID Standard Specifications require a storage pond facility be constructed and sized appropriately for this plat application. Please dedicate this storage facility as a tract of land deeded to the KID. In addition, the KID Standard Specifications require a pump station facility be constructed and sized appropriately for this plat application.
 - b. **As an alternative** to a pond, pump station, and other “on site” construction requirements per KID Standards Specifications, the Applicant and KID may mutually agree that it is in each of their best interests that other “off site” improvements may be made to allow for the delivery of pressurized irrigation water to the plat. This agreement is typically referred to as a Voluntary Mitigation Agreement (VMA). The other improvements would be proportionate and equal to the “on site” requirements and may include:
 - i. Contributions made towards a regional pump facility.
 - ii. The installation of pipelines off site.
 - iii. Upsizing of pipelines adjacent or within the subdivision. **KID plans to upsize the pipeline adjacent to Shockley Road in coordination with the project.**
 - iv. There is an existing KID Irrigation pond and pump station located within the pre plat boundaries. **Decommissioning of this facility will be contingent upon approval of a VMA. KID estimates the decommissioning and the other off-site improvements necessary to extend irrigation service from a neighboring system at \$116,051.04. This number is subject to change depending on timing of the VMA.**
- 3) Design of the required irrigation system must be approved by KID prior to installation. The Applicant is required to submit an irrigation plan designed by a professional engineer for review and approval by the KID. The plan may be hand drawn or computer drafted. The plan shall be accurate and to a scale not to exceed one (1) inch = 50 feet. This is a vital step of the approval process. In addition to compliance with Condition 2 above, the Plan must ensure all reasonable measures are taken to protect any easements, right-of-ways, and facilities. Please contact me at 586-6012 for more information regarding this irrigation plan.
- a. **For single-family attached units (town homes or townhouses), service risers shall be installed no further than 300 feet apart, with a service riser to each side of a street right-of-way or access easement.**
 - i. **Based on the information provided, irrigation distribution pipelines will need to be installed adjacent to the project along Shockley Road with a**

looped pipeline within the project itself. KID estimates approximately 12 service riser connections will be needed to service the project but actual service riser locations will be dependent upon town home layout.

- b. Please note, there are existing irrigation pipelines within the project likely to be impacted due to grading and building/street layouts.**
 - i. Applicant is responsible for the relocations and reinstallation of these pipelines per KID Standards and they must be located within a designated irrigation easement if located outside of the street ROW.**
- 4) Completion of all the facilities, consistent with irrigation plan approved by KID, is required prior to KID signature on the Final Plat.
- a. In the event any KID facilities are damaged during construction, the damage must be fully repaired to KID's then-existing standards.
 - b. For each phase of the plat, KID review and approval of construction and grading plans is required to allow KID to assure all reasonable measures to protect any easements and right-of-ways. Such review and approval will be coordinated as part of City review and the Final Plat approval process.
 - c. The KID must inspect any new irrigation system installations or modifications. The Applicant shall contact the KID to arrange an inspection at least 48 hours in advance of the desired inspection date.
 - d. As an alternative to immediate construction prior to approval of the Final Plat, the Applicant may choose to delay installation of the irrigation system by entering into a facilities installation agreement with the KID. The Applicant must still provide the KID with an irrigation system design that conforms to the most recent addition of the KID standard specifications. This irrigation system may be bonded and delayed up to five years. The facility installation agreement charge is \$350.00. The Applicant must establish an approved bonding mechanism with the KID in an amount approved by KID.

In addition, pursuant to RCW 58.17.310 (1), KID would like to inform the City of the following information regarding the proposed preliminary plat upon the structural integrity, including lateral support, of KID's facilities, other risk exposures, and the safety of the public and irrigation district, and conditions of approval that KID deems to be necessary as a result:

- 5) For each phase of the Project, KID/USBR review and approval of grading and construction plans is required to allow KID to assure all reasonable measures to protect any easements and ROWs. Such review and approval will be coordinated as part of the City's review and Final Plat approval process.
- 6) The Applicant shall include the potential failure of KID system components in its public offering statement for the plat pursuant to RCW 58.19.055(1)(r), which requires a public offering statement to include "[a] list of any physical hazards known to the developer which particularly affect the development or the immediate vicinity in which the developer is located and which are not readily ascertainable by the purchaser."

- 7) The Applicant shall post signs in appropriate areas with KID's easements and ROW's identifying KID's facilities (with locations and design approved by KID).
- 8) The Applicant shall provide fencing for the protection of KID facilities, which shall include but not be limited to adjacent KID/USBR ROW, with fencing locations and design approved by KID.

Finally, KID requests the following additional conditions of final plat approval:

- 9) Prior to approval of each phase, the current year's assessment must be paid. If the final plat is submitted for review after May 31st of a given year or submitted for review prior to May 31st but not submitted for final approval prior to June 15th, the next year's estimated assessment (125% of the current year's assessment) must be paid prior to plat approval.
- 10) Prior to approval of the first phase, the USBR construction loan for **all parcels** owned by the property owner within the boundaries of the KID must be paid and all other USBR requirements associated with this payout must be completed.
- 11) The Review and Inspection fees in place at the time of each review request must be paid. At the time of application the review fees are as follows:
 - a. A Preliminary Plat review fee of **\$825.00** which must be paid prior to scheduling for final plat approval at a KID Board meeting for the first phase.
 - b. For each Phase an inspection fee **\$350** for the first 20 lots/tracts plus \$25 per lot/tract after 20 lots/tracts.
 - c. Final Plat review fee for each phase of **\$225.00**.
- 12) Per KID Policy 4.17, "Irrigable Land Recalibration Principles," as land within the plat is subdivided or developed; KID will remove the irrigation water allocation from the impermeable surfaces, such as streets, from the plats.
- 13) In order to receive KID irrigation water delivery, a water master (or point of contact) for the subdivision must be appointed. This water master can be appointed by the Homeowners Association (or similar organization) officers, or must be elected from among the property owners within the boundary of this proposed subdivision. If no HOA (or similar organization) is organized, than an election method similar to the attached document is required.
- 14) Prior to approval of each phase, an electronic file (AutoCAD 2004 format) and hard copy (6-mil mylar, sealed by a professional engineer) of construction as-builts must be provided to KID.

- 15) All subdivisions of land are required to be approved by the KID Board of Directors during a KID Board Meeting. KID Board Meetings are regularly scheduled on the first and third Tuesdays of each month. All conditions must be completed prior to submittal to KID for final approval. The submittal for final approval must be received by KID a minimum of two weeks prior to a regularly scheduled Board Meeting in order to be considered at that meeting.

KID reserves the following rights regarding future review of the plat:

- 16) KID reserves the right to provide review comments under RCW 58.17.330(1) and RCW 58.17.330(2) in response to future design submittals by the Applicant prior to final plat approval. The scope of these reviews will be limited to Phases that are adjacent to the District's Rights of Way. KID review of construction plans will be consistent with the City of Kennewick's plan review timelines.
- 17) KID reserves the right to review and comment on the Applicant's plat line revisions for potential additional revisions to protect KID system components for Phases that are adjacent to KID's easements or ROWs.
- 18) KID reserves the right to review and comment on the Applicant's covenants, conditions, and restrictions to evaluate whether they should include any terms regarding protection of KID system components after construction and fencing requirements.
- 19) KID reserves the right to submit additional comments during the City's review process under the State Environmental Policy Act (SEPA).

Please provide notice to KID of any Public meeting or hearing where this project will be an agenda item. If you have any questions regarding these comments, please contact me at the address/phone number listed below.

Sincerely,



Jason McShane, P.E.
Engineering/Operations Manager

Sample Watermaster Election Process

That the Water Users are deemed to agree as a condition of water delivery as follows::

- i. The LID participants will elect a Watermaster from among themselves, as follows:
 - a. Election of First Watermaster. The first Watermaster shall be elected prior to April 1, 2011, and shall be elected as described in paragraph d. below.
 - b. Resignation of Watermaster. If the Watermaster resigns, the parties shall meet at a place and time designated by the resigning Watermaster in a written notice and elect a new Watermaster, or if the Watermaster does not designate a time and a place for such a meeting, the parties shall meet at a time and a place first designated in writing by two of the parties hereto to elect a new Watermaster.
 - c. Death or Incapacity of Watermaster. If the Watermaster dies or becomes incapacitated, the parties shall meet at a time and a place first designated in writing by two of the parties hereto to elect a new Watermaster.
 - d. Elections and Replacement of Watermaster. The Watermaster shall be assigned by the elected members of the Royal Ann Estates Homeowner Association Board of Directors. If the Homeowner's Association defaults or stops functioning, the Watermaster shall be elected by and may be replaced by a sixty percent (60%) majority of the Water Users participating in the LID at an election called for by a majority of the properties that are subject hereto. Each property shall have one (1) vote. If more than one person owns a property, the owners of the property shall designate in writing the person who shall have the right to vote for that property. If the owners of the property cannot agree on the person who shall vote for the property, that property shall have no vote in the election. The owners' properties which are calling for an election or replacement of a new Watermaster shall give or cause the other parties to be given a written notice stating the place and time of the election. Any notice required under this paragraph, which notice shall be mailed by U.S. Mail as certified mail to the common address identified above for the property not more than thirty days and not less than ten days

prior to the election. Any election held hereunder shall be held in Benton County, Washington, between 6:00 p.m. and 9:00 p.m.

- ii. Powers and Duties of Watermaster. The Watermaster shall have the power and it shall be his or her duty to take all actions reasonably necessary to fulfill the purposes of this agreement, including but not limited to:
 - a. Provide a primary point of contact for KID to communicate system problems, outages, schedules, drought mitigation measures, etc.
 - b. Assist KID in providing the LID participants information regarding system problems, outages, water schedules, drought mitigation measures, etc.
- iii. Qualified Immunity of Watermaster from Liability. The Watermaster shall not be liable for any damages caused to the parcels or persons subject hereto so long as the Watermaster acts in good faith.
- iv. No water delivery unless a Watermaster is performing duties. If at any time a Watermaster no longer is performing his/her duties, as outlined above, for more than 30 days, KID will stop water delivery to the participants of the LID until a new Watermaster has been elected.
- v. Alternate Watermaster. An alternate Watermaster may be elected in the same manner as described above for the Watermaster. This alternate Watermaster can function as Watermaster for a limited time, not to exceed 60 days, in case of the elected Watermaster being unavailable.



Department of Energy

Bonneville Power Administration
2211 North Commercial Avenue
Pasco, WA 99301

TRANSMISSION SERVICES

May 17, 2021

In reply refer to: Preliminary Plat Review (S2021-103) Fairhaven
Located within a Portion of Section 15, Township 9 North, Range 28 East,
W.M., Benton County, Washington

Shane O'Neill
Senior Planner
City of Richland
625 Swift Boulevard, MS-35
Richland, WA 99352

Dear Shane:

Bonneville Power Administration (BPA) has had the opportunity to review Preliminary Plat Review (S2021-103) Fairhaven. The application is to divide 10 acres into 70 residential lots. The subject site is generally located on Shockley Road located in Richland, WA.

In researching our records, we have found that this proposal will not directly impact BPA facilities approximately .34 miles NE of the subject property. BPA does not have any objections to the approval of this request at this time.

Thank you for the opportunity to review this application. If you have any questions regarding this request or need additional information, please feel free to contact me. I can be reached at (509) 544-4747 or by email at jecottrell@bpa.gov.

Sincerely,

A handwritten signature in blue ink that reads "Joseph E. Cottrell II".

Joseph E. Cottrell II
BPA Field Realty Specialist

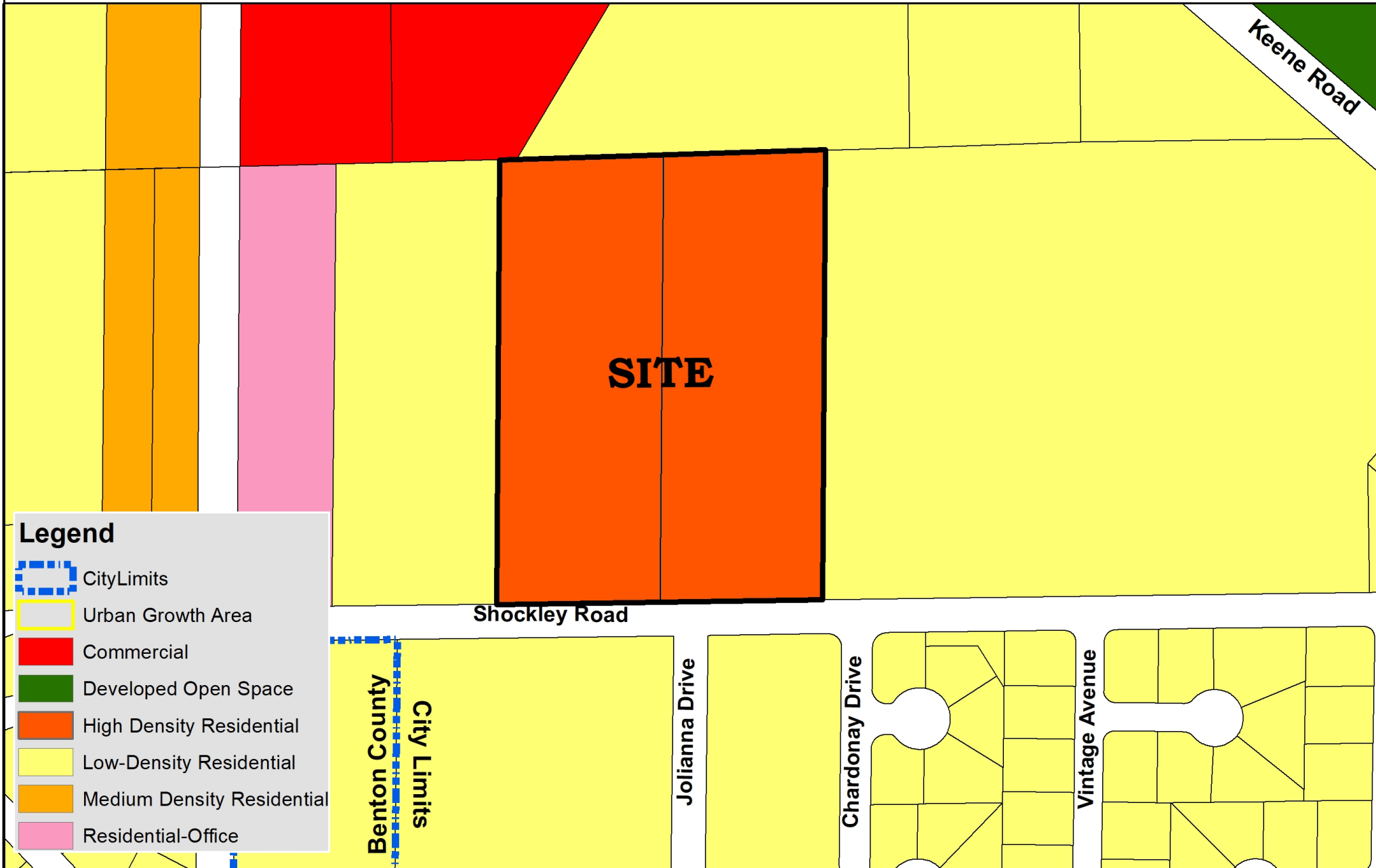
Vicinity Map

Item: Preliminary Plat - Fairhaven
Applicant: Green Plan Construction, LLC
File #: S2021-103



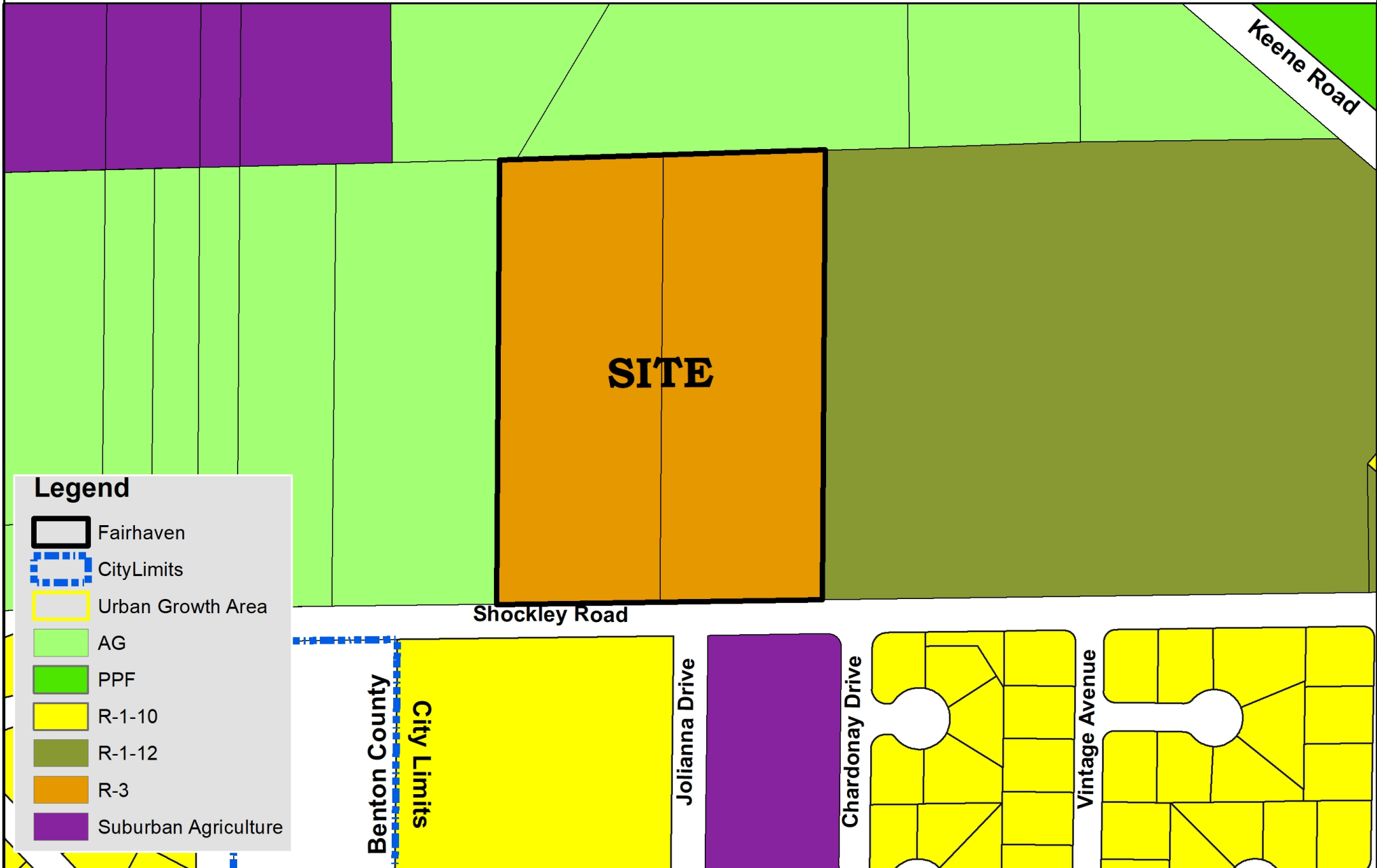
Land Use Map

Item: Preliminary Plat - Fairhaven
Applicant: Green Plan Construction, LLC
File #: S2021-103



Zoning Map

Item: Preliminary Plat - Fairhaven
Applicant: Green Plan Construction, LLC
File #: S2021-103



Looking West

SITE



Looking East

Approx. property line



Looking North

SITE



Looking East

On-site KID irrigation pond
(to be removed)



Looking South

SITE





2015 South Ely Street
Kennewick, WA 99337
Customer Service 509-586-9111
Business 509-586-6012
FAX 509-586-7663
www.kid.org

June 11, 2021

Shane O'Neill
City of Richland – Development Services
625 Swift Blvd. MS-35
Richland, WA 99352

Subject: Review Comments Pre Plat S2021-103

Dear Mr. O'Neill:

This letter provides Kennewick Irrigation District (KID) review comments on Pre Plat No. S2021-103 submitted by Green Plan Construction LLC on behalf of Bethel Church, 600 Shockley Rd., Richland, WA ("Applicant"¹). The properties are generally located at the intersection of Shockley Rd and Jolianna Dr. and includes the following parcels:

- 1-2298-300-0006-003 (**4.82** irrigable acres)
- 1-2298-300-0006-002 (**4.98** irrigable acres)

The properties identified on the proposed preliminary plat are located within the KID boundaries. The properties within this preliminary plat are classified as irrigable land and consist of 9.80 irrigable acres. Accordingly, KID provides the following comments to be included as required conditions of approval by the legislative authority under RCW 58.17.310(2):

- 1) The plat shall include the following irrigation easements consistent with KID requirements:
 - a. Dedicate to KID an irrigation easement 10 feet in width via a recorded deed to match irrigation system components, centered on an irrigation pipe line.
 - b. On all lots within the plat, dedicate to KID an irrigation easement 10 feet in width, or five (5) feet in width if adjacent to a utility easement, located along the road frontage of each lot. An irrigation easement may be included within the 'sidewalk and utility' easement if one is proposed, denoting the easement as a "Sidewalk, Utility, and Irrigation Easement."

¹ Reference to the "Applicant" throughout this comment letter shall refer to the property owner and/or developer of the proposed plat.

- 2) The Applicant is required to install an irrigation system that conforms to the most recent edition of the KID Standard Specifications pursuant to Resolution 86-15-A. This includes providing distribution pipelines adequate to provide pressurized irrigation service to each lot within the preliminary plat. This system will be dedicated to the KID upon completion, at the time of final plat.
 - a. **For single-family attached units (town homes or townhouses), service risers shall be installed no further than 300 feet apart, with a service riser to each side of a street right-of-way or access easement.**
 - i. **Based on the information provided, irrigation distribution pipelines will need to be installed adjacent to the project along Shockley Road with a looped pipeline within the project itself. KID estimates approximately 12 service riser connections will be needed to service the project but actual service riser locations will be dependent upon town home layout.**
 - b. **Please note, there are existing irrigation pipelines within the project likely to be impacted due to grading and building/street layouts.**
 - i. **Applicant is responsible for the relocations and reinstallation of these pipelines per KID Standards and they must be located within a designated irrigation easement if located outside of the street ROW.**
 - c. **Upsizing of pipelines adjacent or within the subdivision. KID plans to upsize the pipeline to 16-inch adjacent to Shockley Road in coordination with the project. The increased costs due to this upsizing will be at the KID's option and expense.**
- 3) There is an existing KID Irrigation pond and pump station located within the pre plat boundaries. This pre-plat application proposal depicts the decommissioning and removal of KID's 159 Pond and Pump Station. This facility has historically provided irrigation service to this property and surrounding areas. KID is open to the decommissioning and removal of the pond provided adequate mitigation is agreed upon by KID and Applicant. **Decommissioning of this facility will be contingent upon approval of an agreed upon amount of mitigation. The decommissioning and removal of the facility will be \$95,580, a mutually agreed upon amount between KID and the Applicant.**
- 4) Design of the required irrigation system must be approved by KID prior to installation. The Applicant is required to submit an irrigation plan designed by a professional engineer for review and approval by the KID. The plan may be hand drawn or computer drafted. The plan shall be accurate and to a scale not to exceed one (1) inch = 50 feet. This is a vital step of the approval process. In addition to compliance with Condition 2 above, the Plan must ensure all reasonable measures are taken to protect any easements, right-of-ways, and facilities. Please contact me at 586-6012 for more information regarding this irrigation plan.
- 5) Completion of all the facilities, consistent with irrigation plan approved by KID, is required prior to KID signature on the Final Plat.

- a. In the event any KID facilities are damaged during construction, the damage must be fully repaired to KID's then-existing standards.
- b. For each phase of the plat, KID review and approval of construction and grading plans is required to allow KID to assure all reasonable measures to protect any easements and right-of-ways. Such review and approval will be coordinated as part of City review and the Final Plat approval process.
- c. The KID must inspect any new irrigation system installations or modifications. The Applicant shall contact the KID to arrange an inspection at least 48 hours in advance of the desired inspection date.
- d. As an alternative to immediate construction prior to approval of the Final Plat, the Applicant may choose to delay installation of the irrigation system by entering into a facilities installation agreement with the KID. The Applicant must still provide the KID with an irrigation system design that conforms to the most recent addition of the KID standard specifications. This irrigation system may be bonded and delayed up to five years. The facility installation agreement charge is \$350.00. The Applicant must establish an approved bonding mechanism with the KID in an amount approved by KID.

In addition, pursuant to RCW 58.17.310 (1), KID would like to inform the City of the following information regarding the proposed preliminary plat upon the structural integrity, including lateral support, of KID's facilities, other risk exposures, and the safety of the public and irrigation district, and conditions of approval that KID deems to be necessary as a result:

- 6) For each phase of the Project, KID/USBR review and approval of grading and construction plans is required to allow KID to assure all reasonable measures to protect any easements and ROWs. Such review and approval will be coordinated as part of the City's review and Final Plat approval process.
- 7) The Applicant shall include the potential failure of KID system components in its public offering statement for the plat pursuant to RCW 58.19.055(1)(r), which requires a public offering statement to include "[a] list of any physical hazards known to the developer which particularly affect the development or the immediate vicinity in which the developer is located and which are not readily ascertainable by the purchaser."
- 8) The Applicant shall post signs in appropriate areas with KID's easements and ROW's identifying KID's facilities (with locations and design approved by KID).
- 9) The Applicant shall provide fencing for the protection of KID facilities, which shall include but not be limited to adjacent KID/USBR ROW, with fencing locations and design approved by KID.

Finally, KID requests the following additional conditions of final plat approval:

- 10) Prior to approval of each phase, the current year's assessment must be paid. If the final plat is submitted for review after May 31st of a given year or submitted for review prior to May 31st but not submitted for final approval prior to June 15th, the next year's estimated assessment (125% of the current year's assessment) must be paid prior to plat approval.
- 11) Prior to approval of the first phase, the USBR construction loan for **all parcels** owned by the property owner within the boundaries of the KID must be paid and all other USBR requirements associated with this payout must be completed.
- 12) The Review and Inspection fees in place at the time of each review request must be paid. At the time of application the review fees are as follows:
 - a. A Preliminary Plat review fee of **\$825.00** which must be paid prior to scheduling for final plat approval at a KID Board meeting for the first phase.
 - b. For each Phase an inspection fee **\$350** for the first 20 lots/tracts plus \$25 per lot/tract after 20 lots/tracts.
 - c. Final Plat review fee for each phase of **\$225.00**.
- 13) Per KID Policy 4.17, "Irrigable Land Recalibration Principles," as land within the plat is subdivided or developed; KID will remove the irrigation water allocation from the impermeable surfaces, such as streets, from the plats.
- 14) In order to receive KID irrigation water delivery, a water master (or point of contact) for the subdivision must be appointed. This water master can be appointed by the Homeowners Association (or similar organization) officers, or must be elected from among the property owners within the boundary of this proposed subdivision. If no HOA (or similar organization) is organized, than an election method similar to the attached document is required.
- 15) Prior to approval of each phase, an electronic file (AutoCAD 2004 format) and hard copy (6-mil mylar, sealed by a professional engineer) of construction as-builts must be provided to KID.
- 16) All subdivisions of land are required to be approved by the KID Board of Directors during a KID Board Meeting. KID Board Meetings are regularly scheduled on the first and third Tuesdays of each month. All conditions must be completed prior to submittal to KID for final approval. The submittal for final approval must be received by KID a minimum of two weeks prior to a regularly scheduled Board Meeting in order to be considered at that meeting.

KID reserves the following rights regarding future review of the plat:

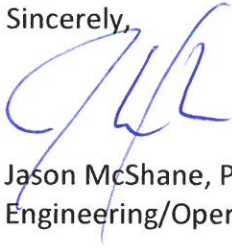
- 17) KID reserves the right to provide review comments under RCW 58.17.330(1) and RCW 58.17.330(2) in response to future design submittals by the Applicant prior to final plat

approval. The scope of these reviews will be limited to Phases that are adjacent to the District's Rights of Way. KID review of construction plans will be consistent with the City of Kennewick's plan review timelines.

- 18) KID reserves the right to review and comment on the Applicant's plat line revisions for potential additional revisions to protect KID system components for Phases that are adjacent to KID's easements or ROWs.
- 19) KID reserves the right to review and comment on the Applicant's covenants, conditions, and restrictions to evaluate whether they should include any terms regarding protection of KID system components after construction and fencing requirements.
- 20) KID reserves the right to submit additional comments during the City's review process under the State Environmental Policy Act (SEPA).

Please provide notice to KID of any Public meeting or hearing where this project will be an agenda item. If you have any questions regarding these comments, please contact me at the address/phone number listed below.

Sincerely,



Jason McShane, P.E.
Engineering/Operations Manager

Enc: Sample Water Master Information
C: LB\correspondence\File: [14-8-29]