SOUTHWEST BRANDON SECONDARY PLAN AREA TRAFFIC IMPACT STUDY

CITY OF BRANDON

FINAL REPORT | NOVEMBER 2022

City of BRANDON

MORR TRANSPORTATION CONSULTING

FINAL Report

Southwest Brandon Secondary Plan Area
Traffic Impact Study

Prepared by

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Winnipeg, Manitoba

Submitted to

The City of Brandon
Brandon, Manitoba

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EXECUTIVE SUMMARY

This Traffic Impact Study (TIS) was prepared in support of the Southwest Brandon Secondary Plan Area (SPA). The purpose of the TIS was to identify the transportation infrastructure required to allow the SPA to develop as a primary growth centre, while limiting impacts on nearby existing neighbourhoods and integrating into the external transportation network.

The TIS study area included the SPA and the Brookwood North neighbourhood, and a portion of the Parkland Heights neighbourhood, from Durum Drive south to the Bellafield neighbourhood.

The TIS considered transportation infrastructure needs through the following perspectives:

- Street and active transportation network connectivity and coverage
- Street classification
- Active transportation facility types and crossing control
- Traffic operations performance
- Safe systems principles and traffic calming
- Transit service
- Emergency services access

This resulted in a list of recommendations for the study area. For each recommendation, the condition that would make the recommendation required was identified, along with a forecast horizon year for when that condition would occur. Recommendations were also tested for robustness against potential alternate future scenarios. Conceptual design geometry sketches were produced for recommended intersection treatments, including roundabouts and signalized intersections. The sketches included geometry for active transportation facilities, and estimated property acquisition requirements.

A Safe Systems approach was integral to development of the recommendations. The approach was used to identify potential safety issues in the study area, including issues related to incompatibility between traffic flow and neighbourhood functions, issues around understandability, and issues around speed. This led to recommendations for traffic calming treatments including curb extensions, speed cushions, and raised crossings. Those treatments can help to control vehicle speeds and make collector street environments more inviting to people on foot, cycling, or using transit.

1 INTRODUCTION

The Southwest Brandon Secondary Plan Area (SPA) is intended to be a primary growth centre. The SPA will have a greater chance to be successful if the transportation system supports—rather than hinders—growth and development. Building too much transportation capacity is a misuse of resources that can lead to liveability and safety issues, while too little capacity would constrain development and could generate delay and a different slate of safety issues in the long term. Traffic Impact Studies (TIS) have been completed for specific neighbourhoods within the SPA over time; however, this TIS was requested by the City of Brandon to bring all the pieces together and provide a holistic assessment of full development of the entire growth area and group needs in five-year increments.

As of October 2022, the City administration had recommended the SPA be expanded to include recently annexed lands south of Patricia Avenue and west of 18th Street. Figure 1 shows the original SPA from 2014, and the updated boundary. Note that as of October 2022 the boundary change had not yet been approved by City Council.

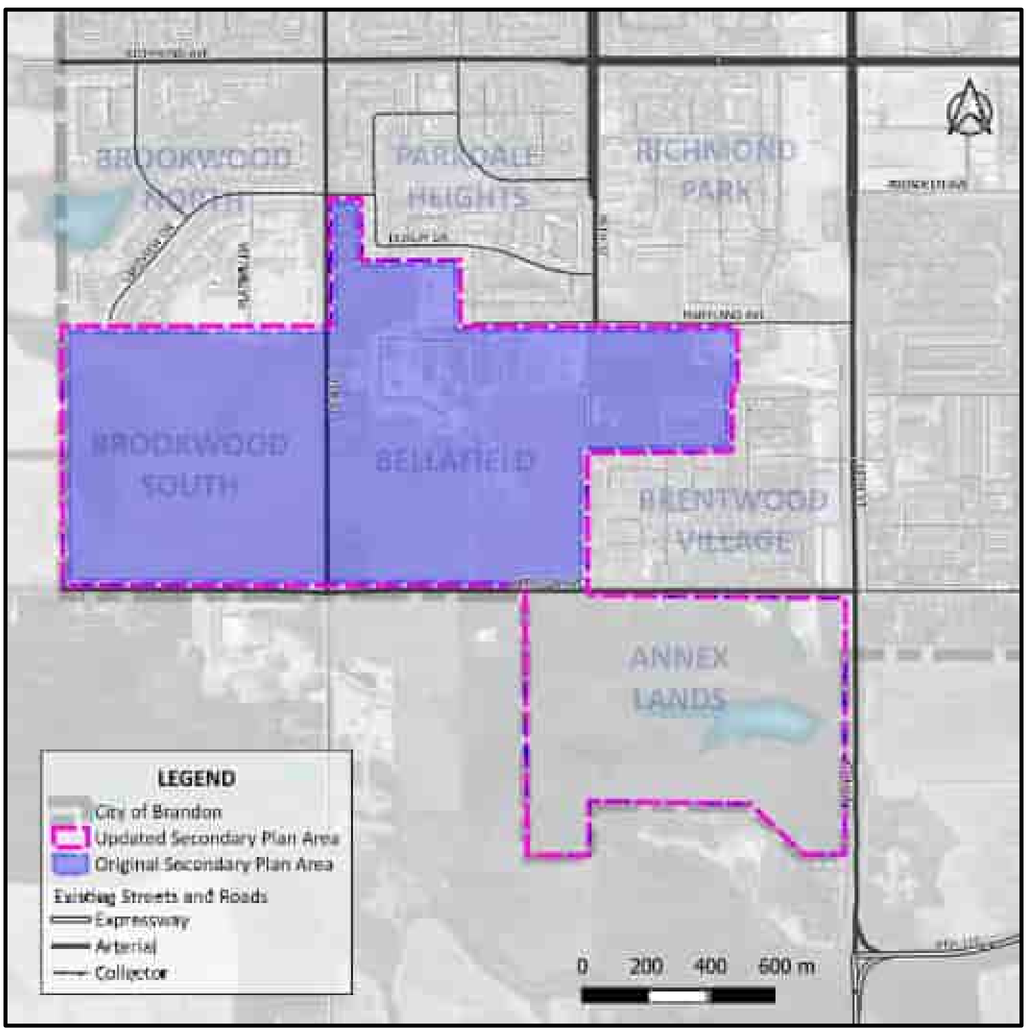


FIGURE 1: SECONDARY PLAN AREA

1.1 Purpose and Scope

The purpose of the TIS was to identify the transportation infrastructure required to allow the SPA to develop as a primary growth centre. The TIS also considered how development traffic could impact nearby neighbourhoods, how SPA development could integrate into the wider area, and how traffic concerns from nearby neighbourhoods (see the end of Section 2.3) could impact the planning of the SPA. As such, the study area included the SPA and adjacent lands, including Brookwood North and Parkdale Heights from Bellafield to Durum Drive. The study focused on arterial road and collector street segments and intersections.

The TIS study area is shown on Figure 2. The figure shows proposed collector street alignments originally from the Secondary Plan, and updated based on more recent development plans. The figure also shows the study intersections, which were subject to detailed review and analysis.

FIGURE 2: TIS STUDY AREA

The study intersections included:

- Richmond Avenue at Brookwood Drive
- Richmond Avenue at 34th Street
- 34th Street at Lakeview Drive/Aberdeen Avenue
- 34th Street at Patricia Avenue
- Patricia Avenue at 18th Street
- 26th Street at Maryland Avenue
- 26th Street at Durum Drive/Hummingbird Lane
- South extension of Lakeview Drive at a new east-west collector street north of Patricia Avenue
- New east-west collector street at 34th Street
- New east-west collector street at a south extension of 26th Street
- South extension of Lakeview Drive at Patricia Avenue
- South extension of 26th Street at Patricia Avenue
- Patricia Avenue at Brentwood Trace (west intersection)
- Patricia Avenue at a new commercial access west of 18th Street
- 18th Street at a new commercial access south of Patricia Avenue

The study considered full build out conditions at a 2052 horizon, as well as interim conditions in 5-year intervals between 2022 and 2052.

Analyses and reviews included consideration of the street and active transportation (AT) networks at a segment or "link" level, detailed assessments of intersection performance, and sensitivity analyses. Link-level reviews included:

- **Network Structure Review** to assess street and path network connectivity and coverage, including connections to developed and undeveloped external areas.
- **Safe Systems Review** to identify any potential safety issues arising from how the street and AT networks are structured. This included consideration for the functions served by each street—with identification of any incompatible mix of functions—and identification of potential need for traffic calming, along with potential treatments to address those needs.
- **Transit Review** to identify potential routing for future transit service, and potential stop locations.
- **Emergency Access, Truck Route, and Constructability Review** to review requirements for emergency vehicle access, truck routes, and construction routes, and to recommend any changes to the street networks to provide the required level of access. This also included consideration for temporary construction accesses.

Detailed intersection performance analyses included:

- **Traffic Operations Analyses** to identify traffic operations performance in terms of delay, level of service, volume to capacity, and queue lengths. This was used to identify requirements for intersection traffic control and lane configurations.
- **Traffic Signal Warrant Analyses** to identify intersections where conflicting traffic volumes are too high to be adequately serviced by stop control, and traffic signal or roundabout control would be required.
- **Pedestrian Crossing Control Analyses** to identify requirements for pedestrian crossing control devices where paths met streets at mid-block.

Sensitivity analyses included consideration for:

- Impacts of changing the location of a proposed Brandon School Division school between one of two potential locations.
- Need for treatments at the interim horizon years. This allowed the study team to identify the level of development that would trigger the need for any recommended treatments.
- Funding considerations, including the extent to which recommended treatments address issues related to development, background issues, or a combination of the two.
- Treatment robustness against changes in traffic volumes representing different levels of development, including a scenario representing development at the higher end of potential demand forecast by the City of Brandon.

In addition to the reviews and analyses noted above, the study team conducted a site visit in July 2022. Findings from the site visit—including notes about signage—are presented where relevant, particularly in Sections 2.3.

The analyses and reviews allowed the study team to identify required transportation infrastructure at the ultimate 2052 horizon and at the interim horizons. Recommended treatments were developed to concept design level of detail, outlining street centrelines and edges of pavement, sidewalk and path edges, and high-level right of way requirements.

1.2 Report Outline

The remainder of the report includes the following sections:

- **Context** outlines elements of the study area, transportation network, and policy environment that influence considerations around transportation infrastructure.
- **Travel Demand** presents data, calculations, and assumptions used to quantify travel demand in the study area.
- **Functional Requirements** details the results of the analyses and reviews conducted to identify required treatments at intersections and crossings, and on street segments in the study area. This

section also outlined findings from sensitivity analyses to test the robustness of the recommended treatments to different traffic conditions.

- Concept Design presents concept design geometry for the functional requirements, along with info on whether background conditions or development growth is the main driver for each treatment.
- Conclusions and Recommendations summarizes the study findings and recommendations.

2 CONTEXT

2.1 Location

The Southwest Brandon Secondary Plan Area (SPA) includes undeveloped areas south of Richmond Avenue, west of 18th Street, and north and east of the City of Brandon boundary. Note that after the Secondary Plan document was approved by City Council, the City of Brandon annexed lands south of Patricia Avenue and west of 18th Street. The City of Brandon thus advised MORR to consider those lands as part of the SPA for the purposes of the TIS.

Figure 3 shows the SPA relative to the rest of Brandon.

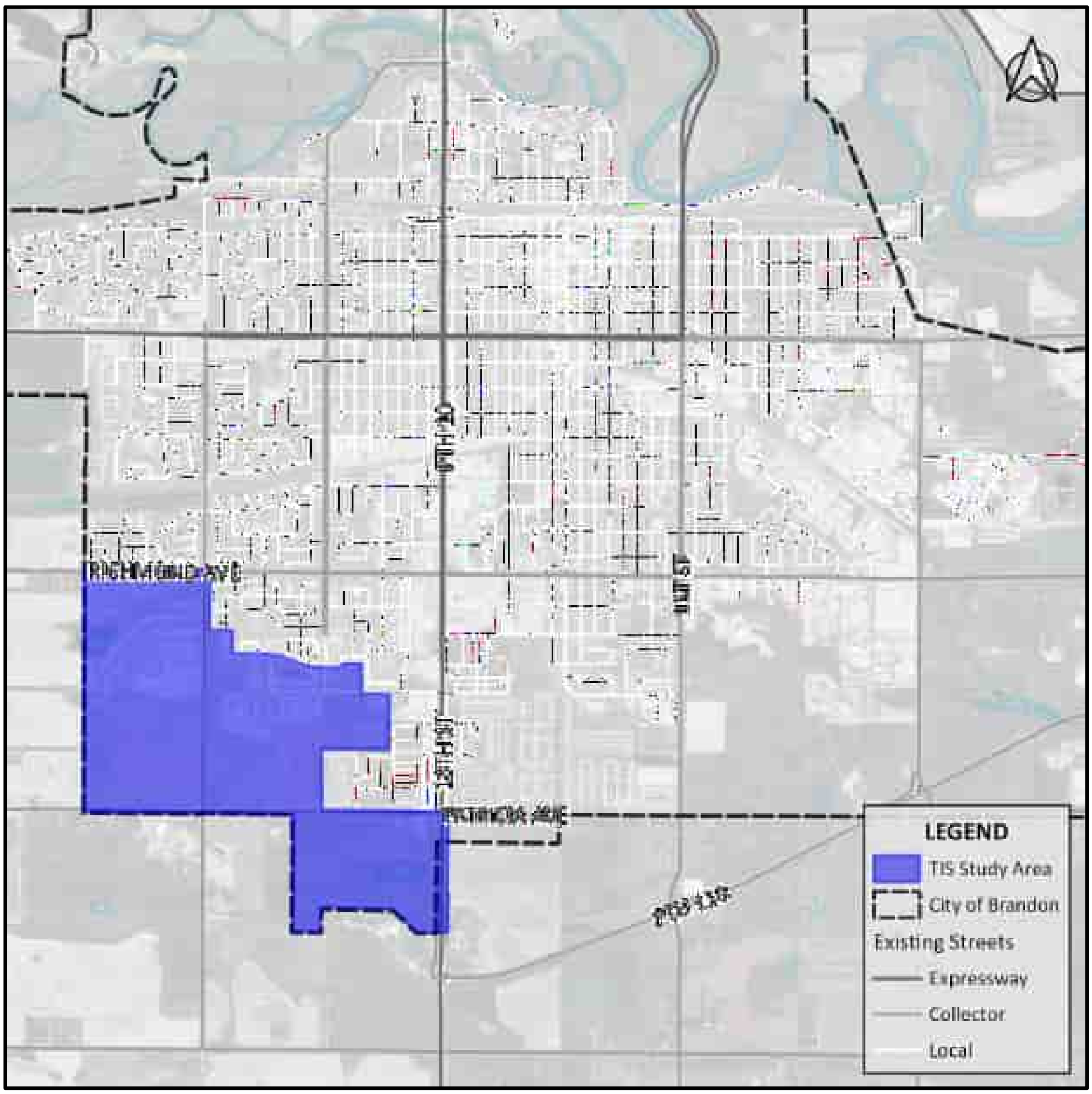


FIGURE 3: REGIONAL CONTEXT

As of September 2022, land use within the SPA were largely agricultural, with some new residential development east of 34th Street, near Maryland Avenue. The SPA also includes a school, Christian Heritage School, south of Maryland Avenue and east of 26th Street.

Most development adjacent to the SPA was low density residential, with highway commercial east of the SPA along 18th Street and big box commercial northeast of the SPA along Richmond Avenue and 18th Street. Linden Lanes School and Meadows School are located near the SPA, to the northeast.

2.2 Development Parameters

The City of Brandon provided estimates on the land uses that would be developed in the SPA, in both a base case—representing the City's assessment of likely development—and a "maximum case" representing the City's assessment of the maximum development potential. Table 1 shows the land use types and quantities for each scenario.

TABLE 1: SPA DEVELOPMENT PARAMETERS

Type	Base Case Development Quantity	Maximum Development Quantity
Single Family Detached Homes	1,083 du	1,123 du
Semi-Detached Units/Townhouses	596 du	618 du
Apartments	1,562 du	1,619 du
Brandon School District School	250 students	250 students
Division Scolaire Franco-Manitobaine School	250 students 60 childcare	250 students 60 childcare
Neighbourhood Commercial	38,000 ft^2	41,000 ft^2
Big Box Commercial	640,000 ft^2	699,000 ft^2

du: Dwelling Units

In the maximum development scenario, the residential uses are developed with 4% more units than the base scenario, and the commercial uses are developed with 9% more units than the base scenario.

Note that in this TIS, school traffic was considered as it pertained to operations at the study intersections. The TIS assumed that school site planning would include appropriate provisions for drop-off and pick-up to avoid creating issues on adjacent streets. Future increases in student counts would likely have a greater impact on operations internal to the school sites than on nearby intersection performance.

Vehicular access to the development in the SPA is to be provided via the collector streets shown on Figure 2, with intersections on 34th Street, 18th Street, and Patricia Avenue, and extensions of Lakeview Drive and 26th Street. Active transportation connections are shown in Section 2.4.3.

2.3 Policy Context

The following points outline the policy documents and other references relevant to the project. For each policy or reference, specific policies or directions relative to the TIS are listed, as well as takeaways on how the policies may apply to the TIS:

- The ***Southwest Brandon Secondary Plan*** was approved by Brandon City Council in 2014. The *Plan* sets the bounds of the SPA, overarching objectives for the area, and specific policies dictating how the area should develop. Relevant objectives and include:
    - Creation of a multi-modal transportation system that allows for safe and efficient travel by means of walking, cycling, transit, and personal vehicle use.
    - Cost-effective provision of transportation infrastructure

  Specific policies relevant to the TIS include:
    - The street network shall generally adhere to the street network shown on Figure 12 (Policy 4.1.1). The street network should allow for convenient vehicle circulation without compromising the safety and attractiveness of the pedestrian environment (Policy 4.4.3).
    - Transport network development should align with the Access Management, Traffic Calming, and Smart Growth principles contained in the *Brandon Area Road Network Development Plan* (Policy 4.1.2).
    - The transport network within the SPA should be integrated with the broader City transport network, including connections to future development areas beyond the SPA (Policy 4.1.3).
    - Collector streets may include wider boulevards on one side to accommodate a multi-use trail (Policy 4.2.4). On streets with multi-use trails, properties fronting the street on the side with the trail should have driveways from the side or the rear of the property, to avoid creating conflict points on the multi-use trail (Policy 4.2.5).
    - Transit routes should be located along arterial or collector streets (Policy 4.3.1). Transit stops should be located within 400 m of key destinations including higher density residential and mixed-use areas, and non-residential uses like commercial or community greenspace areas (Policy 4.3.2). A transit stop should be provided directly in front of a new school in the SPA (Policy 4.3.3).
    - Driveways are not permitted on arterial streets, except for driveways to mixed-use areas (Policy 4.4.6). Collector streets should also have minimal driveway connections (Policy 4.4.7).
    - Traffic calming treatments can be considered on streets of all classifications (Policy 4.4.9). Traffic calming is a higher priority on collector streets and local streets.

The *Secondary Plan* also includes typical cross-sections for arterial, collector, and local streets. However, the study team understood that the cross-sections are currently under review as part of the ongoing *Municipal Servicing Standards* project. The study team thus identified functional requirements for different street types (see Section 4) but did not comment on overall right-of-way widths, at the direction of the City of Brandon. City of Brandon staff indicated that they would be responsible for integrating the findings from the TIS with the outcomes from the *Municipal Servicing Standards*. Other policies were considered in the identification of functional requirements (see Section 4) and the concept design (see Section 5).

As of October 2022, the *Secondary Plan* was being revised to include the annex lands south of Patricia Avenue and west of 18th Street, as shown on Figure 1.

- The ***Brandon Area Road Network Development Plan*** (BARNDP, 2007) developed a prioritized infrastructure investment plan for highways, roads, and streets within Brandon and the surrounding area. The BARNDP included a review of current conditions, a public consultation program, development and employment of a traffic forecasting model, an origin-destination study, and identification of general strategies and specific infrastructure needs at the link level (for example, twinning 18th Street from PTH 110 to Maryland Avenue). The *Plan* also included a Traffic Impact Study Policy that remained in effect as of October 2022.

  Discussion of general strategies in the BARNDP includes:

  - Discussion on types of traffic calming treatments, with pros and cons for each and example warrant thresholds from other jurisdictions.
  - Outline of access management goals (generally reducing access points on arterial streets and roads) and specific techniques (development of frontage roads, shared access, etc.) to achieve those goals.
  - Principles of Smart Growth as defined by the United States Environmental Protection Agency (EPA). With respect to transportation, the principles largely have to do with providing good alternatives to walking, in large part via reducing the distances between origins and destinations by mixing land uses.
  - Comparison of alternative funding options, including impact assessments, incremental tax financing, user fees, and public-private partnerships.

  The study team considered the general directions from the BARNDP in the identification of functional requirements (see Section 4) and the concept designs (see Section 5). However, traffic calming considerations were based largely on more up to date references like the Transportation Association of Canada (TAC) *Canadian Guide to Traffic Calming*, from 2018.

  In 2017, the BARNDP was updated to include analysis on the need for a potential extension of Maryland Avenue from Marquis Drive to 34th Street. The analysis found that there was no need for that extension for system capacity reasons, although the extension could be considered network connectivity and development access. Considerations for the extension are discussed in Section 4.9.3 of this TIS.

- The ***Brandon and Area Planning District Development Plan*** (2013) laid out planning directives for the now-defunct Brandon and Area Planning District. The *Development Plan* included policies for the transportation system, aligned to objectives around energy efficient transport, a logical street hierarchy, access management, and safe movement of dangerous goods.

  The transportation policies in the *Development Plan* are largely present in the *Secondary Plan*, and do not impose any new requirements on this TIS.

- The ***Brandon and Area Planning District Fringe Area Growth Strategy*** (2012) set out policies specific to the areas near the limits of the City of Brandon. The *Fringe Area Growth Strategy* considered where Brandon's boundaries should expand to accommodate future growth, sustainable development patterns, and the costs related to those developments. Policies relevant to transportation are largely taken from the *Development Plan*, with emphasis on locating higher-density development near transit stops. Those policies were already considered in the *Development Plan* and the *Secondary Plan,* and thus they did not impose any new requirements on this TIS.

  The *Fringe Area Growth Strategy* also includes population growth forecasts and estimates of land required to accommodate that growth. Those forecasts were an input to the City's work that determined the development parameters in Table 1.

- The ***City of Brandon Development Charge Background Study*** (2017) considered different means for the City of Brandon to recover costs associated with expanding City infrastructure to accommodate growth. The study included recommendations for development charges and policies. The study included a list of transportation projects eligible for development charge funding, with estimated costs for each project.

  Projects relevant to this TIS include:

  - Twinning Richmond Avenue between 26th Street and 34th Street
  - Constructing an extension of Maryland Avenue from 26th Street to 34th Street
    - This has since been revised to extend from 26th Street to Marquis Crescent
  - Upgrading 34th Street from Park Avenue (north of Richmond Avenue) to Patricia Avenue
  - Developing Patricia Avenue as a two-lane undivided urban arterial street from 1st Street (east of 18th Street) to 38th Street (west of 34th Street).
  - Upgrading 18th Street to an arterial street standard from Richmond Avenue to south of Patricia Avenue.
    - This has since been revised to begin at Maryland Avenue—rather than Richmond Avenue—and proceed south to Patricia Avenue.

  - Roundabouts at 34th Street and Maryland Avenue (since removed from the plan), 26th Street and Maryland Avenue, 34th Street and Patricia Avenue, and Patricia Avenue and 18th Street.
    - This has since been revised to include a roundabout at 34th Street and the Brookwood/Bellafield Collector street, and a roundabout or traffic signals at 34th Street and Aberdeen Avenue.

  As of October 2022, the Development Charge By-law and rates were under review and subject to Council approval.

- The ***Brandon City Plan*** process was ongoing as of October 2022, with the first phase of community engagement completed in May 2022. Work to date on the *City Plan* identified three focus areas, including "Brandon as a Moving City", emphasizing a proactive, preventative approach to traffic safety. Feedback from community group meetings indicated that there was concern around poor public transit service and limited transportation options. Those findings accord well with the priorities for transportation options and transit-oriented development (in the sense of locating higher density development near transit service) in the *Secondary Plan* and the *City of Brandon Development Charge Background Study.*

- The ***Traffic Signal Coordination Study in the City of Brandon*** (2015) involved development of a traffic analysis model to identify modifications to traffic signal timing, to provide safer and more efficient traffic operations, with an emphasis on overall system performance, rather than focusing on isolated intersections. The study considered all of the 57 signalized intersections in the City of Brandon as of 2015. There are no signalized intersections in the TIS study area, although the *Traffic Signal Coordination Study* found that the intersection of 18th Street and Patricia Avenue could require traffic signals in the future. The study team considered signals as a possible modification to that intersection, in the identification of functional requirements in Section 4.

- Traffic Impact Studies (TIS) for the ***Bellafield*** (2015) and ***Brookwood South*** (2015) neighbourhoods, which encompass most of the SPA. The TISs considered intersections on Richmond Avenue, Maryland Avenue, Patricia Avenue, 34th Street, 26th Street, and 18th Street. The TISs included development traffic forecasts based on proposed unit counts, existing traffic counts, and intersection performance analysis. The performance analyses found that existing intersection configurations were generally sufficient to accommodate the new traffic from the developments, although several intersections (Richmond Avenue and 18th Street, 34th Street and Aberdeen Avenue) were forecast to be at or nearing capacity once the developments were fully built out.

  The study team used the trip generation forecasts and performance analysis findings from the TISs as a reference and comparison for this TIS.

- A Traffic Impact Study for the development of the ***Annex Lands,*** west of 18th Street and south of Patricia Avenue. Like the other TISs, the study included forecasts of development traffic and performance analysis. As of October 2022 the study was in draft form, and its conclusions were not available to the study. However, the study team was provided with information regarding trip generation, internal capture, and pass-by trip rates. That data is noted in Section 3.3.

- A ***Traffic Analysis and Geometric Review*** for the intersection of 26th Street and Maryland Avenue (2021). The review used traffic counts from 2021 and development traffic forecasts from the *Bellafield* TIS, and conducted analyses of intersection performance with various intersection configurations. The analysis found that the intersection should have a four-way stop controlled configuration with single lane approaches except for the northbound approach, which should also include a right-turn lane. The geometric review considered various options for developing the intersection geometry.

  The study team used the *Analysis and Review* results as a check on findings from this TIS.

In addition to the policy documents and studies listed above, the study team reviewed Brandon City Council minutes and found that there were concerns from the community regarding traffic speeds on Durum Drive, just north of the TIS study area. The minutes indicated that the City of Brandon was conducting a trial of a 40 km/h speed limit through 2022. City of Brandon staff indicated that the wide pavement on Durum Drive (approximately 12 m wide) and alignment as a connection from Lakeview Drive to Maryland Drive made Durum Drive an effective short-cut route. The study team considered those factors in the review of the collector street network, detailed in Section 4.

2.4 Transportation Infrastructure

This section outlines the study team's understanding of the study area arterial roads and collector streets, truck route designations, active transportation infrastructure, and transit infrastructure and service. This section includes discussion on both existing infrastructure and planned future infrastructure.

2.4.1 Roads and Streets

Table 2 shows the characteristics of existing arterial roads in the study area.

TABLE 2: ARTERIAL ROAD CHARACTERISTICS

Name	Posted Speed Limit in Study Area	Cross-Section in Study Area	Road Surface Type
34th Street	60 km/h	Rural two-Lane Undivided	Pavement
26th Street	50 km/h	Rural two-Lane Undivided	Pavement North of Maryland Avenue, Aggregate South of Maryland Avenue
18th Street	80 km/h	Rural two-Lane Undivided	Pavement
Richmond Avenue	60 km/h	Rural two-Lane Undivided	Pavement
Patricia Avenue	50 km/h (18th Street to Brentwood Trace), 60 km/h (Brentwood Trace to 34th Street), 90 km/h (west of 34th Street)	Rural two-Lane Undivided	Pavement from Brentwood Trace to 18th Street, Aggregate west of Brentwood Trace

34th Street, 26th Street, and 18th Street are arterial roads on north-south alignments, at 800 m spacing. 18th Street has the longest extent, continuing south of Brandon as Provincial Trunk Highway (PTH) 10, and north of the Assiniboine River to PTH 1. The other streets extend for approximately 2.7 km north of the study area. Richmond Avenue and Patricia Avenue run on east-west alignments at 1.6 km spacing. Both streets continue west of Brandon and continue east to PTH 110. The arterial roads are all paved in the study area, except for Patricia Avenue west of Brentwood Trace to the west limit of the study area, and 26th Street south of Maryland Avenue. All the arterial roads have straight alignments with no curves in the study area; however, 26th Street has a staggered alignment at Maryland Avenue, with the segment south of Maryland Avenue offset approximately 25 m to the west of the segment north of Maryland Avenue. The southerly section of 26th provides access to Christian Heritage School and continues further south to an informal connection to the Brentwood Village neighbourhood. The conceptual collector street network from the Secondary Plan includes a realignment of 26th street to remove the staggered intersections on Maryland Avenue and to formalize the connection to Brentwood Village.

In the study area each of the roads has a rural, two-lane undivided cross-section, with adjacent lands backing on to the roads, with the except of some low-density residential uses fronting on the east side of 34th Street south of Aberdeen Avenue and on the east side of 26th Street north of Durum Drive. In those areas the fronting properties have direct access, but in the rest of the study area access is limited to street intersections typically spaced at least 400 m apart, but spaced as close as 30 m apart, on Patricia Avenue between 18th Street and Currie Boulevard. The rural cross-sections include minimal shoulders (except for paved shoulders on 18th Street) and thus there is little ability to park along any of these roads. However, parking restrictions are present on the approaches to the roundabout at 34th Street and Richmond Avenue, at the pedestrian crossings at 34th Street and Aberdeen Avenue, and on the segment of 26th Street with fronting residential lands, near Durum Drive.

The combination of straight alignments, limited interaction with adjacent land use, and limited intersections allow those roads to provide a significant mobility function. However, those factors may also allow comfortable travel at speeds above the posted speed limits, except on Patricia Avenue where the aggregate surface condition can help to limit vehicle speeds. Issues around speed are discussed in more detail in Section 4.3.

Table 3 shows the characteristics of the existing collector streets in the study area.

TABLE 3: COLLECTOR STREET CHARACTERISTICS

Name	Posted Speed Limit in Study Area	Cross-Section in Study Area	Road Surface Type
Brookwood Drive	50 km/h	Urban two-lane undivided	Paved
Lakeview Drive	50 km/h	Urban two-lane + parking lanes, divided	Paved
Aberdeen Avenue	50 km/h	Urban two-lane undivided (with space for future four-lane section)	Paved
Durum Drive	40 km/h (temporary 2022 trial)	Urban two-lane undivided	Paved
Maryland Avenue	50 km/h	Rural two-lane undivided	Paved

Brookwood Drive and Lakeview Drive are the main collector streets in the Brookwood North neighbourhood. Their alignments include curves and straight segments, such that continuous straight segments are limited to approximately 300 m long. Adjacent lands are developed with (mostly) fronting low-density residential uses with direct access and sidewalks on both sides, except for the west side of Brookwood Drive in a short section along a retention pond. Street intersections are provided at spacing ranging from 70 m to 210 m. Parking is permitted on both sides of both streets.

Aberdeen Avenue and Durum Drive are collector streets in the Parkdale Heights neighbourhood. Aberdeen Avenue serves to connect Durum Drive to 34th Street, with a short extent of only 150 m between 34th Street and a “T” intersection at Durum Drive. The right-of-way allows for a four-lane cross-section, but as of October 2022 the street was constructed with a two-lane cross-section, but with extra pavement at the intersection with Durum Drive. That intersection is discussed in more detail in Sections 4.3 and 5. Durum Drive has a wide (approximately 12 m) pavement and a gently curving alignment, with parking permitted on both sides of the street. Adjacent lands are developed with fronting low-density residential uses, with direct access and sidewalks on one side. Street intersections are provided at spacing ranging from 40 m to 240 m. There is a park along one segment of Durum Drive, and in that segment, there is a speed reader sign.

The collector streets noted above all have fronting residential land uses, direct access, and sidewalks. Those factors mean that the streets are well integrated with the adjacent land use, and thus the access function of the streets is important. That can create an imperative to limit vehicle speeds. That is discussed in more detail in Section 4.3.

Unlike those streets, Maryland Avenue is much less integrated with its adjacent lands, which are undeveloped, backing onto the street, or developed with commercial uses with large setbacks. Maryland Avenue also has a completely straight alignment and a nearly 800 m long segment with no traffic control, and a rural cross-section. Those factors make Maryland Avenue feel more like the arterial roads in the study area than a collector street. City of Brandon staff indicated that the City has received complaints about vehicle speed on Maryland Avenue. The City has attempted to address those issues by adding a “BEGINS” tab to the 50 km/h speed limit sign at the start of that segment, just west of 18th Street. Section 4.3 includes discussion on speeds on Maryland Avenue.

Planned Future Infrastructure

Per the City’s *Development Charge Background Study* (see Section 2.3), the study team was aware of several road improvements planned for the study area, including:

- Twinning Richmond Avenue between 26th Street and 34th Street
- Upgrading 34th Street from Park Avenue (north of Richmond Avenue) to Patricia Avenue
- Developing Patricia Avenue as a two-lane undivided urban arterial street from 1st Street (east of 18th Street) to 38th Street (west of 34th Street).
- Upgrading 18th Street to an arterial street standard from Maryland Avenue to south of Patricia Avenue.
- Roundabouts at 26th Street and Maryland Avenue, 34th Street and Patricia Avenue, 34th Street at a new collector street in Brookwood South and Bellafield, and Patricia Avenue and 18th Street. 34th Street at Aberdeen Avenue is identified for either a roundabout or a signalized intersection.

The study team considered the need for those changes in the analyses and reviews in Section 4.

The study team was aware that MTI has plans to extend PTH 110 from PTH 10 (18th Street) to the west, with a connection to PTH 1 west of Brandon. The study team and the City of Brandon were not aware of a timeline for that extension. Further, the extension would be unlikely to affect traffic volumes in the study area, unless 34th Street was connected to the extension. The study team and City of Brandon staff agreed that it would not be productive to attempt to estimate traffic volumes for a future scenario with those changes in place. Instead, in Section 4.9 the study team provided comment on future traffic capacity to serve additional traffic at 34th Street and Patricia Avenue.

2.4.2 Truck Routes

Brandon Traffic By-law 5463 defines the truck route network. 18th Street is the only designated truck route in the study area. City of Brandon staff noted that 34th Street and Patricia Avenue could be designated truck routes in the future, to serve industrial development on 34th Street south of Patricia Avenue.

2.4.3 Active Transportation

As noted in Section 2.4.1, collector streets in Brookwood North and Parkdale Heights include sidewalks on at least one side. The sidewalk network in Brookwood North extends south to the end of Lakeview Drive (north edge of Brookwood South), and the sidewalk network in Parkdale Heights extends south of Maryland Avenue. Controlled pedestrian crossing are provided on Richmond Avenue at Brookwood Drive, and on 34th Street at Aberdeen Avenue.

Cycling infrastructure includes multi-use paths along Richmond Avenue, 34th Street, Maryland Avenue, and 26th Street, as well as paths along retention ponds in Brookwood North, paths in Parkdale Community Park, and a north-south path west of Derlago Drive in the developing Bellafield neighbourhood. The paths along 34th Street, Richmond Avenue, and 26th Street are part of the Brandon City Loop cycle route, which provides continuous connections around the City.

Planned Future Infrastructure

The Secondary Plan and conceptual neighbourhood plans include extensive AT path networks in Brookwood South, Bellafield, and the Annex Lands.

Figure 4 illustrates the existing and proposed active transportation infrastructure in the study area.

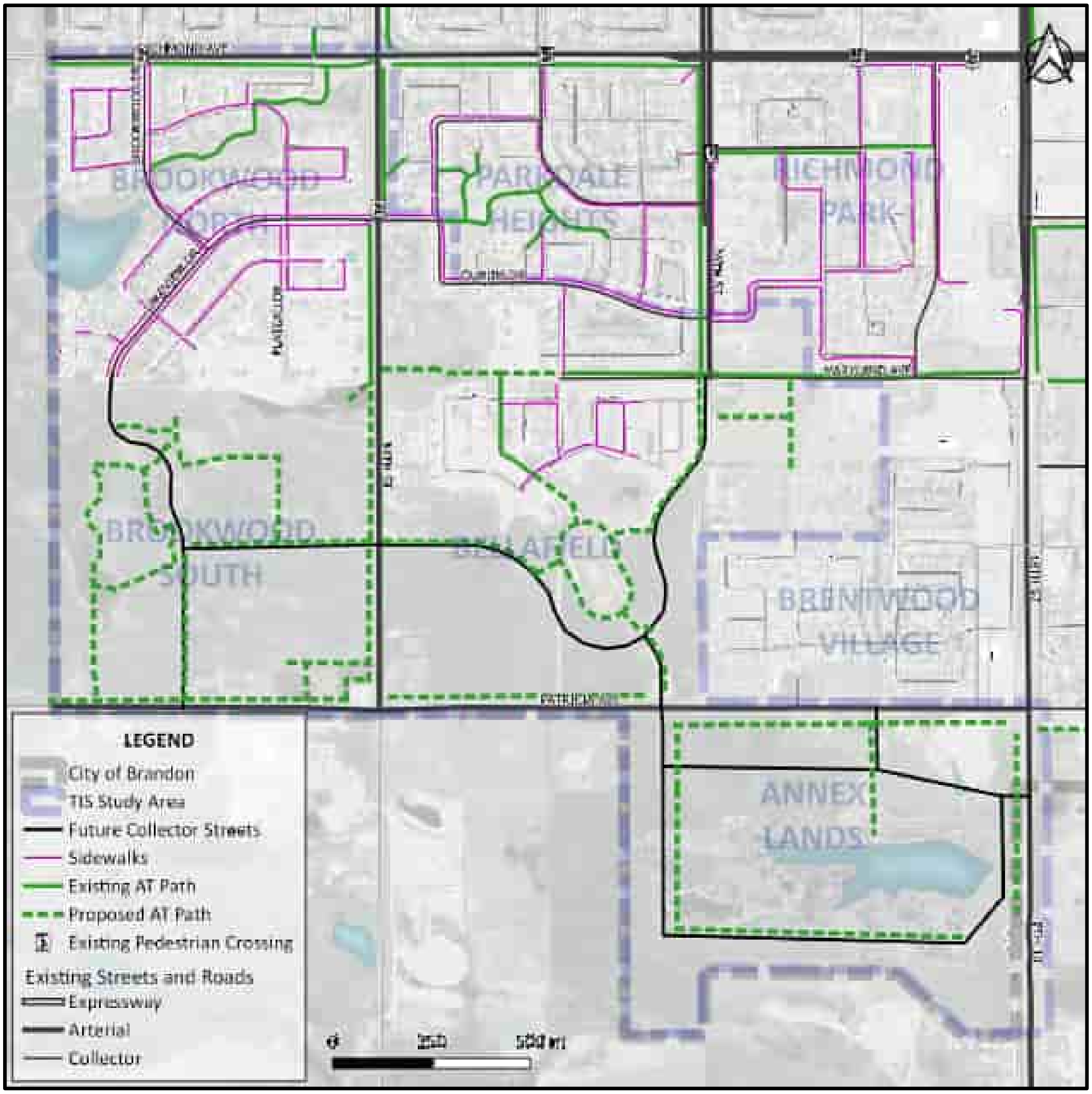


FIGURE 4: ACTIVE TRANSPORTATION NETWORK

As part of this TIS the study team reviewed the proposed AT path network and provided recommendations on the sidewalk network. Section 4.2 outlines the review and recommendations.

2.4.4 Transit

Existing transit service in the study area is limited to the #8 Maryland West Route, the #14 Victoria West Route, and the #17 South Central Route. All routes run north-south with service to Downtown.

The #8 route provides service along 26th Street and Maryland Avenue at the northeast limit of the study area, providing service to Brandon Shopper's Mall and Downtown Brandon. The #14 route provides service along 34th Street to the Westview neighbourhood, north of Brookwood North. #17 route provides service along 18th Street and Currie Boulevard, with connections to neighbourhoods east of 18th Street, and to Downtown Brandon.

Planned Future Service and Infrastructure

The study team was not aware of any planned future transit service. The study team reviewed potential future transit routing and stop locations in the study area. See Section 4.4.

2.5 Nearby Developments

The study team was aware of three nearby developments relevant to the TIS:

- A commercial development at 2222 Currie Boulevard including a 37,000 ft^2 building intended for development as a restaurant and department store based on the highest density within the zoning. As of 2022, a car dealership was being constructed on the site.
- The largely residential development proposed in the Southeast Brandon Secondary Plan Area.
- A recently completed hockey arena and school located on the south side of Patricia Avenue, west of 34th Street.

Figure 5 shows the nearby developments in relation to the study area.

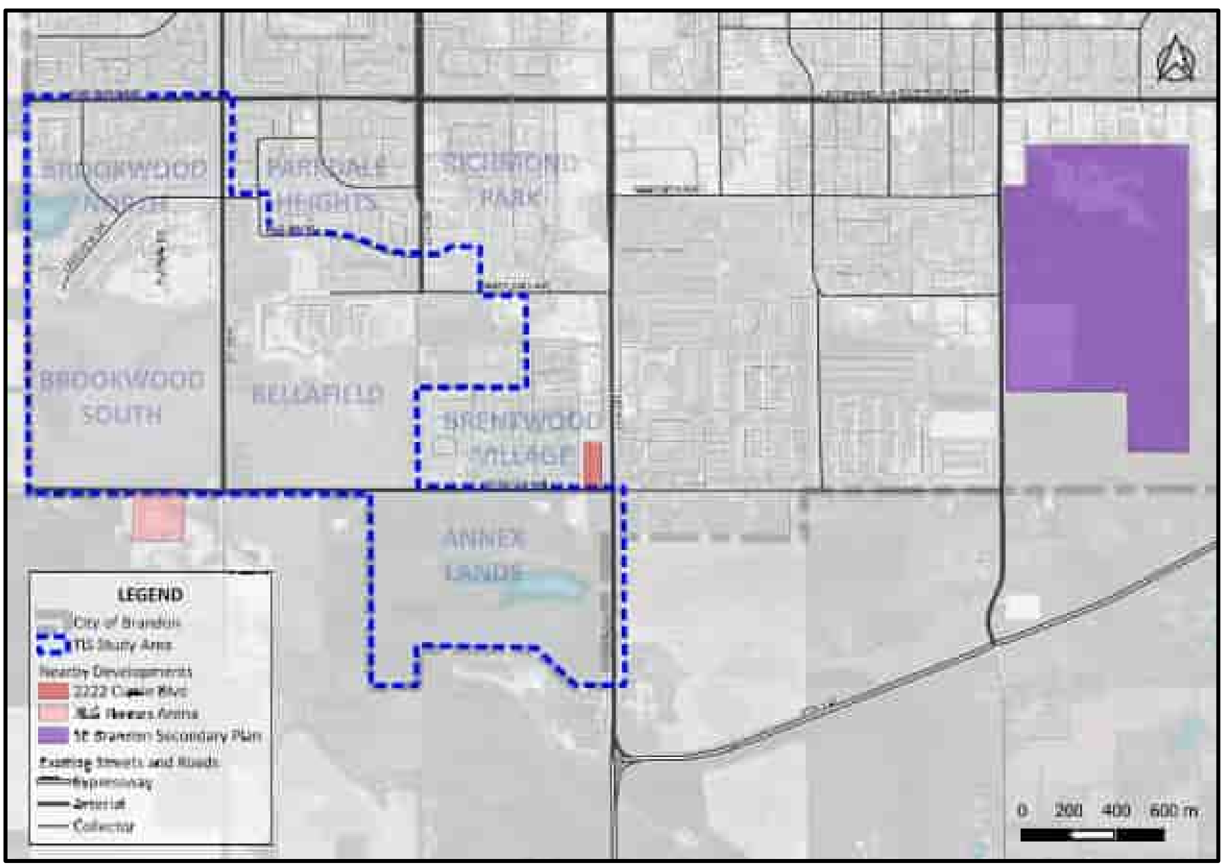


FIGURE 5: NEARBY DEVELOPMENTS

The TIS for the Southeast Brandon Secondary Plan Area considered trips between the Southeast Secondary Plan Area and commercial development on the Annex Lands. In this study those trips were considered as part of the trips heading east on Patricia Avenue to/from the Annex Lands.

Trips generated by development at 2222 Currie Boulevard were taken from a TIS completed by WSP and provided to the study team by the City of Brandon. Those trips are noted in Section 3.2.

The hockey arena and school opened in late 2021, and thus its traffic affects may be seen in counts conducted in 2022. However, traffic from that development will not be included in older traffic counts. As such, the hockey arena and school were considered in the processing of adjusting historical traffic counts to 2022 levels, detailed in Section 3.1.

City of Brandon staff noted that development further west and south of the study area was unlikely to proceed within the 30-year time horizon considered in this TIS. As such, development of those lands was not considered in the TIS.

2.6 Analysis Scenarios

Analyses focused on 2022 existing conditions to provide an understanding of existing conditions, and on 2052 post-development conditions to identify long-term infrastructure needs. The sensitivity analyses in Section 4.9 also considered interim scenarios in 2027, 2032, 2037, 2042, and 2047 horizons with partial build out in the study area. The study team considered that development in the SPA would account for essentially all growth in traffic volumes and travel demand in the study area, with little growth in background demand merely passing through the study area. As such, there was not a need to consider background conditions at the interim horizons.

For each scenario, analyses primarily considered conditions during the weekday AM peak hour and during the weekday PM peak hour. Some analyses also considered conditions during the peak six hours of a typical weekday (two hours in the morning, two hours at mid-day, two hours in the afternoon) or average daily traffic volumes. Evening and weekend conditions were not considered.

3 TRAVEL DEMAND

The study team quantified travel demand in the study area, with demand considered in four categories:

1. Existing "background" travel demand, as quantified by traffic counts
2. Future background travel demand growth, independent of development in the SPA
3. Future travel demand growth due to development in the SPA
4. Total future "post-development" travel demand, including future growth due to development in the SPA and other development independent of the SPA

Demand was quantified at each of the study intersections listed in Section 1.1. Quantification focused on vehicle traffic volumes, with consideration for the general magnitude of pedestrian and cycling volumes.

The following sections outline how each category of demand was quantified.

3.1 Existing Travel Demand

Existing travel demand was quantified using intersection turning movement counts (TMCs) conducted at study intersections:

- 34th Street at Aberdeen Avenue/Lakeview Drive
  Conducted by the City of Brandon
  Friday December 10th, 2021, 6:00 AM to 10:00 PM
  AM Peak Hour: 8:00 – 9:00 AM
  PM Peak Hour: 4:30 – 5:30 PM

  Conducted by the City of Brandon
  Monday December 13th, 2021, 6:00 AM to 10:00 PM
  AM Peak Hour: 8:00 – 9:00 AM
  PM Peak Hour: 3:45 – 4:45 PM
- 26th Street at Maryland Avenue
  Conducted by the City of Brandon
  Tuesday February 23, 2021, 12:00 AM to 11:59 PM
  AM Peak Hour: 8:00 – 9:00 AM
  PM Peak Hour: 3:30 – 4:30 PM
- 34th Street at Patricia Avenue
  Conducted by the City of Brandon
  Tuesday September 10, 2019, 6:00 AM to 7:00 PM
  AM Peak Hour: 7:00 – 8:00 AM
  PM Peak Hour: 4:15 – 5:15 PM

- **18th Street at Patricia Avenue**
  Conducted by the University of Manitoba Transport Information Group (UMTIG)
  Wednesday May 8, 2013, 2:00 PM to 9:00 PM
  Thursday May 9 2013, 7:00 AM to 2:00 PM
  AM Peak Hour: 8:00 – 9:00 AM
  PM Peak Hour: 4:45 – 5:45 PM

- **Patricia Avenue at Brentwood Trace**
  Conducted by the City of Brandon
  Tuesday August 23, 2022, 12:00 AM to 11:59 PM
  AM Peak Hour: 7:30 – 8:30 AM
  PM Peak Hour: 3:30 – 4:30 PM

The study team also had access to two TMCs at the intersection of 18th Street and Maryland Avenue, from 2013 and 2019. Those TMCs allowed the study team to estimate changes in volume at the intersection of 18th Street and Patricia Avenue from 2013 to 2019. The details for the counts at 18th Street and Maryland Avenue include:

- **18th Street at Maryland Avenue**
  Conducted by UMTIG
  Monday May 6, 2013, 7:00 AM to 2:00 PM
  Tuesday May 7, 2013, 2:00 PM to 7:00 PM
  AM Peak Hour: 7:45 – 8:45 AM
  PM Peak Hour: 4:45 – 5:45 PM

  Conducted by MORR
  Tuesday May 28, 2019, 3:30 PM to 5:30 PM
  Wednesday May 29, 2019, 7:00 AM to 9:00 AM
  AM Peak Hour: 7:45 – 8:45 AM
  PM Peak Hour: 5:00 – 6:00 PM

Appendix B includes the raw count data, as well as information on the adjustment process for the count at 18th Street and Patricia Avenue.

The study team also had access to several street segment counts conducted by the City of Brandon. Those counts either covered several days and gave hourly volumes, or simply provided a daily total in each direction. The counts were collected at all or most legs of intersections, but they did not include the actual turning movements at the intersection. The study team used the segment counts to estimate those movements. The segment-to-turning movement estimation process is documented in Appendix B.

The segment counts included:

- **Richmond Avenue at Brookwood Drive**
  East leg counted Wednesday May 25, 2022, to Friday May 27, 2022
  South leg counted Friday June 10, 2022 to Wednesday June 15, 2022

North leg counted Wednesday June 15, 2022 to Friday, June 17, 2022
West leg not counted

- **Richmond Avenue at 34th Street**
  East leg counted Wednesday May 18, 2022 to Friday May 20, 2022
  South leg counted Friday May 20, 2022 to Wednesday May 25, 2022
  West leg counted Wednesday May 25, 2022 to Friday May 27, 2022
  North leg counted in May 2022 (daily total only)

- **26th Street at Durum Drive**
  North, south, and west legs counted Wednesday August 3, 2022 (daily totals only)
  East leg not counted

Figure 6 shows a summary of the unadjusted count volumes. Volumes are shown for the AM peak hour, with PM peak hour volumes following in parentheses and daily traffic volumes in square brackets.

After converting the segment counts to estimated intersection turning movement volumes, the study team balanced the volumes between intersections and adjusted old counts to 2022 levels. The following points outline the balancing and adjustment process, which is outlined in more detail in Appendix B:

- For the 2021 count at 34th Street and Aberdeen Avenue, movements to/from the north leg were balanced to the 2022 segment count on 34th Street south of Richmond Avenue. The other movements were adjusted using the factor of 2022 volumes to 2021 volumes from the north leg.

- The count at 34th Street and Patricia Avenue (collected in 2019) was adjusted to align with the adjusted volumes at 34th Street and Aberdeen Avenue. There were 12 single family homes with access to 34th Street between Aberdeen Avenue and Patricia Avenue, so the study team allowed for imbalances of up to 15 vehicles per hour (vph) between those intersections. Adjustments at 34th Street and Patricia Avenue were focused on the southbound left-turn and westbound right-turn, representing increases in traffic traveling east on Patricia Avenue from development in Brookwood North.

  The count was also adjusted to include volumes generated by the hockey arena and school that opened in late 2021, on Patricia Avenue west of 34th Street. The study team assumed one trip per peak hour per student (40) and teacher (1). All trips were assumed to enter during the AM peak hour and leave during the PM peak hour. This was a conservative, worst-case generation figure that did not consider any arrivals/departures outside the peak hours, or any carpooling. Volumes were distributed to/from the north on 34th Street and the east on Patricia Avenue, with consideration for the balance at intersections further east on Patricia Avenue and north on 34th Street. Daily traffic volumes were estimated by “factoring up” the peak hour volumes using peak hour to daily volume relationships from the rest of the study area. On event days, traffic in the evenings—and total daily traffic—may be greater than the figures included in this TIS.

- The 2013 count at 18th Street and Patricia Avenue was adjusted to 2022 using growth rates calculated from the 2013 and 2019 counts at 18th Street and Maryland Avenue. Separate rates were used for movements travelling through on 18th Street (which showed little growth) and turning to/from the east and west, which showed growth rates in the 2%-4% range. The study team took this to represent growth in Bellafield, which likely had a larger impact on Maryland Avenue than on Patricia Avenue. However, the 2013 turning movement volumes on Patricia Avenue were quite low, so larger growth rates would not equate to huge growth in absolute terms. The study team thus used slightly reduced, 2%-3% growth rates for turning movements to/from Patricia Avenue.

- The 2021 count at Maryland Avenue and 26th Street was increased by 3% to represent development from 2021 to 2022. This was an assumed growth rate, based on the observed 2%-4% annual growth rates on Maryland Avenue at 18th Street, from 2013 to 2019.

- The 2022 count at 26th Street and Durum Drive only included total daily volumes, and it was collected during the summer months, and thus would not include school traffic. The study team estimated that the AM and PM peak hour volumes would each be equivalent to 10% of the daily total, and then balanced the resulting volumes to the volumes at 26th Street and Maryland Avenue. The balancing process involved adjustments of no more than 19 vph, suggesting that the 10% daily to peak hour conversion was a reasonable starting point.

Figure 7 shows the 2022 existing traffic volumes after adjustments and balancing. Volumes are shown first for the AM peak hour, with PM peak hour volumes following in parentheses and daily traffic volumes noted as such.

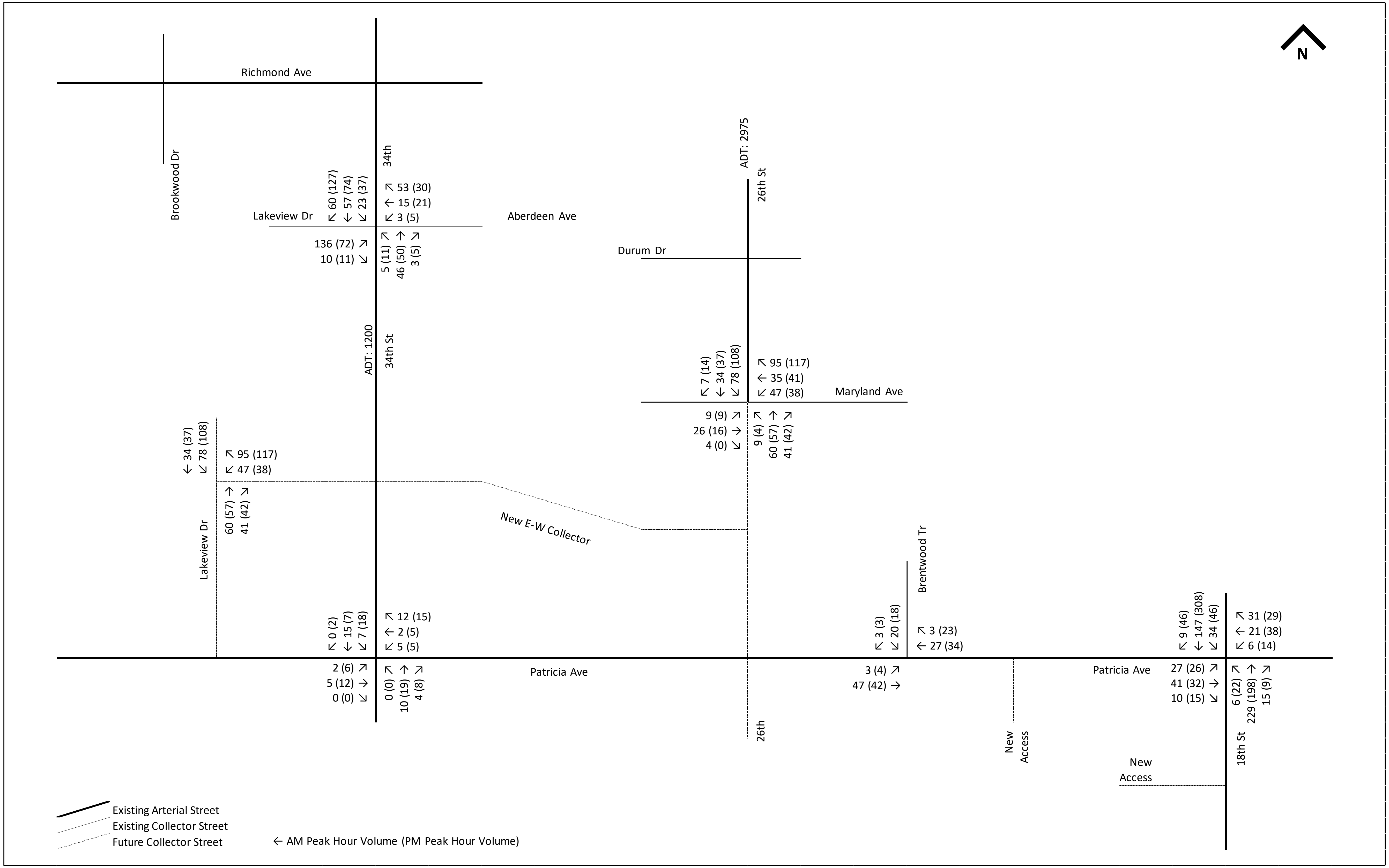


FIGURE 6: RAW DATA VOLUMES

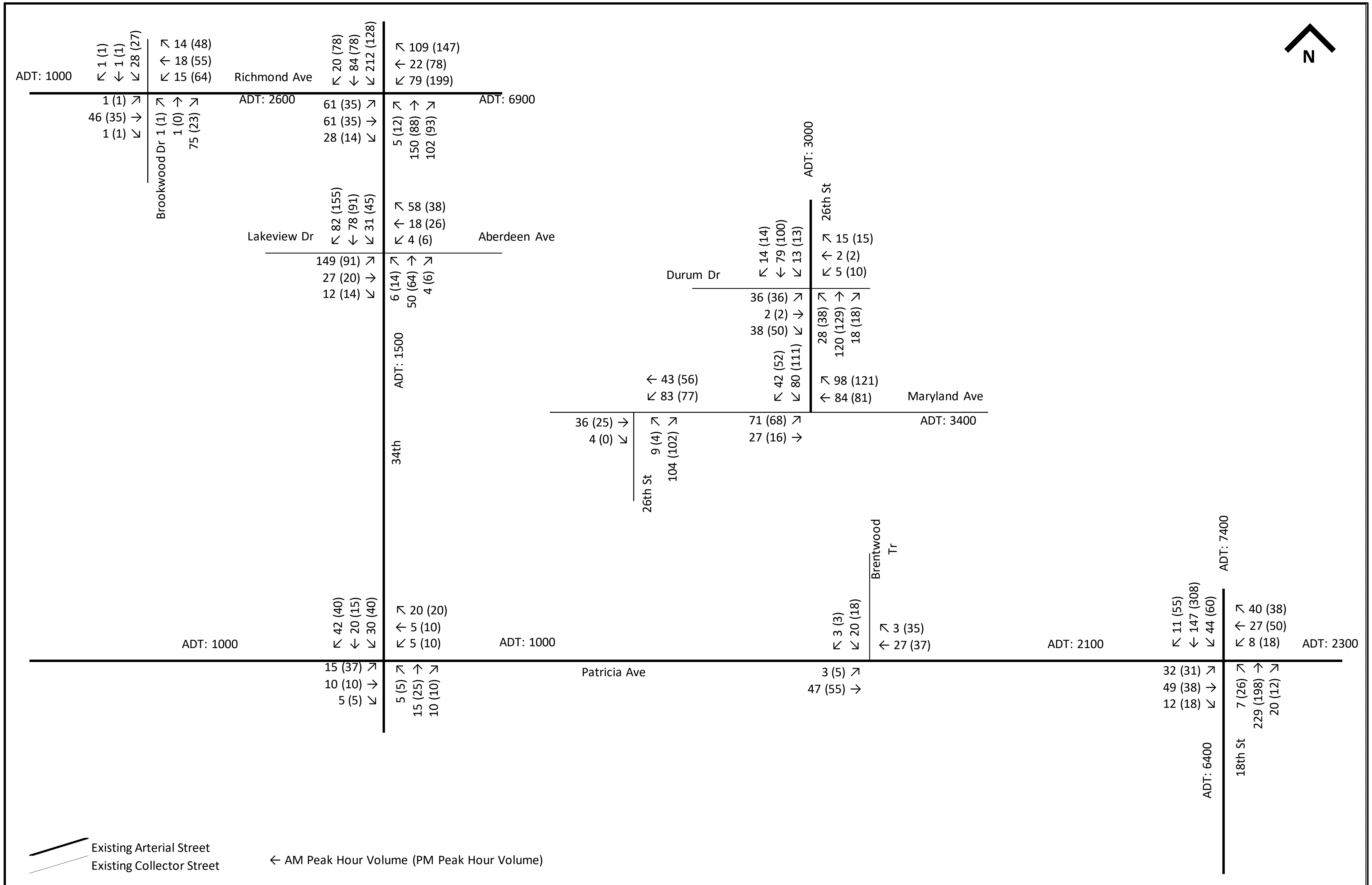


FIGURE 7: 2022 BACKGROUND

3.1.1 Peak Hour Factors and Heavy Vehicle Percentages

Peak hour factors (PHFs) represent the fluctuation in traffic within the peak hour. They are defined with the following formula:

$$PHF = \frac{Peak\ Hour\ Volume}{4\ \times Peak\ 15\ Minute\ Volume}$$

Higher PHFs represent more consistent volumes during the peak hour, while lower volumes represent concentration of volume into a smaller period within the peak hour. Intersections on arterial streets typically see PHFs ranging from 0.85 to 0.95, with PHFs generally increasing as peak hour volumes approach capacity. PHFs were used in the traffic operations analysis discussed in Section 4.6.

The intersection turning movement counts included volumes in 15-minute intervals, which allowed for calculation of PHFs. PHFs could not be calculated at the other intersections where volumes were estimated from segment counts. Table 4 shows the calculated PHFs for the AM peak hour and the PM peak hour.

TABLE 4: PEAK HOUR FACTORS

Intersection	AM Peak Hour Factor	PM Peak Hour Factor
34th Street and Aberdeen Avenue	0.74	0.90
26th Street and Maryland Avenue	0.65	0.73
34th Street and Patricia Avenue	0.57	0.81
Patricia Avenue and Brentwood Trace	0.78	0.73
18th Street and Patricia Avenue	0.80	0.85

Peak hour factors were lower than typical, consistent with the relatively low volumes in the study area.

The heavy vehicle percentage (HV%) is another parameter used in the traffic operations analysis in Section 4.6. Counts provided by the City of Brandon did not distinguish between heavy vehicles and passenger cars, and thus HV% could not be calculated for those intersections. However, the count at 18th Street and Patricia Avenue (conducted by UMTIG) did allow for calculation of HV%. The count showed that heavy vehicles accounted for approximately 5% of peak hour through traffic on 18th Street, and between 0% and 10% of turning movement traffic. HV% for other intersections are discussed in Section 4.6.1.

3.1.2 Pedestrian and Cyclist Counts

The turning movement counts conducted by the City of Brandon included counts of pedestrians and cyclists crossing each leg of the intersection. The counts showed 10-20 pedestrians using the crossing on 34th Street at Aberdeen Avenue in each of the peak hours, and 10 pedestrians crossing at Maryland Avenue and 26th Street in the PM peak hour. No other pedestrian activity was observed, and no cyclists were counted.

3.2 Future Background Travel Demand

Background traffic—traffic passing through the study area but not generated by the new development in the SPA—could grow in the future due to regional increases in activity, and/or due to other developments near the study area.

The study area is at the edge of Brandon, so regional background traffic growth would represent trips between Brandon and external areas to the south and west. Those areas are rural with relatively sparse development, and the study team assumed that any regional traffic growth would be marginal. This was consistent with the traffic counts at 18th Street and Maryland Avenue, which showed little growth in 18th Street through traffic from 2013 to 2019. The study team did not include any increase in background traffic due to regional growth.

Recall from Section 2.5 that the study team was aware of a nearby development at 2222 Currie Boulevard. The City of Brandon provided the TIS for that development, which showed an increase of 30-45 vehicles per hour (vph) at 18th Street and Patricia Avenue, but marginal (less than 5 vph) increases on other intersection movements, and no impact at other study intersections. The study team included those volumes in the future background traffic volumes for all future scenarios (2027 through 2052).

The traffic projections thus included little growth in background traffic. Development in the SPA was assumed to account for nearly all traffic growth in the study area through 2052.

The study team did not perform any forecasts of future changes in background pedestrian, cycling, or transit demand.

3.3 Development Generated Travel Demand

Development generated travel demand was considered in detail for vehicle trips, but only generally for trips by walking, cycling, and transit.

Vehicle trips were estimated using a four-step process:

1. Trip Generation – How many trips will begin and end at the development?
2. Directional Distribution – Where will trips be going to and coming from?
3. Mode Split – Will trips by non-vehicle modes account for a greater share of all trips than is typical for suburban areas?
4. Route Assignment – How will vehicle trips navigate through the street network to complete their trips?

Trips by walking, cycling, and transit were only considered at the trip generation step. The following sections outline the calculations for each step.

3.3.1 Trip Generation

Development generated traffic volumes were forecast using vehicle trip generation rates from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition*, a standard reference for trip generation rates derived from existing developments across North America, drawing on data from the 1970s to the present day. Rates are categorized by land use, and the study team selected the following land use categories to represent the development proposed in the SPA:

- Land Use #210 *Single-Family Detached Housing* to represent the single-family homes
- Land Use #215 *Single-Family Attached Housing* to represent the townhouse units
- Land Use #221 *Multifamily Housing (Mid-Rise)* to represent the apartment units
- Land Use #520 *Elementary School* to represent the new Brandon School Division (BSD) school and the new Division Scolaire Franco-Manitobaine (DSFM) school
- Land Use #565 *Daycare Center* to represent the daycare centre
- Land Use #820 *Shopping Center* to represent the big-box commercial development in the Annex Lands
- Land Use #822 *Strip Retail Plaza (<40 k)* to represent the neighbourhood commercial development

For the single-family homes, the study team cross-referenced the ITE data against trip generation rates derived from the traffic counts on Brookwood Drive at Richmond Avenue and Lakeview Drive at 34th Street. Those counts captured all traffic coming in and out of Brookwood North. The counts were then divided by the number of residences in the neighbourhood to give a Brandon-specific, 2022 trip generation rate for predominantly single family residential development. Brookwood North included approximately 420 units, 24 of which were attached. The counts did not allow for the attached units to be separated from the single family homes, so the 24 attached units were included in the total unit count. The rate derivation calculations are included in Appendix B.

Table 5 shows the comparison between ITE rates from Land Use #210 *Single Family Detached Housing* and the rates calculated for Brookwood North.

TABLE 5: LOW-DENSITY RESIDENTIAL VEHICLE TRIP GENERATION RATES

Period	ITE Land Use 210 Rates [trips per unit]	Brookwood North Rates [trips per unit]	Brookwood North % Difference vs ITE
AM	0.70	0.78	+12%
PM	0.94	0.89	-5%
Daily	9.43	7.78	-18%

The counts from Brookwood North showed AM peak hour trip generation approximately 12% higher than the ITE rates, but PM peak hour generation was 5% lower, and daily trip generation was 18% lower than

ITE. The study team was hesitant to use the Brookwood North rates exclusively, since they were only derived from short period counts, while the ITE data was derived from a much larger sample with more than 170 studies. The study team thus elected to use the average of the ITE rates and the Brookwood North rates for trip generation forecasts. This combined the up to date and Brandon specific Brookwood North rates with the larger sample size from the ITE rates.

For the other land uses the study team used unaltered ITE rates. Table 6 shows the selected trip generation rates and the resulting trip generation forecasts at full build out using the base case development parameters from Table 1 in Section 2.2.

TABLE 6: VEHICLE TRIP GENERATION ESTIMATES

Land Use (ITE Land Use #)	Quantity	Trip Generation Rates	Trip Generation Estimates
Single Family Homes (210*)	1,083 units	0.74 AM trips per unit 0.92 PM trips per unit 8.60 Daily trips per unit	804 AM trips 991 PM trips 9,318 Daily trips
Townhouses (215)	596 units	0.48 AM trips per unit 0.57 PM trips per unit 7.20 Daily trips per unit	286 AM trips 340 PM trips 4,291 Daily trips
Apartments (221)	1,562 units	0.37 AM trips per unit 0.39 PM trips per unit 4.54 Daily trips per unit	578 AM trips 610 PM trips 7,096 Daily trips
Schools (520)	500 students	0.74 AM trips per student 0.16 PM trips per student 2.27 Daily trips per student	370 AM trips 80 PM trips 1,135 Daily trips
Daycare Centre (565)	60 children	0.78 AM trips per student 0.79 PM trips per student 4.09 Daily trips per student	47 AM trips 47 PM trips 245 Daily trips
Big-Box Commercial (820)	640,000 ft^2 floor area	0.84 AM trips per 1,000 ft^2 3.40 PM trips per 1,000 ft^2 37.01 Daily trips 1,000 ft^2	538 AM trips 2,176 PM trips 23,686 Daily trips
Neighbourhood Commercial (822)	38,000 ft^2	2.36 AM trips per 1,000 ft^2 6.59 PM trips per 1,000 ft^2 54.45 Daily trips 1,000 ft^2	89 AM trips 248 PM trips 2,053 Daily trips
		TOTAL	**2,712 AM trips** **4,492 PM trips** **47,824 Daily trips**

* Rate averaged from ITE data and counts from Brookwood North

Development in the SPA is forecast to generate 2,712 trips during the AM peak hour, 4,492 trips during the PM peak hour, and 47,824 daily trips. Detailed calculations including the split of inbound and outbound trips are included in Appendix B. The big-box commercial land use is forecast to be the largest individual trip generator, accounting for nearly half of the forecast PM peak hour and daily vehicle trip generation.

For reference, the study team compared the trip generation forecasts to estimates from previously completed TISs for Brookwood South and Bellafield. Those TISs used unit counts that were available at the time (as of 2015), and trip generation rates from the 7th Edition of the *Trip Generation Manual*. Further, the TIS for Brookwood South did not include the BSD School, and the TIS for Bellafield did not include the neighbourhood commercial component. The TISs forecast 7,900 vehicle trips per day from Brookwood South, and 8,500 trips per day from Bellafield. In this TIS, the development in Brookwood South is forecast to generate 6,900 vehicle trips per day, and development in Bellafield is forecast to generate 7,000 vehicle trips per day. The Brookwood South TIS had the same unit counts as this TIS, so the difference in trip generation was due to higher rates. For Bellafield, the higher trip generation estimate in the previous TIS was due to a higher unit count and higher trip generation rates.

Pass-By Trips

For the commercial area, the study team considered that some trips would likely be “pass-by” trips, drawn from existing through traffic on 18th Street, rather than entirely new trips. The ITE *Trip Generation Handbook*—a companion to the *Manual*—indicates that developments in the land use #820 category see an average of 34% of their PM peak hour trips as pass-by trips. No data was provided for the AM peak hour or daily trips, or for other land uses. The study team applied the 34% pass-by trip rate to the commercial big-box commercial area and found that the resulting pass-by trips were equivalent to 61% of the traffic on 18th Street, where the pass-by trips were be drawn from. In the study team’s view, it was not realistic to expect 61% of existing traffic on 18th Street to divert in to the commercial development. The study team tested other pass-by trip percentages for the AM and PM peak hours and for daily trips and found that pass-by trip rates of 5 to 10% resulted in pass-by trips that were equivalent to 7% to 9% of traffic on 18th Street. That was a more reasonable portion of 18th Street traffic diverting to the commercial development. The study team thus applied pass-by trip rates of 10% for the AM peak hour, 5% for the PM peak hour, and 10% for daily traffic, with those rates representing the portion of development traffic drawn from existing traffic on 18th Street, rather than entirely new trips. These pass-by trips were taken from northbound and southbound traffic at 18th Street and Patricia Avenue and assumed to access the development via the new access on 18th Street south of Patricia Avenue.

Pass-by trip calculations are included in Appendix B.

Walking, Cycling, and Transit Trips

While the *Trip Generation Manual* primarily provides vehicle trip generation rates, it includes trip generations by other modes, for some land use categories. This is an emerging area for trip generation data, and as such the sample sizes are relatively small; in most cases rates are based on fewer than 10 studies.

Table 7 shows the available trip walking, cycling, and transit trip generation rates.

TABLE 7: WALKING, CYCLING, AND TRANSIT TRIP GENERATION RATES

Land Use (ITE Land Use #)	AM Peak Hour Rate	PM Peak Hour Rate	Daily Rate
Single Family Homes (210)	-	-	-
Townhouses (215)	0.11 trips per unit	0.18 trips per unit	-
Apartments (221)	0.06 trips per unit	0.07 trips per unit	-
Schools (520)	0.25 trips per student	-	-
Daycare Centre (565)	-	-	-
Big-Box Commercial (820)	-	0.04 trips per 1,000 ft^2	-
Neighbourhood Commercial (822)	-	0.06 trips per 1,000 ft^2	

Rate coverage was spotty, with no daily rates and limited data for schools and commercial developments. More rates were available for residential land uses, but not for daily trips or for single family homes. However, the study team's intent was to consider walking, cycling, and transit demand in more of a general way, and these rates helped to provide some quantification of that demand, at least during the peak hours. The study team thus generalized the rates and then estimated peak hour walking, cycling, and transit demand from the development in the SPA. The generalized rates were:

- Residential land uses: 0.12 walking, cycling, and transit trips per unit during the peak hours
- Schools and Daycare: 0.25 walking, cycling, and transit trips per student during the peak hours
- Commercial: 0.05 walking, cycling, and transit trips per student during the peak hours

Applied to development in the SPA, those rates yielded approximately 560 walking, cycling, and transit trips during each of the peak hours. The residential land uses were the heaviest generators, accounting for 390 of the 560 trips, or 70%. Detailed calculations are included in Appendix B.

Note that walking, cycling, and transit demand were considered generally and were not distributed by direction or assigned to routes.

3.3.2 Directional Distribution

The study team considered that vehicle trips from residential areas would likely be heading to and coming from different areas than trips generated by commercial areas or schools. Further, the DSFM school may see trips coming from across Brandon and the surrounding area, while the BSD school would likely see trips coming from nearby areas. As such, the study team developed four separate directional distributions. Trips were distributed to the arterial streets at the edges of the study area and to nearby neighbourhoods including Brentwood Village and Westview, just east of 18th Street and north of Patricia Avenue.

There will likely be trips made between the residential land uses in the SPA and the schools and commercial areas in the SPA. The study team used engineering judgement to estimate the share of those "internal" trips, such that they accounted for a reasonable share of trips at the residential and non-residential ends. Internal trips were set such that they accounted for no more than 20% of the residential trips during any time period. The 20% threshold was based on the study team's engineering judgement considering the lack of employment in the SPA—at least 80% of trips from the residential lands were assumed to be bound for destinations outside of the SPA. The internal trips also assumed that 85% of trips to/from the BSD school would be coming from and going to residential lands in the SPA. Full internal trip calculations are included in Appendix B.

Table 8 shows the directional distribution splits for residential land uses, commercial land uses, the BSD school, and the DSFM school and daycare.

TABLE 8: VEHICLE TRIP DIRECTIONAL DISTRIBUTION

Direction	Residential Trip Distribution	Commercial Trip Distribution	BSD School Trip Distribution	DSFM School Trip Distribution
West on Richmond Ave	2.5%	2.5%	-	5%
North on 34th St	10%	12.5%	-	10%
North on 26th St	10%	12.5%	-	10%
North on 18th St	15%	24%	-	25%
East on Richmond Ave	15%	12.5%	-	10%
East on Patricia Ave	10%	12.5%	5%	10%
South on 18th St	10%	12.5%	-	10%
West on Patricia Ave	2.5%	2.5%	-	5%
Westview (North of Brookwood North)	-	-	5%	-
Brentwood village	-	-	5%	-
Commercial near Richmond & 18th	10%	-	-	-
Internal	15%	8.5%	85%	15%
TOTAL	100%	100%	100%	100%

Note that residential trips had the distribution biased towards Downtown Brandon and the industrial area east on Richmond Avenue. Commercial trips had a more dispersed distribution, representing trips coming from residential areas in different directions. The DSFM school had a similar distribution. The BSD school had most trips coming from within the SPA, with the remaining trips coming from Brentwood Village, east of 18th Street on Patricia Avenue, and the Westview neighbourhood (north of Brookwood North).

This distribution was applied to trips for the AM peak hour, PM peak hour, and daily trips.

3.3.3 Mode Split

The ITE vehicle trip generation rates are taken from predominantly suburban developments. The rates thus represent conditions where most trips are made by personal vehicles, rather than walking, cycling, or transit. Where development plans and/or the surrounding area are more conducive to walking, cycling, or transit, trip generation estimates can be reduced to account for a greater share of trips by those modes.

The proposed development land use mix, active transportation infrastructure and nearby complimentary land uses are all typical for suburban type developments. The study team thus considered that the ITE rates were a reasonable representation of the proposed development, without any mode split adjustments.

3.3.4 Route Assignment

The study intersections included new intersections within Brookwood South and Bellafield, as well as intersections on the existing arterial street network. Understanding development traffic increases at those locations required a detailed assignment between different areas of the SPA and the destinations listed in Table 8. The study team thus divided the SPA into 11 zones bounded by the edges of the SPA and collector and arterial streets. Figure 8 shows the zones.

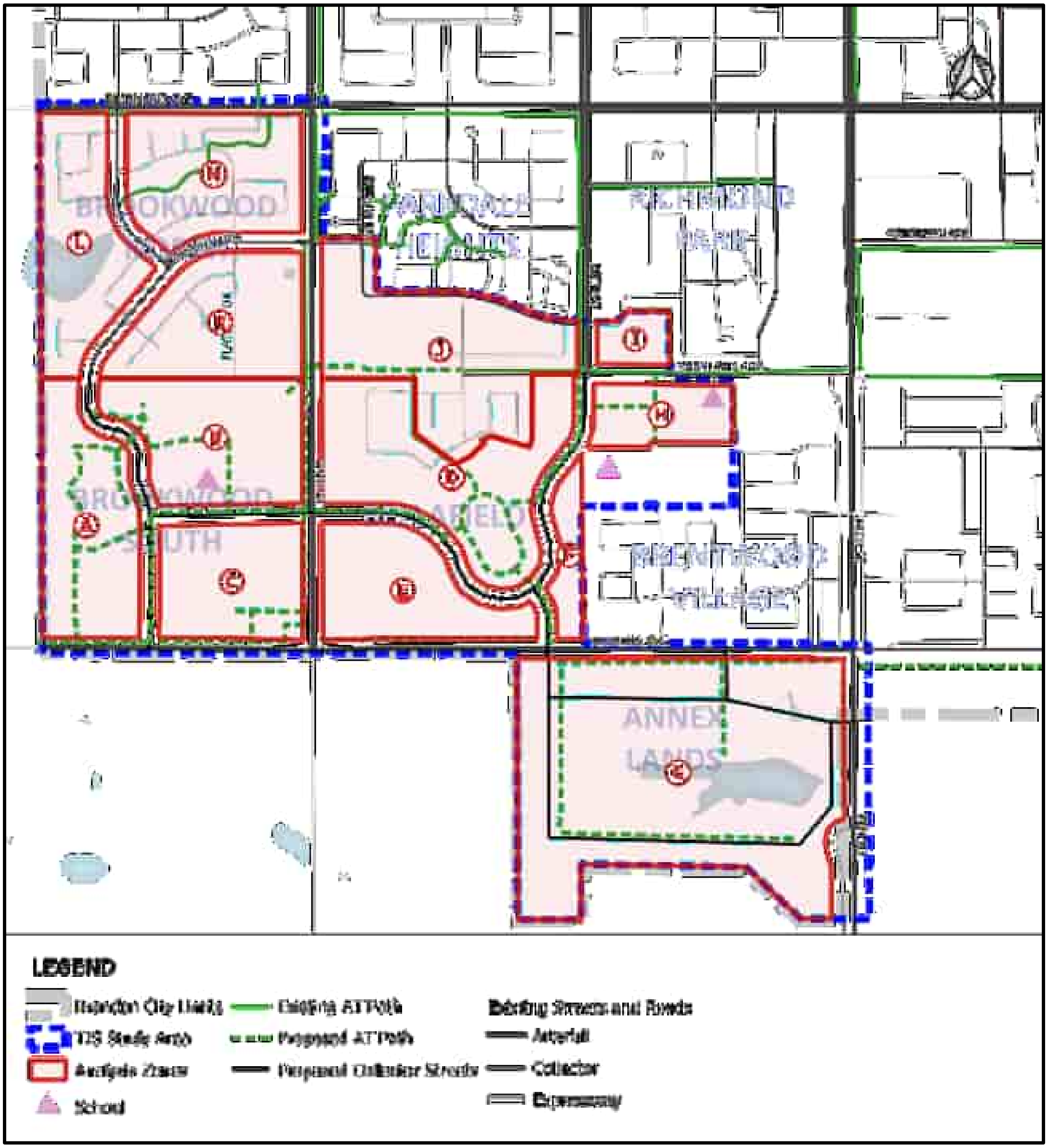


FIGURE 8: ANALYSIS ZONES

Residential unit counts were provided by neighbourhood (Brookwood North, Bellafield, Annex Lands), so the study team assigned units to zones based on the area of the zone relative to the total neighbourhood area. The BSD school was assigned to Zone B, based on City of Brandon input[1]. The DSFM school was assigned to Zone H. The neighbourhood commercial area was assigned to Zone E, and the big-box commercial was assigned to Zone G. This allowed the study team to calculate the vehicle trips generated in each zone—see Appendix B for detailed calculations.

The study team then assigned the trips from each zone to each destination from Table 8, with the trips added to the appropriate study intersections to facilitate each trip. This was done for trips to external destinations, as well as the internal trips. Note that the commercial area in the Annex Lands had access to Patricia Avenue and to 18th Street. The study team thus needed to assume a split between accesses. The study team assigned 2/3rds of the commercial traffic to the Patricia Avenue access, as it would be the most direct access for trips from 26th Street and 34th Street, and similarly direct for trips from the north on 18th Street or the east on Richmond Avenue. However, the ultimate distribution of traffic between the accesses will likely depend on part on the location of specific destinations within the Annex Lands—information that was not available when this TIS was conducted.

This process gave development generated traffic volumes at the study intersections. Figure 9 shows the development generated traffic, with AM peak hour volumes shown first, followed by PM peak hour volumes in parentheses, and daily traffic volumes noted as such.

Calculations are included in Appendix B.

3.4 Post-Development Travel Demand

Figure 10 shows the total post-development traffic at the 2052 horizon year, including future background traffic growth from the development at 2222 Currie Boulevard and the development generated traffic. Like the other traffic volume figures, AM peak hour volumes shown first, followed by PM peak hour volumes in parentheses, and daily traffic volumes are noted as such.

[1] City of Brandon staff indicated that the BSD school could alternatively be developed in Zone I. That scenario was considered in the sensitivity analysis in Section 4.9.

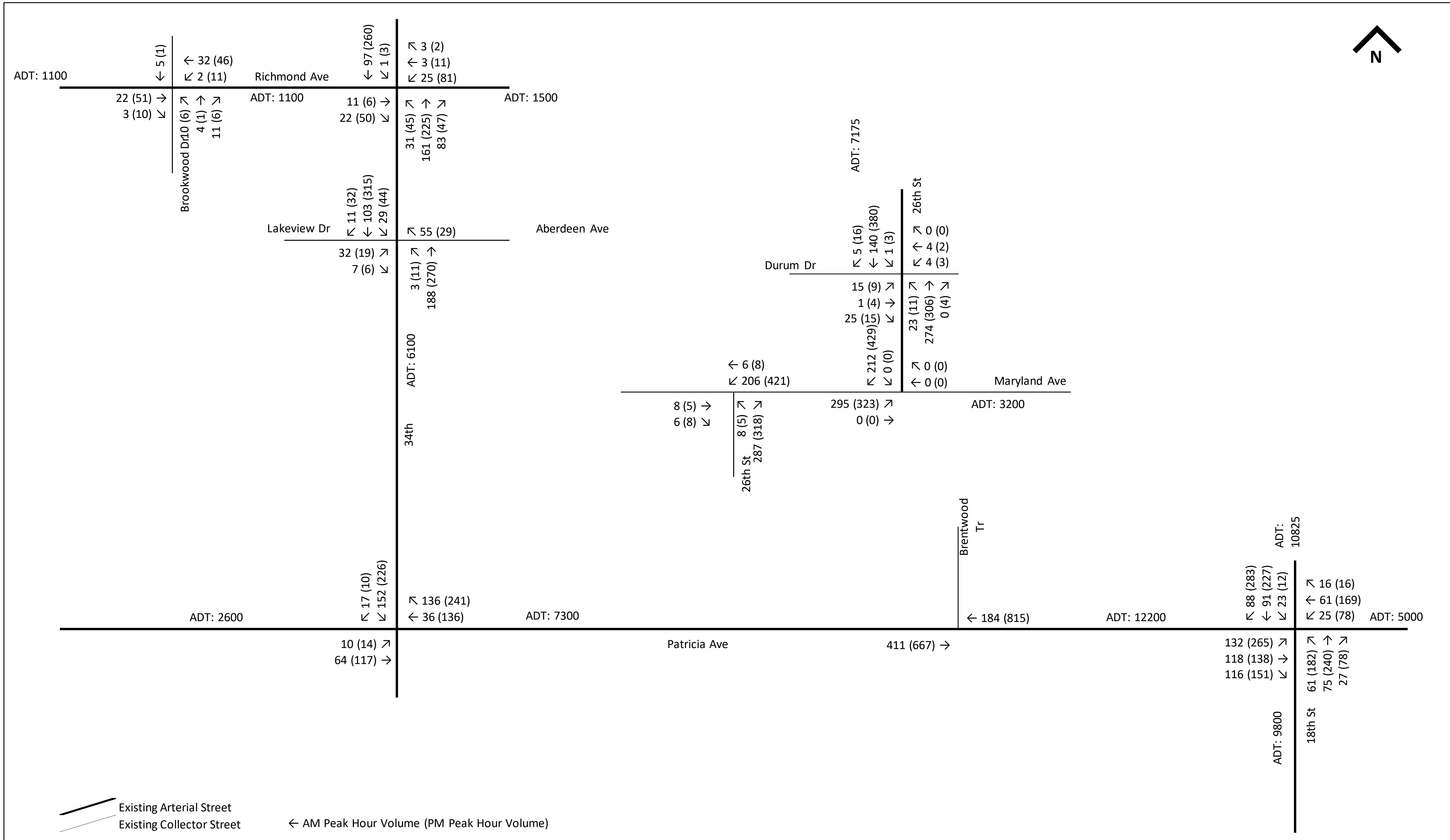


FIGURE 9: DEVELOPMENT GENERATED TRAFFIC VOLUMES

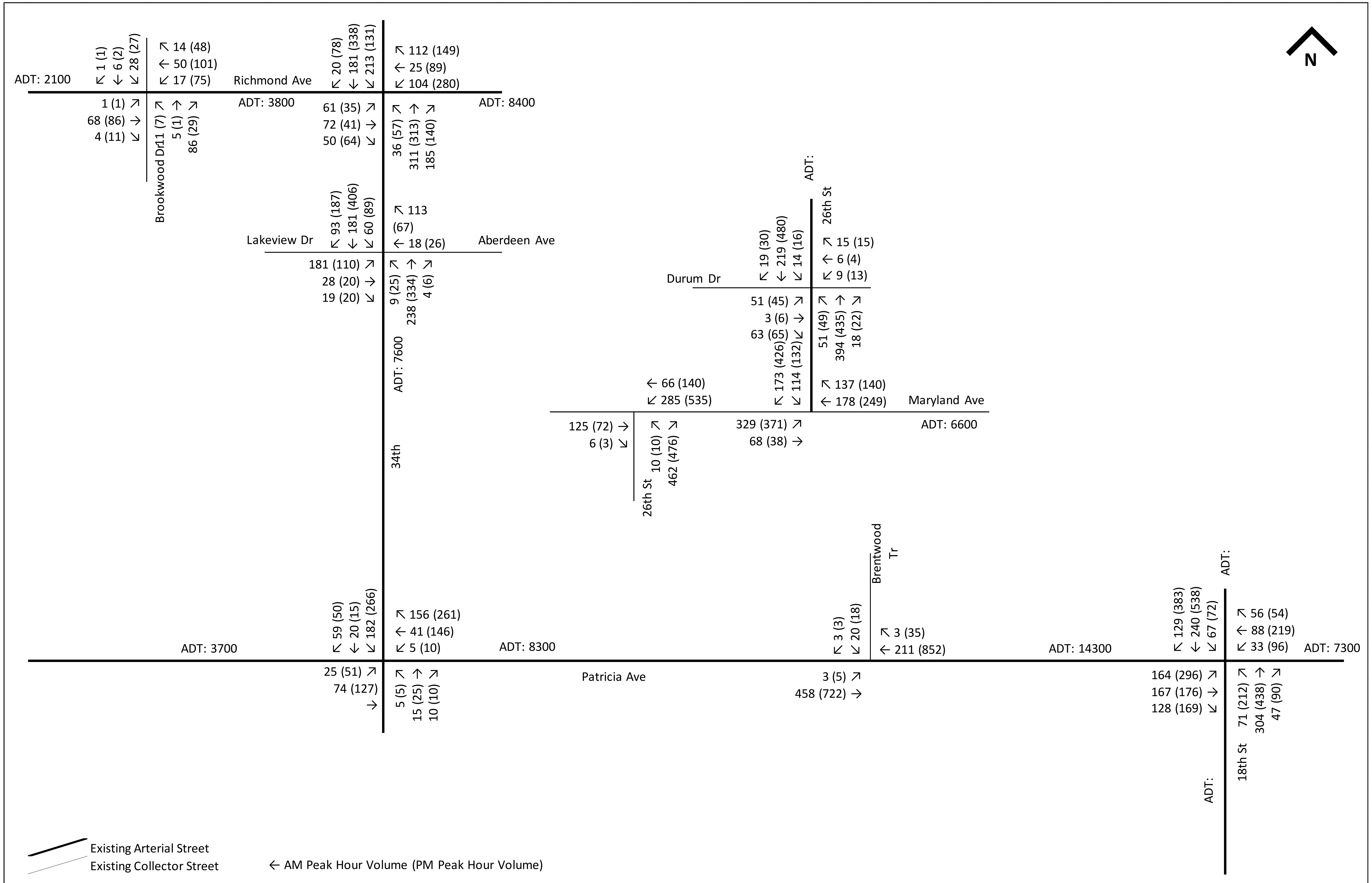


FIGURE 10: 2052 POST DEVELOPMENT

4 FUNCTIONAL REQUIREMENTS

Functional requirements were assessed through a series of analyses and reviews. Those analyses and reviews included consideration of the street and active transportation (AT) networks at a segment or "link" level, detailed assessments of intersection performance, and sensitivity analyses.

Link-level reviews included:

- **Network Structure Review** to assess street and path network connectivity, coverage, and functional classification.
- **Safe Systems Review** to identify any potential safety issues arising from how the street and AT networks are structured. This included consideration for the functions served by each street—with identification of any incompatible mix of functions—and identification of potential need for traffic calming, along with potential treatments to address those needs.
- **Transit Review** to identify potential routing for future transit service, and potential stop locations.
- **Emergency Access and Truck Route Review** to review requirements for emergency vehicle access, and truck routes, and to recommend any changes to the street networks to provide the required level of access.

Detailed intersection performance analyses included:

- **Traffic Operations Analyses** to identify traffic operations performance in terms of delay, level of service, volume to capacity, and queue lengths. This was used to identify requirements for intersection traffic control and lane configurations.
- **Traffic Signal Warrant Analyses** to identify intersections where conflicting traffic volumes are too high to be adequately serviced by stop control, and traffic signal or roundabout control would be required.
- **Pedestrian Crossing Control Analyses** to identify requirements for pedestrian crossing control devices where paths met streets at mid-block.

Sensitivity analyses included consideration for:

- Need for treatments at the interim horizon years. This allowed the study team to identify the level of development that would trigger the need for any recommended treatments. This review also considered needs for access during construction.
- Funding for recommended treatments, based on the extent to which the treatments were required to serve development-related needs, background needs, or a combination of the two.
- Treatment robustness against changes in traffic volumes representing different levels of development, including a scenario representing development at the higher end of potential demand forecast by the City of Brandon.

For ease of comprehension, the recommendations synthesized from the reviews and analyses are presented in the next subsection. Subsequent sections provide a detailed account of each review or analysis.

4.1 Recommendations

The study team recommends the following infrastructure for the study area:

- New collector streets in the study area should generally have 10 m pavement widths, which will provide one travel lane in each direction, plus a parking lane on one side. Curb extensions should be provided at intersections, to reduce the clear width to as little as 6 m wide, and no more than 7 m wide. Curb extensions can help to limit vehicle speeds by introducing edge friction, define parking areas, and improve visibility for crossing pedestrians.
    - Curb extensions should be installed on Plateau Drive and on Durum Drive, to address the lack of side friction and reduce operating speeds resulting from their wide pavements.
    - Speed cushions should be added to Plateau Drive to pre-emptively address speed issues that could arise from its wide pavement, straight alignment, and connectivity to development in Brookwood South.
- Collector streets should include sidewalks on both sides of the street. Where noted in the Secondary Plan network, sidewalks can be superseded by multi-use paths to provide facilities for cycling.
- Two lane cross-sections (one lane in each direction) are sufficient for nearly all collector streets and arterial roads in the study area. Four-lane cross sections are forecast to be required on 18th Street through the study area, and on Patricia Avenue from 18th Street to the proposed Annex Lands access approximately 385 m west of 18th Street. Collector streets in the commercial area of the Annex Lands are also forecast to require four lane sections where they meet 18th Street and Patricia Avenue.
- A street connection between the south extension of 26th Street and the Brentwood Village neighbourhood should be considered a collector street, rather than a local street, and designed as such.
- Right of way should be reserved for potential future collector street connections to the west and south of the study area.
- Multi-use paths at 3 m pavement widths are appropriate active transportation facilities as per national guidelines, both for off-street and on-street alignments. When used on collector street alignments, multi-use paths can replace the sidewalk on one side of the street, while the other side should retain a typical sidewalk.
- A controlled pedestrian crossing should be provided on 34th Street south of Aberdeen Avenue, along the projection of the Maryland Avenue right of way. Sign-controlled pedestrian crossings

should be provided where AT paths cross collector or arterial streets at locations other than roundabout or traffic signal-controlled intersections. Raised crossings should be provided at crossings near schools, except on Maryland Avenue, where the rural cross-section would be less amenable to a raised crossing.

- Speeds should be monitored on Durum Drive, Maryland Avenue and Derlago Drive (Marquis Drive). If speeds are unacceptable, speed cushions can be used to limit vehicle speeds.
- Intersections identified for roundabout control in the Secondary Plan (Figure 11) can achieve good traffic operations performance with single lane roundabouts, provided that a right-turn slip lane is included at the 26th Street and Patricia Avenue roundabout, and that a bypass lane and eastbound and northbound right-turn lanes are provided at the Annex Lands commercial access roundabout on Patricia Avenue. Traffic signals are forecast to be required on 18th Street at Patricia Avenue and at the access to the Annex Lands.
- Transit routes can be extended to provide service on the south extension of Lakeview Drive and on the 26th Street extension. This could include future transit stops on the south extension of Lakeview Drive, Brookwood Drive, the proposed east-west collector in Brookwood South, and the south extension of 26th Street.
- Patricia Avenue should be paved from the existing paved section east of Brentwood Trace, to the west limit of the study area. This will provide a paved surface throughout the study area.
- The intersection of Aberdeen Avenue and Durum Drive should have the west leg modified to remove excess pavement approaching the intersection.

The recommended treatments are illustrated on Figure 11.

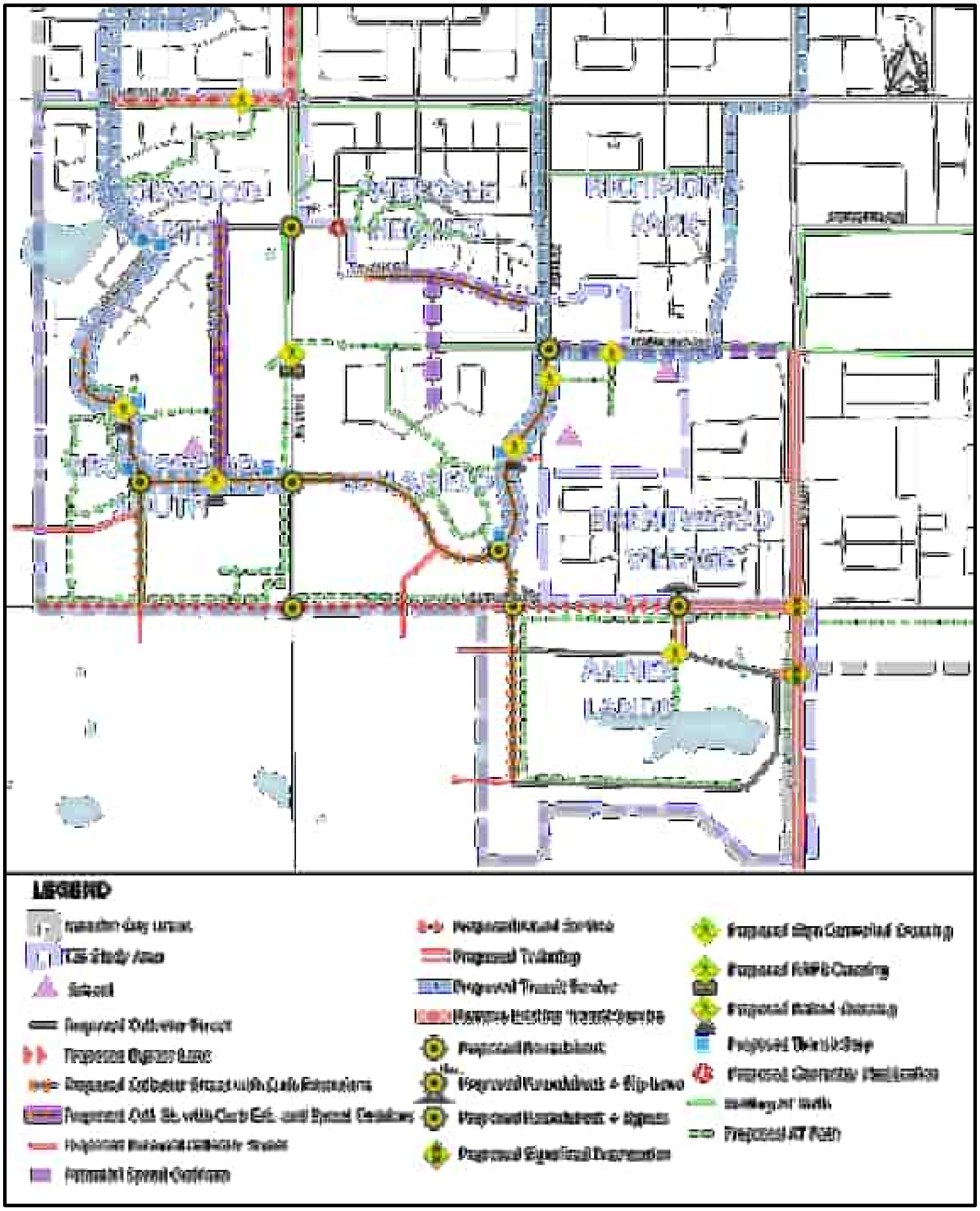


FIGURE 11: RECOMMENDED TRANSPORTATION INFRASTRUCTURE

4.2 Network Structure Review

The network structure review assessed street and path network connectivity and coverage, as well as street classification at active transportation (AT) facility types. The review used the collector street and AT network layout proposed in the Secondary Plan and updated to match street and path alignments and land use locations from development plans provided by the City of Brandon.

Figure 12 shows the collector street and AT networks.

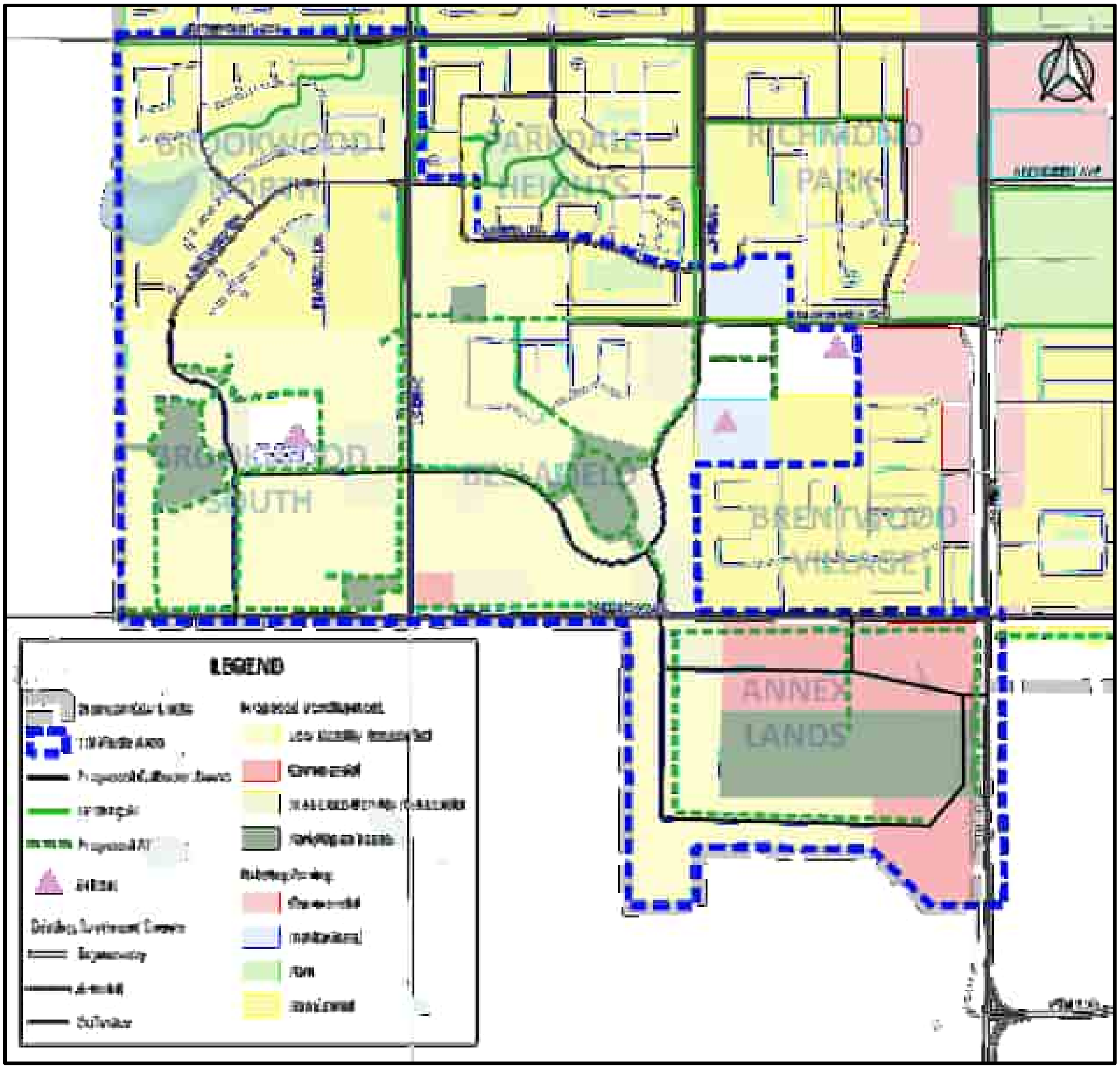


FIGURE 12: TRANSPORTATION AND LAND USE AS PROPOSED IN SECONDARY PLAN

4.2.1 Connectivity

Connectivity involves providing direct links between key generators and the surrounding networks, including connections to external areas.

Street Network

The *Secondary Plan* land use maps shows a potential BSD school located on a new east-west collector street west of 34th Street or on a site in the northeast corner of the intersection of 26th Street and Maryland Avenue. In either location, the collector streets provide direct connections to arterial streets (34th Street, 18th Street, Richmond Avenue).

Similarly, the *Secondary Plan* land use maps show higher density residential development located near arterial-collector and collector-collector intersections. In all cases, those land uses are either located immediately adjacent to an arterial street or within a direct—non-circuitous—trip to an arterial street.

Active Transportation Network

Active transportation network connectivity can be considered with the help of "desire lines" illustrating potential demand for trips by active modes. Figure 13 shows desire lines between residential areas in the study area, and key trip generators like schools, commercial areas, and recreational areas. Other nearby attractions include connections to the City Loop Trail, Parkdale Park just north of the study area, and Brandon Shopper's Mall to the northeast of the study area.

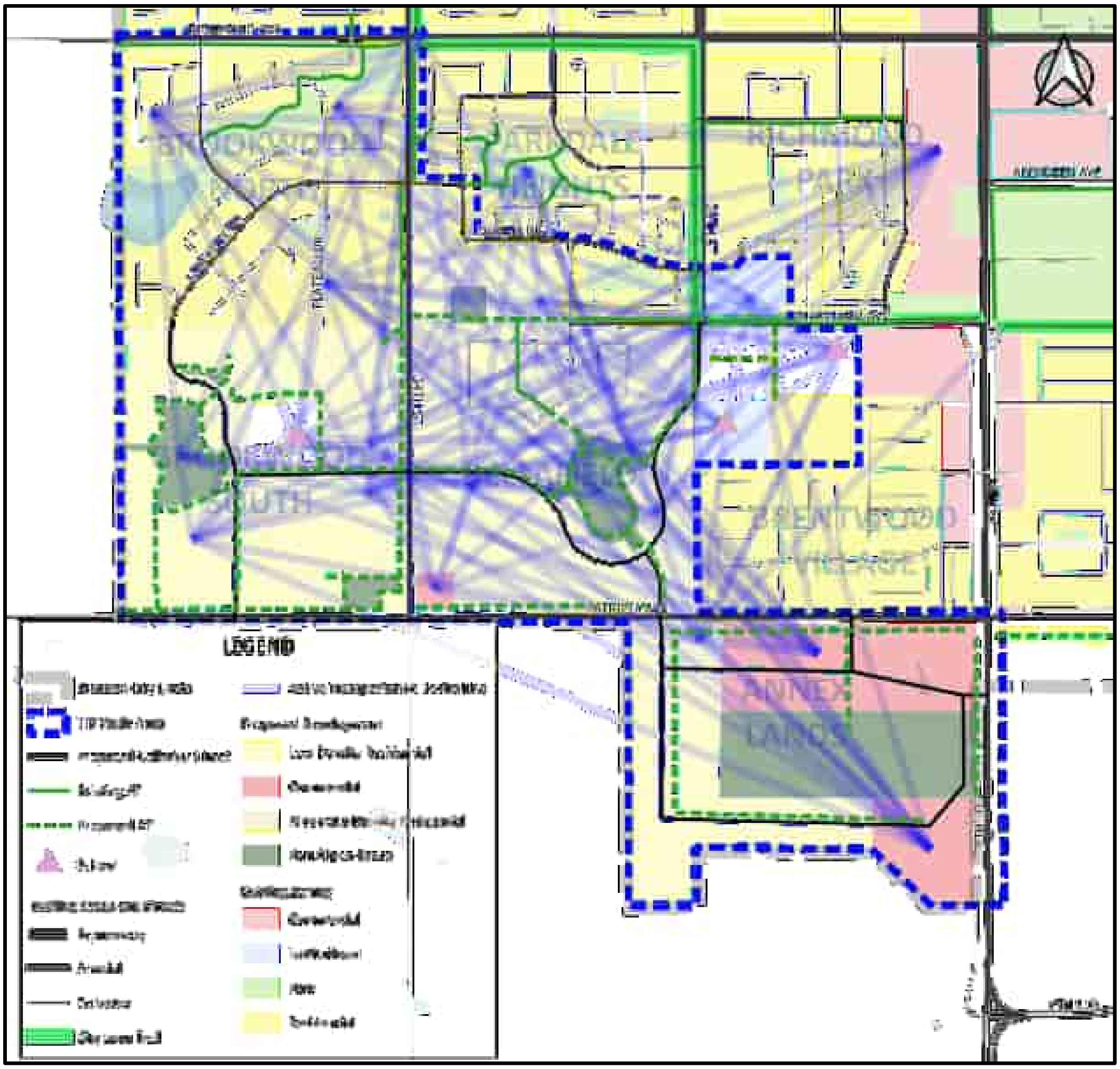


FIGURE 13: ACTIVE TRANSPORTATION DESIRE LINES

Desire lines are concentrated in the middle of the study area, particularly east of 34th Street. The existing and proposed active transportation networks provide good service for most of the desire lines. However, there are many desire lines crossing 34th Street between the AT facilities on Richmond Avenue and the proposed AT path on the new east-west collector, a distance of approximately 1,200 m. It may be prudent to have an AT crossing on 34th Street to align with the path east of 34th Street, as an extension of Maryland Avenue. There are also a concentration of desire lines crossing 34th Street near the new east-west collector, so the design of that intersection should consider the potential for significant volumes of people walking and cycling. A similar condition is present at the intersection of 26th Street and Maryland Avenue. Given the future DSFM school on Maryland Avenue, it may be prudent to include an AT crossing on Maryland Avenue near the school, on the alignment for the proposed north-south path. A crossing could also be provided on 26th Street at the connection to the path alignment to Christian Heritage School. Figure 14 illustrates these potential additions to the network.

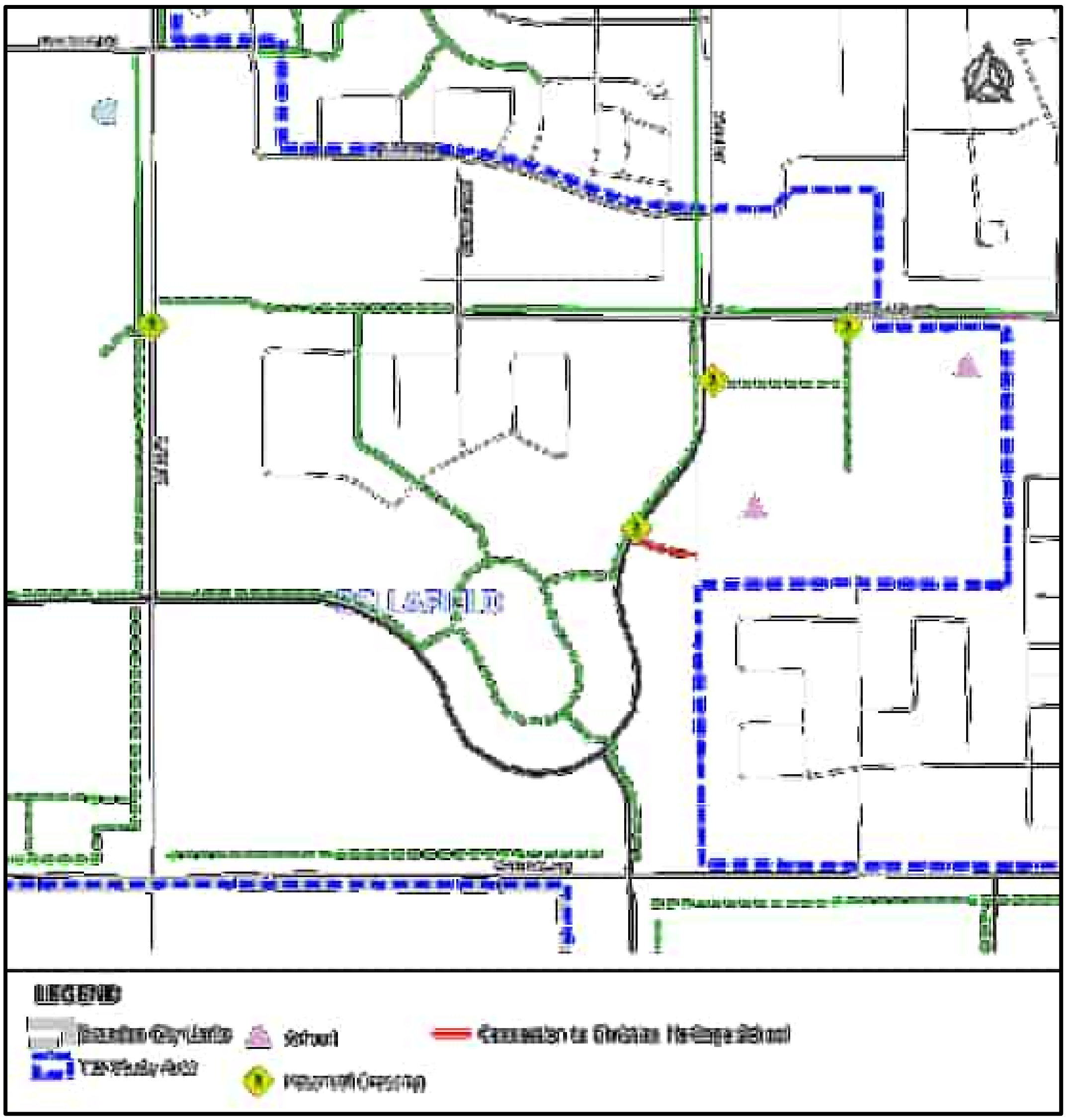


FIGURE 14: POTENTIAL ADDITIONS TO THE ACTIVE TRANSPORTATION NETWORK

External Connections

External connections are largely provided via the arterial street network (as is appropriate for longer distance trips) at 34th Street to the south and Patricia Avenue and Richmond Avenue to the west. Richmond Avenue and Patricia Avenue are approximately 1,600 m apart, and there are no collector-level east-west connections in the Brookwood North neighbourhood or in the Secondary Plan transport network for Brookwood South. It may be prudent to reserve space for a future collector street connection to the west in Brookwood South, on an alignment approximately 400 m north of Patricia Avenue. This would help to reserve capacity on Patricia Avenue for longer distance trips and provide a more direct connection to a future BSD school in Brookwood South. Alternatively, a connection could be limited to an active transportation connection.

It may also be prudent to provide external connections to the south, in addition to the connection on 34th Street. Those connections could be made via collector streets spaced at approximately 400 m west of 34th Street (where the extension of Lakeview Drive intersects Patricia Avenue) and at some offset east of 34th Street. Note that the Lakeview Drive extension should not be aligned with the arena access on Patricia Avenue approximately 350 m west of 34th Street, as that would preclude a continuous collector street connection to future development south of Patricia Avenue. If traffic signals or roundabouts were ever required on Patricia Avenue at Lakeview Drive, the arena could be connected to the intersection via a service road.

Proposed external collector street connections would allow for low speed, neighbourhood level connections between the SPA and the future development areas south of Patricia Avenue, while allowing 34th Street to preserve its capacity for a connection to PTH 110. Those connections could also give approximately 400 m intersection spacing on Patricia Avenue, an appropriate spacing for a suburban arterial street. The development of the areas south of Patricia Avenue is likely far into the future, so the near-term and medium-term direction for those connections would be to simply reserve right of way for their future implementation. Additional connections could be provided to that area via collector street extensions from the west edge of the Annex Lands. At a minimum, those connections should be active transportation connections.

Connections to the north are provided at the arterial level via 34th Street and 26th Street—spaced approximately 800 m apart—and at the collector level via Lakeview Drive and Marquis Drive. Those collector street connections are spaced approximately 400 m to 650 m from the parallel arterial streets. That provides a good density of connections for a suburban area like the SPA. However, Plateau Drive extends on a north-south alignment from Brookwood North into Brookwood South, and may provide an additional, local street level connection to the north of the SPA. The function and design of Plateau Drive should be considered carefully: its straight alignment, connection to Lakeview Drive, and extent could have it functioning like a collector street rather than a local street. Similarly, Marquis Drive provides a direct connection between Bellafield and 26th Street via Durum Drive. Development in Bellafield may result in Marquis Drive—and its south extension, Derlago Drive—serving a collector-type function. Traffic calming treatments are recommended on those streets. See Section 4.3.2.

Connections to the east are provided at Maryland Avenue and at Patricia Avenue, spaced at approximately 800 m apart. Development plans show a local street connection to Brentwood Village as an improvement on the existing informal connection via 26th Street. That connection will likely function more like a collector street than a local street, given that it may serve a significant portion of Brentwood Village, in addition to some of Bellafield.

Recommended external connections are shown on the summary recommendation diagram in Section 4.2.5.

4.2.2 Coverage

The study team reviewed collector street network coverage using a 200 m buffer radius from the collector streets in the proposed network. Figure 15 illustrates the results of the 200 m buffer.

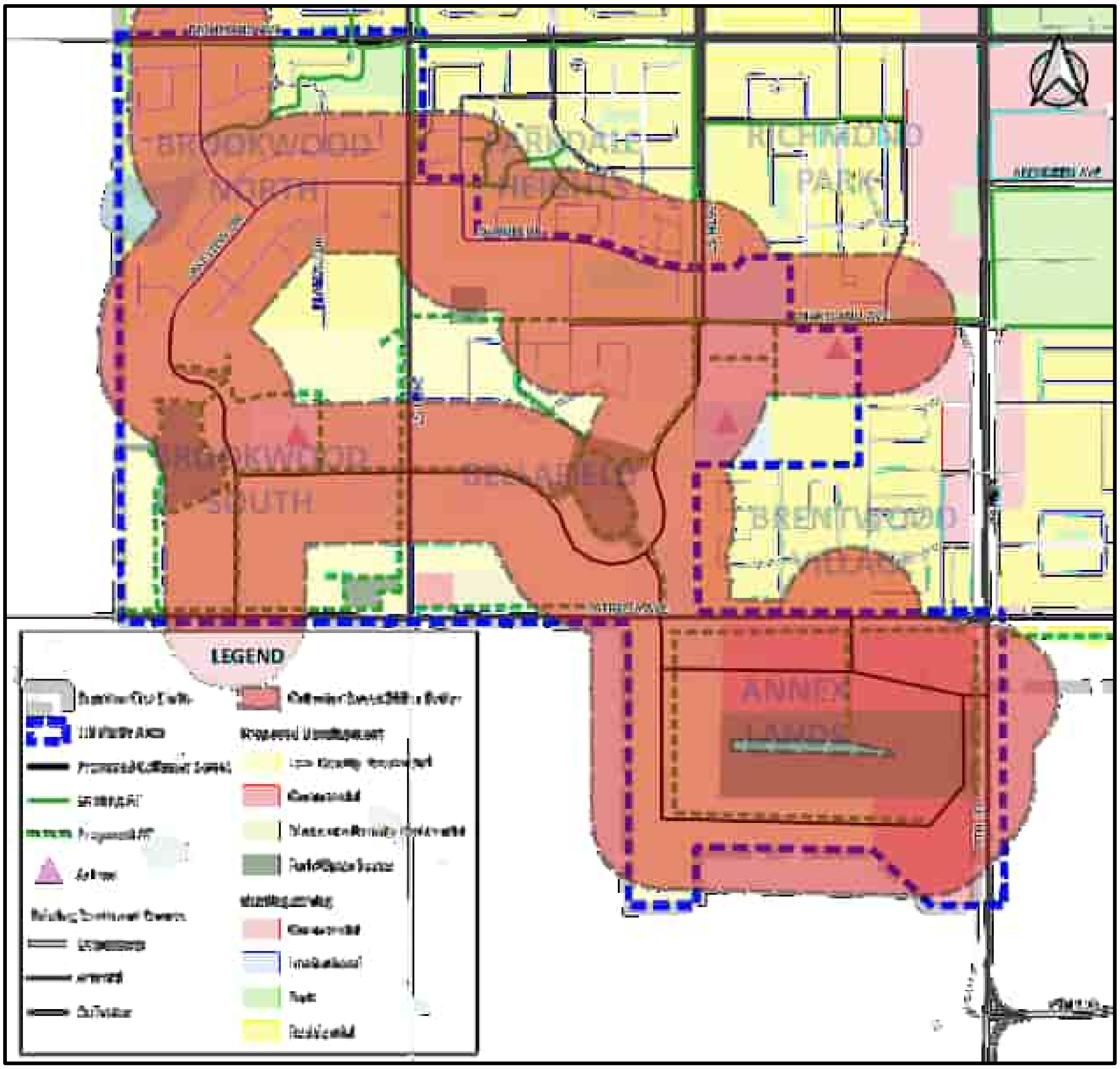


FIGURE 15: COLLECTOR STREET COVERAGE

Collector street coverage is best in the Annex Lands, where nearly all of the lands are within 200 m of a collector street. However, there areas more than 200 m from the collector network in other parts of the study area, largely along the arterial streets. This is a result of Brandon's strong access control on Arterial Streets, where intersections are largely limited to 400 m spacing. However, it may result in some local streets—such as Plateau Drive—functioning more like collector streets than local streets, as they end up serving areas larger than typical for a local street. This may create a need for traffic calming, as discussed in the next Section.

The study team reviewed the proposed active transportation (AT) network coverage with a 200 m buffer radius, representing cycling facility coverage. This is a typical network density used in suburban areas. Figure 16 shows the 200 m buffer applied to the study area.

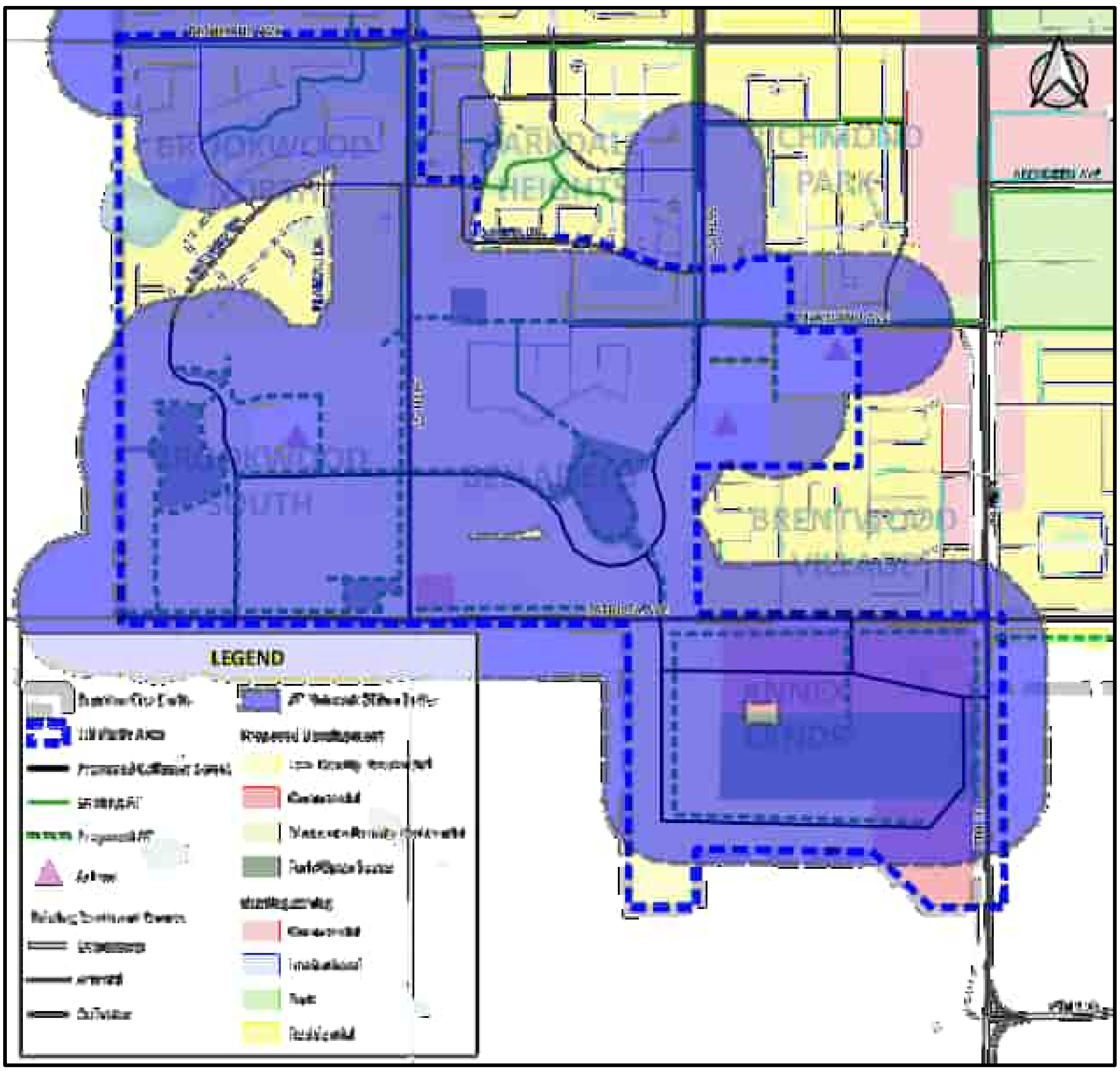


FIGURE 16: ACTIVE TRANSPORTATION NETWORK COVERAGE

The existing and proposed AT networks provide very good coverage in the study area, with almost the entire area covered, except for a portion of Brookwood North along Lakeview Drive. Lakeview Drive is a less than ideal street for an AT facility, due to the many driveways on the street: there would be frequent potential conflicts, reducing the quality of the cycling experience. The driveways would also preclude any physical separation—any barrier would have openings at such frequent intervals that it would cease to be an effective barrier. In contrast, Plateau Drive has fewer driveways, and is on an alignment more consistent with the desire lines shown on Figure 13. Traffic calming on Plateau Drive may allow it to function as a neighbourhood greenway.

4.2.3 Street Classification

The study team compared forecast daily traffic volumes to typical capacity thresholds from the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads* (GDG). That comparison provided insight into appropriate classifications for each collector and arterial street segment. The daily traffic volumes can also provide insight into potential need for widening two-lane sections to four-lanes.

The GDG gives the following typical volume ranges for roads and streets in urban contexts:

- Major Arterial Roads: 10,000 to 30,000 vehicles per day (vpd)
- Minor Arterial Roads: 5,000 to 20,000 vpd
- Collector Streets: ≤ 8,000 vpd (residential), 1,000 to 12,000 vpd (industrial, commercial)
- Local Streets: ≤ 8,000 vpd (residential), ≤ 3,000 vpd (industrial, commercial)

In the study team's judgement, widening from two lanes to four lanes could be considered when daily traffic volumes reach the 8,000 vpd to 12,000 vpd range. Below that range, two lanes likely provide sufficient capacity, and above that range four lanes are likely required to provide acceptable traffic operations performance. Note that decisions on widening should also consider the adjacent land use context (particularly whether adjacent land uses are fronting or backing onto the road) and lane requirements at intersections. Recommendations for widening are included at the end of this Section.

Figure 19 shows the forecast 2052 post-development traffic volumes. For context, Figure 17 shows the existing daily traffic, and Figure 18 shows the forecast traffic generated by development in the SPA between 2022 and 2052. Recall from Section 3.1 that traffic count data was focused on intersections on the arterial street network. As such, the study team did not have data on background traffic volumes on collector streets further into neighbourhoods and away from arterial streets—this is reflected in the figures for the background and post-development conditions.

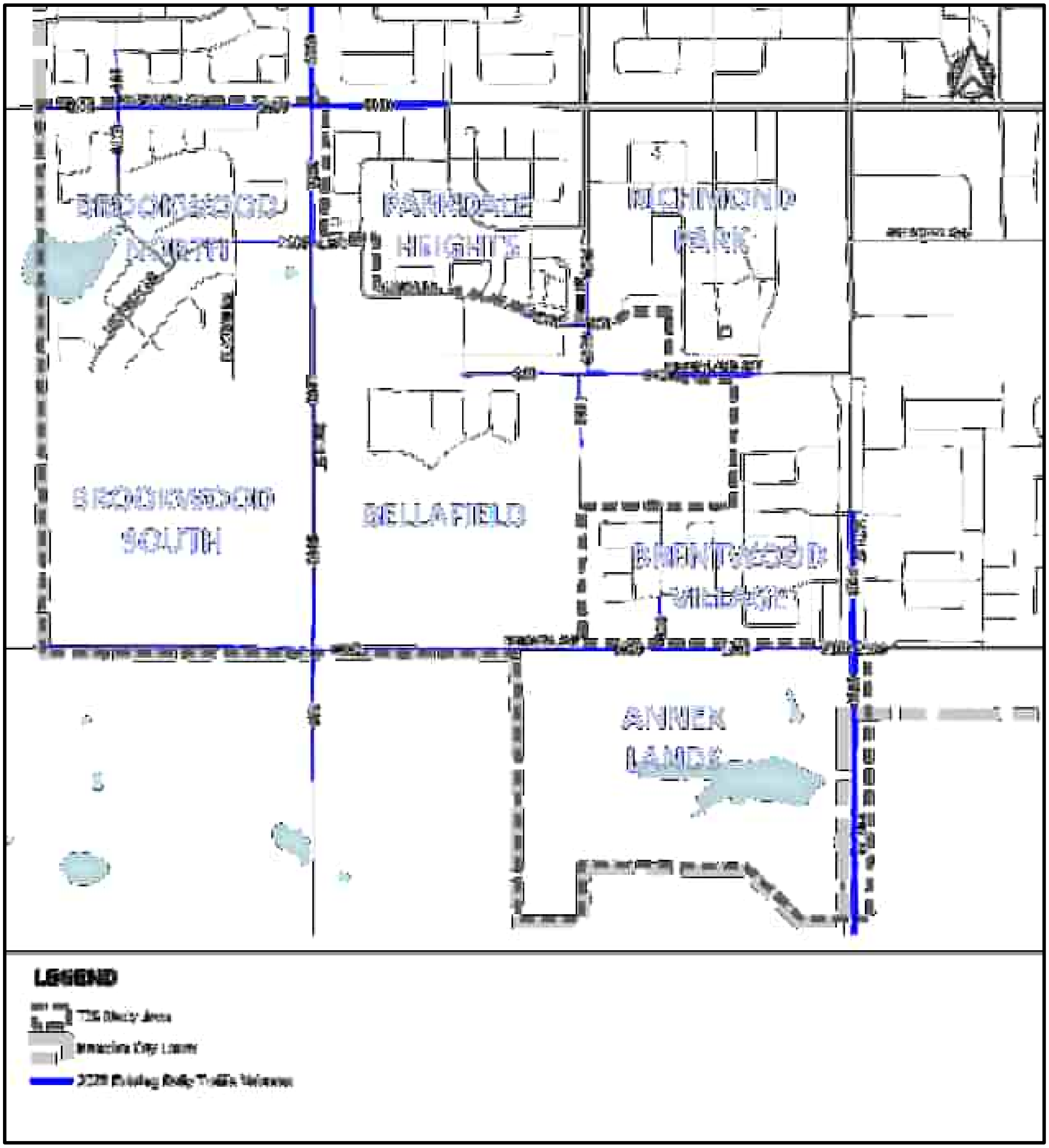


FIGURE 17: EXISTING BACKGROUND TRAFFIC VOLUMES

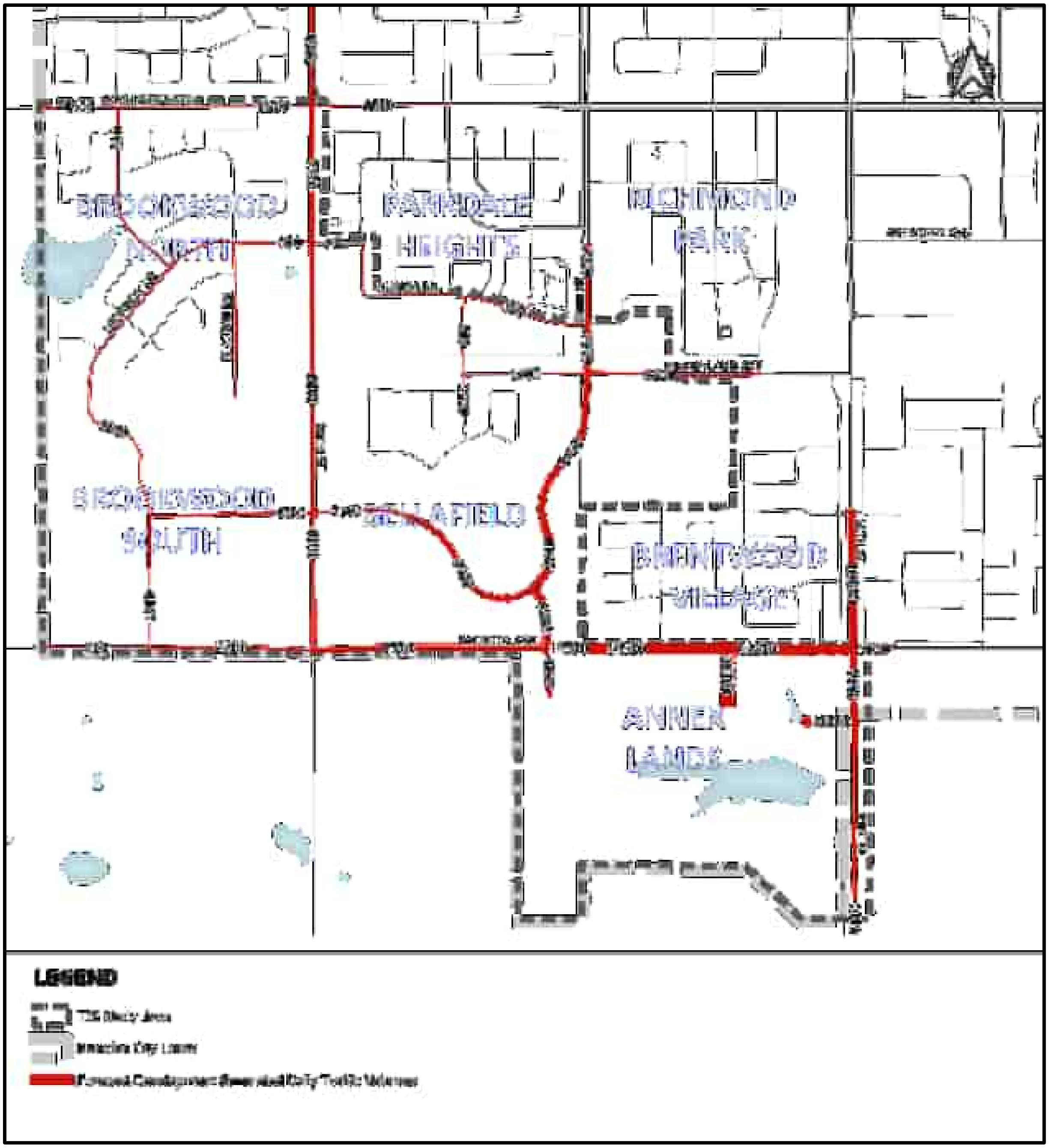


FIGURE 18: FORECAST FULL BUILD OUT DEVELOPMENT GENERATED DAILY TRAFFIC VOLUMES

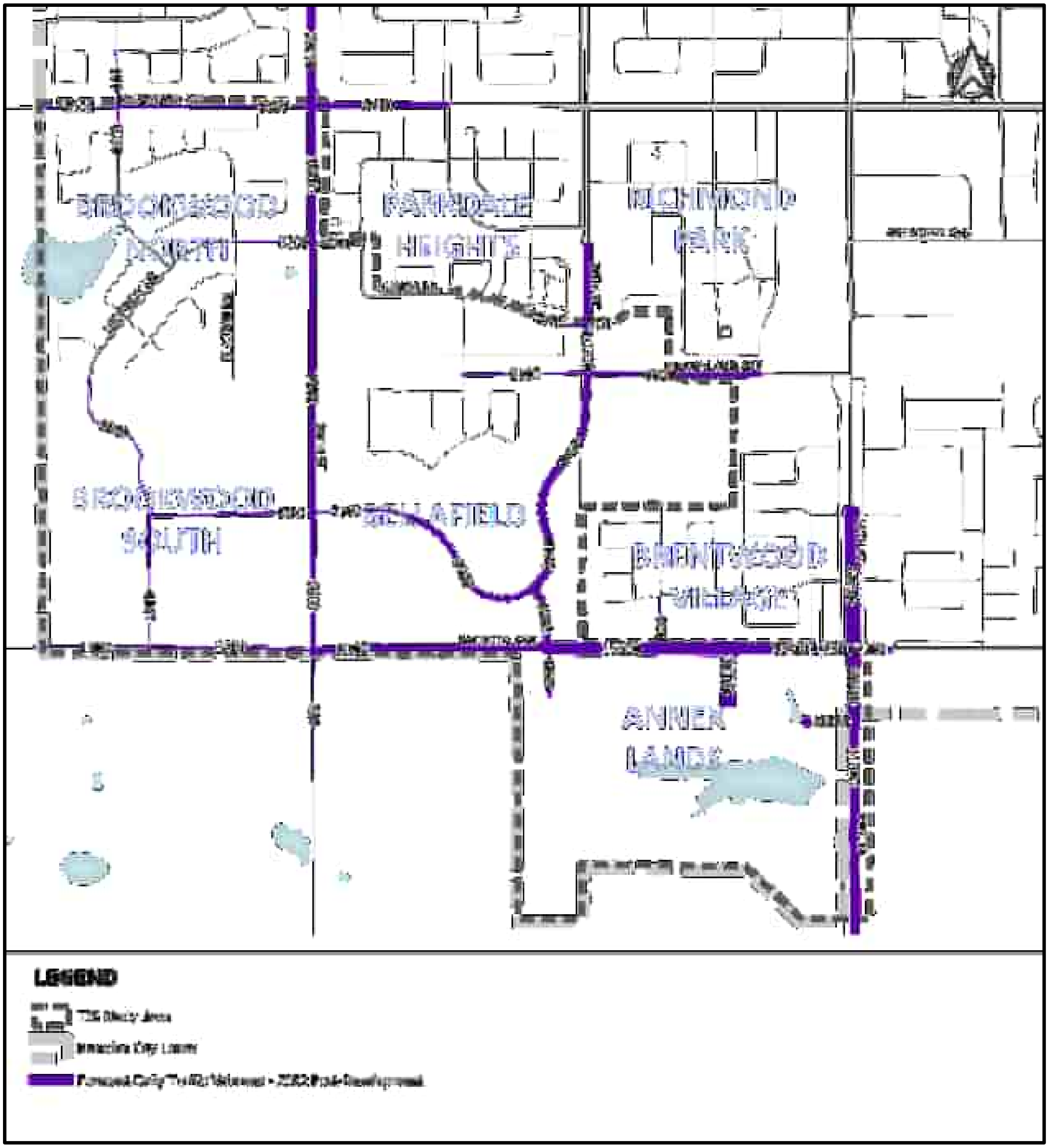


FIGURE 19: FORECAST 2052 POST-DEVELOPMENT DAILY TRAFFIC VOLUMES

The following points summarize the study team's findings with respect to classification:

- All streets currently classified as arterials (Richmond Avenue, Patricia Avenue, 34th Street, 18th Street, 26th Street) can maintain those classifications. Segments of Richmond Avenue and Patricia Avenue west of 34th Street are forecast to have volumes more like collector streets, but the arterial classification should maintain for continuity with the arterial classification (and volumes) east of 34th Street.

- Patricia Avenue should have its road surface improved from the existing aggregate surface west of Brentwood Trace to a paved surface through the study area.
- Traffic volumes are in the range where widening to four lanes could be considered on the following segments:
    - 34th Street from north of Richmond Avenue to Aberdeen Avenue
    - Richmond Avenue east of 34th Street
    - Patricia Avenue east of 34th Street to 18th Street
    - 26th Street north of Maryland Avenue through to the existing four lane segment
    - 18th Street through the study area
  - Widening is not equally appropriate on all of those roads: the highest volumes and minimal land use conflicts are present on 18th Street and on Patricia Avenue from 18th Street to 26th Street. Those segments should be widened to four-lane divided sections for the 2052 post-development scenario.
  - Traffic operations analyses found that intersections on the other segments could provide acceptable performance without four lane divided sections. Those streets should not be widened to four lanes.
- Volumes on the existing collector streets are consistent with typical volumes for collector streets. However, the proposed 26th Street extension in Bellafield has forecast volumes above the typical range for collector streets in residential areas, and the streets in the Annex Lands have forecast volumes at or above the typical range for collectors in commercial areas.
  - The function of 26th Street south of Maryland Avenue should be considered carefully—it can be designed to serve the traffic function as a potential minor arterial, but the increased traffic volumes would degrade the environment for pedestrians. This is discussed in more detail in the next section.
  - The proposed collector streets in the commercial portion of the Annex Lands can be considered for four-lane sections given the high forecast volumes and the proposed big-box commercial land use. That type of development is typically automobile oriented, so it is sensible to provide more capacity for traffic. In the residential portion of the annex lands volumes are forecast to be in the typical range for collector streets in residential areas.
- Local streets were not included in the study scope, but Plateau Drive and Marquis Drive are local streets that provide connections into the SPA, and some development generated traffic was assigned to those streets. The study team did not have data on existing traffic on those streets—so the total 2052 traffic could not be estimated—but the development generated traffic shown on Figure 18 included approximately 500 vpd on each of the streets. The combined existing

traffic and development generated traffic could easily exceed the typical volume range for local streets, and those streets could thus function more like collectors than locals. This could be particularly acute on Derlago Drive (the south extension of Marquis Drive), where development traffic is forecast to add 2,200 vpd south of Maryland Avenue. Those streets could be candidates for traffic calming, which is discussed in the next Section.

4.2.4 Active Transportation Facility Selection

In the study team's judgement, it would be appropriate to implement a policy of including sidewalks on both sides of collector streets. This would provide a base network for walking and would facilitate future transit service.

Provisions for cycling and walking off the collector street network are more complex. The study team reviewed the TAC GDG guidance on cycling facility selection. The following points summarize the findings:

- For AT off-street paths, multi-use paths are an appropriate facility. GDG Section 5.3.1.4 provides a recommended design domain of 3 m to 6 m. According to the GDG, a 3 m wide path can serve approximately 100 users per hour, assuming most users are pedestrians. This is likely sufficient for all off-street paths in the AT network. The main means of increasing capacity is widening the path to include a separate sidewalk.

- The GDG Section 5.4.1 indicates that streets with posted speed limits of 30 km/h to 50 km/h should have physically separated cycling facilities when traffic volumes are in the range of 4,000 vehicles per day (vpd) and/or when transit service is present. Per Figure 19, this applies to most of the proposed collector street network. For consistency and high-quality AT provision, it would be appropriate to include multi-use paths for all on-street paths on collector streets. Collector streets could include a path on one side, and a sidewalk on the other side.

- In Section 4.2.2, Plateau Drive was identified as a potential location for an additional AT facility. Plateau Drive may not have right-of-way for a separated path, but it will likely have traffic volumes below 4,000 vpd (existing traffic volumes were unavailable, see Figure 18 for forecast development generated traffic on Plateau Drive). In that context, Plateau Drive may be a suitable location for a neighbourhood greenway created through traffic calming. See 4.3.2 for more information.

4.2.5 Summary

The proposed collector street network and AT networks provide generally good connectivity and coverage, but the network could be improved with an active transportation crossing on 34th Street near the Maryland Avenue alignment, right-of-way can be reserved for potential future connections outside the study area, and some local streets may need traffic calming and/or active transportation facilities.

The existing arterial streets in the study area can retain their classifications for the forecast 2052 scenario, and the proposed collector streets can retain their classifications. Widening two four lane cross-sections is likely most appropriate for 18th Street and Patricia Avenue from 18th Street to the proposed 26th Street extension. In the 2052 scenario, Plateau Drive and Marquis Drive/Derlago Drive may have higher than typical volumes for local streets, so traffic calming should be considered on those streets.

It would be prudent to include sidewalks on both sides of collector streets in the study area. Multi-use paths are appropriate facilities for the proposed AT network in the SPA, including the on-street and off-street alignments. An AT facility on Plateau Drive would address the main gap in AT network coverage. A neighbourhood greenway may be an appropriate facility for that street.

Figure 20 illustrates the recommendations from the Network Structure Review.

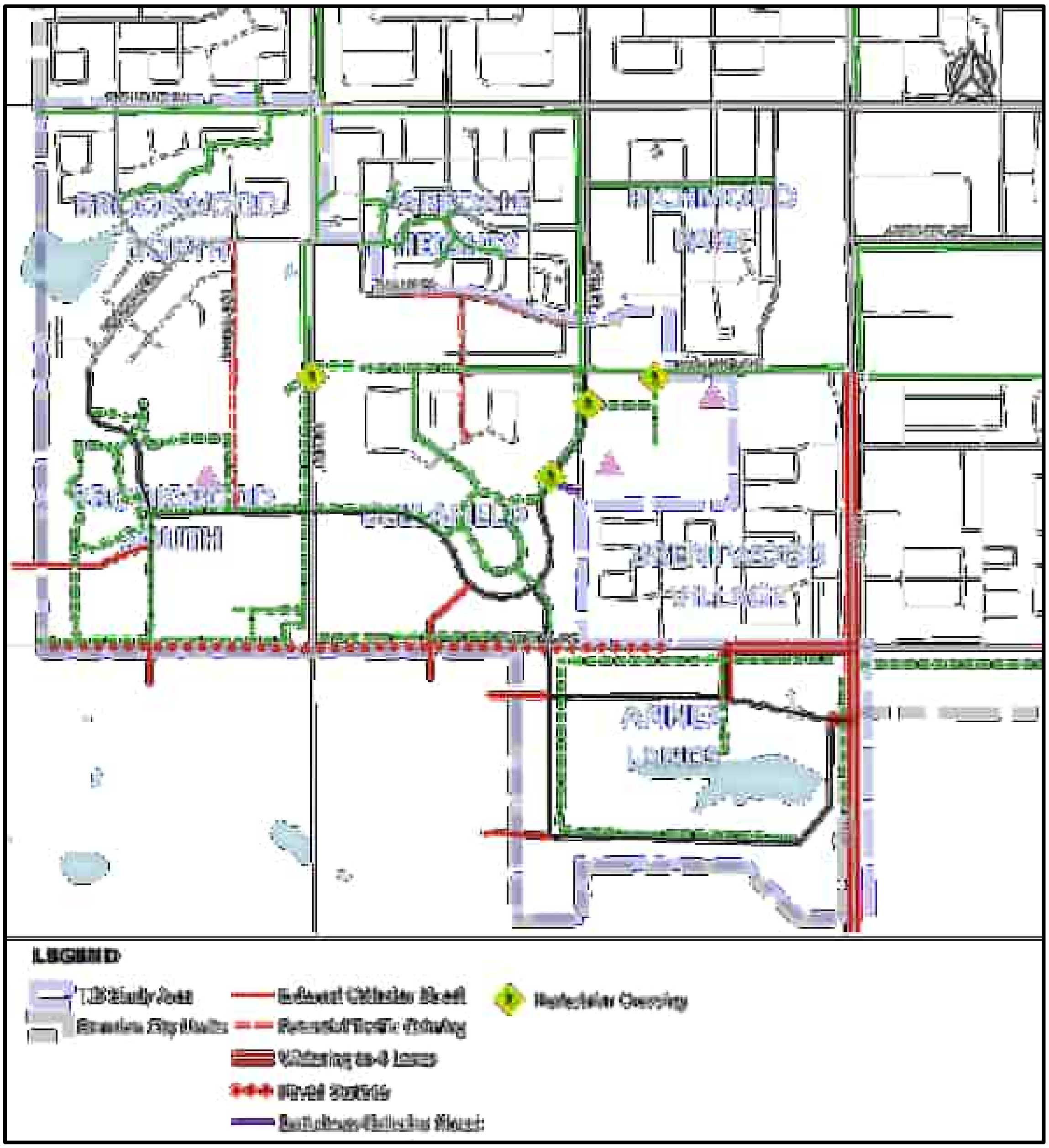


FIGURE 20: NETWORK STRUCTURE RECOMMENDATIONS

4.3 Safe Systems Review

A Safe Systems approach seeks to develop a road system consistent with human abilities and limitations. Considered broadly, safe systems can inform transport infrastructure design as well as vehicle design, road user education, and enforcement. Safe Systems approaches look to identify root issues and address them pre-emptively, rather than waiting for serious collisions before acting.

Vision Zero is an application of a Safe Systems approach, with an emphasis on fatal and serious injury collisions. In the Vision Zero approach, all transport fatalities are seen as preventable and thus unacceptable. Roads and streets designed from a Vision Zero approach are able to absorb human errors without resulting in human fatalities.

The study team evaluated the proposed collector street and AT networks against Safe Systems principles and identified areas where special attention may be needed to prevent safety issues from arising. Road function and traffic calming were considered as part of this review.

4.3.1 Safe Systems Principles

Figure 21 shows a Safe Systems principles summary graphic from the United States Federal Highway Administration (FHWA)[2].

FIGURE 21: FHWA SAFE SYSTEMS PRINCIPLES

[2] (U.S. Department of Transportation Federal Highway Administration 2022)

The Netherlands has applied a safe systems approach on the national level, with a simple approach centered around five principles, three of which deal with the design and structure of the transport network. Those principles are quoted directly from the 3rd edition of *Sustainable Safety*[3]:

- ***Functionality of Roads***
  Ideally, road sections and intersections have only one function for all modes of transport (mono-functionality): a traffic flow function or an exchange function. The road network ideally shows a hierarchical and functional structure of these functions.

- ***(Bio)mechanics***
  Ideally, traffic flows and transport modes are compatible with respect to speed, direction, mass, size, and degree of protection. This is supported by the design of the road, the road environment, the vehicle, and, where necessary, additional protective devices. For two-wheeled vehicles, it is important that the road and the road environment contribute to the stability of the rider.

- ***Psychologics***
  The design of the traffic system is well-aligned with the general competencies and expectations of road users, particularly senior road users. This means that for them as well as others the information from the traffic system is perceivable, understandable ("self-explaining"), credible, relevant and feasible…

According to the functionality principle, heavy or fast traffic flow is not compatible with frequent turning or crossing movements. The road network should be planned such that no road or street is expected to serve both functions at a high level. Instead, some facilities should be roads that prioritize traffic movement and thus manage access, while others should be streets that prioritize access and thus manage speed.

The biomechanics principles includes identification of safe speeds based on different types of potential conflicts. Figure 22 shows a summary from *Sustainable Safety.*

[3] (SWOV Institute for Road Safety Research 2018)

Potential conflicts and requirements associated with	Safe speed
• Possible conflicts between cars and vulnerable road users in home zones (pedestrians, cyclists and pedestrians using the carriageway)	15 km/h
• Possible conflicts with vulnerable road users on roads, at intersections, including situations with bike lanes or advisory bike lanes	30 km/h
• No conflicts with vulnerable road users, except with helmet-protected riders of motorized two-wheelers (mopeds in the carriageway) • Possible right-angle conflicts between motorized vehicles, possible frontal conflicts between motorized vehicles • Stopping sight distance ≥ 47 m	50 km/h
• No conflicts with vulnerable road users No right-angle conflicts between motorized vehicles, possible frontal conflicts between motorized vehicles Obstacles shielded or obstacle-free zone ≥ 2.5 m, (semi-)hard shoulder Stopping sight distance ≥ 64 m	60 km/h
• No conflicts with vulnerable road users No right-angle conflicts between motorized vehicles, possible frontal conflicts between motorized vehicles Obstacles shielded or obstacle-free zone ≥ 4.5 m, (semi-)hard shoulder Stopping sight distance ≥ 82 m	70 km/h
• No conflicts with vulnerable road users No right-angle or frontal conflicts between motorized vehicles Obstacles shielded or obstacle-free zone ≥ 6 m, (semi-)hard shoulder Stopping sight distance ≥ 105 m	80 km/h
• No conflicts with vulnerable road users No right-angle and frontal conflicts between motorized vehicles Obstacles shielded or obstacle-free zone ≥ 10 m, hard shoulder Stopping sight distance ≥ 170 m	100 km/h
• No conflicts with vulnerable road users No right-angle or frontal conflict between motorized vehicles Obstacles shielded or obstacle-free zone ≥ 13 m, hard shoulder Stopping sight distance ≥ 280 m	120 km/h
• No conflicts with vulnerable road users No right-angle or frontal conflict between motorized vehicles Obstacles shielded or obstacle-free zone ≥ 14.5 m, hard shoulder Stopping sight distance ≥ 315 m	130 km/h

FIGURE 22: SUSTAINABLE SAFETY SAFE SPEEDS BY CONFLICT TYPE

The safe speeds state that where pedestrians may share the road surface with vehicles (which often occurs on local streets without sidewalks), vehicles should operate at no more than 15 km/h. Where vehicles may interact with pedestrians or cyclists at intersections, speeds should be limited to 30 km/h. The safe speeds indicate that 50 km/h speeds are appropriate where pedestrians and cyclists are physically separated from vehicles, and intersections can allow right-angle or head-on conflicts between vehicles. Speeds higher than 50 km/h are only appropriate where there are no right-angle conflicts, which means that any junctions would require roundabout control—two-way stop control or signalized intersections would not be appropriate.

4.3.2 Application to Study Area

The study team considered how these principles would apply to the study area, under the headings of functionality, shortcutting, alignment, traffic calming, and other applications.

Functionality

Recall from the previous Section that the south extension of 26th Street has volumes in excess of 8,000 vpd—the typical top end volume for urban collector streets. A traffic-oriented planning approach might take that as an indication that 26th Street should be designed to prioritize traffic, with limits on accesses and (potentially) space reserved for future widening to four lanes. However, according to the functionality principle, if 26th Street is intended to serve more of a neighbourhood function with fronting residential development and frequent access, the design should instead prioritize managing vehicle speeds through traffic calming. The study team recommends that course of action for the 26th Street extension, given the neighbourhood context.

The proposed collector streets in the east (commercial) part of the Annex Lands have forecast volumes that are either at the top end of the typical range for collectors or well into the range for arterial streets. The commercial development is intended to have big-box style development—which is amenable to higher traffic volumes—so there may not be as much of a need for traffic calming on those streets. However, the functionality principle indicates that if there is an intent for frequent access points on the collector streets, the design should include speed management measures. Conversely, if there is a desire to provide efficient traffic movement on those streets, access points should be more limited.

The forecast development generated traffic volumes on Figure 18 present additional potential functional conflicts. Plateau Drive—a local street in Brookwood North intended to extend into Brookwood South—is forecast to see an additional 500 vpd from the remaining development in Brookwood North, and additional development in Brookwood South. The study team did not have a count of existing traffic volumes on Plateau Drive, but the forecast growth was equivalent to half of the typical daily volume on local streets in residential areas, indicating that the total volume including existing traffic may exceed the typical range for that type of street. Additionally, Plateau Drive has a straight alignment with a relatively wide (10 m) pavement. Plateau Drive may benefit from traffic calming.

A similar situation could develop on Marquis Drive extending north-south in Parkdale Heights and Bellafield, where development is forecast to add 500 vpd, and 2,200 vpd south of Maryland Avenue—more than the typical volume on local streets, without considering any existing traffic. That traffic is forecast to include 500 vpd bound for the west on Durum Drive. Recall from Section 2.3 that Durum Drive has drawn complaints about vehicle speeds, and it has a wide pavement. Those streets are also candidates for traffic calming.

Shortcutting

The study team considered that congestion may develop at intersections on 18th Street, and the southerly extension of 26th Street may present opportunities for short-cutting. This was not considered in the traffic volumes presented earlier, and it could result in volumes even greater than those shown on Figure 19. Figure 23 illustrates the potential congestion on 18th Street and the potential congestion avoidance route.

Note that the figure includes potential traffic signals on Patricia Avenue at 18th Street and at the access to the commercial area in the Annex Lands, per the results from the traffic operations analysis in Section 4.6.

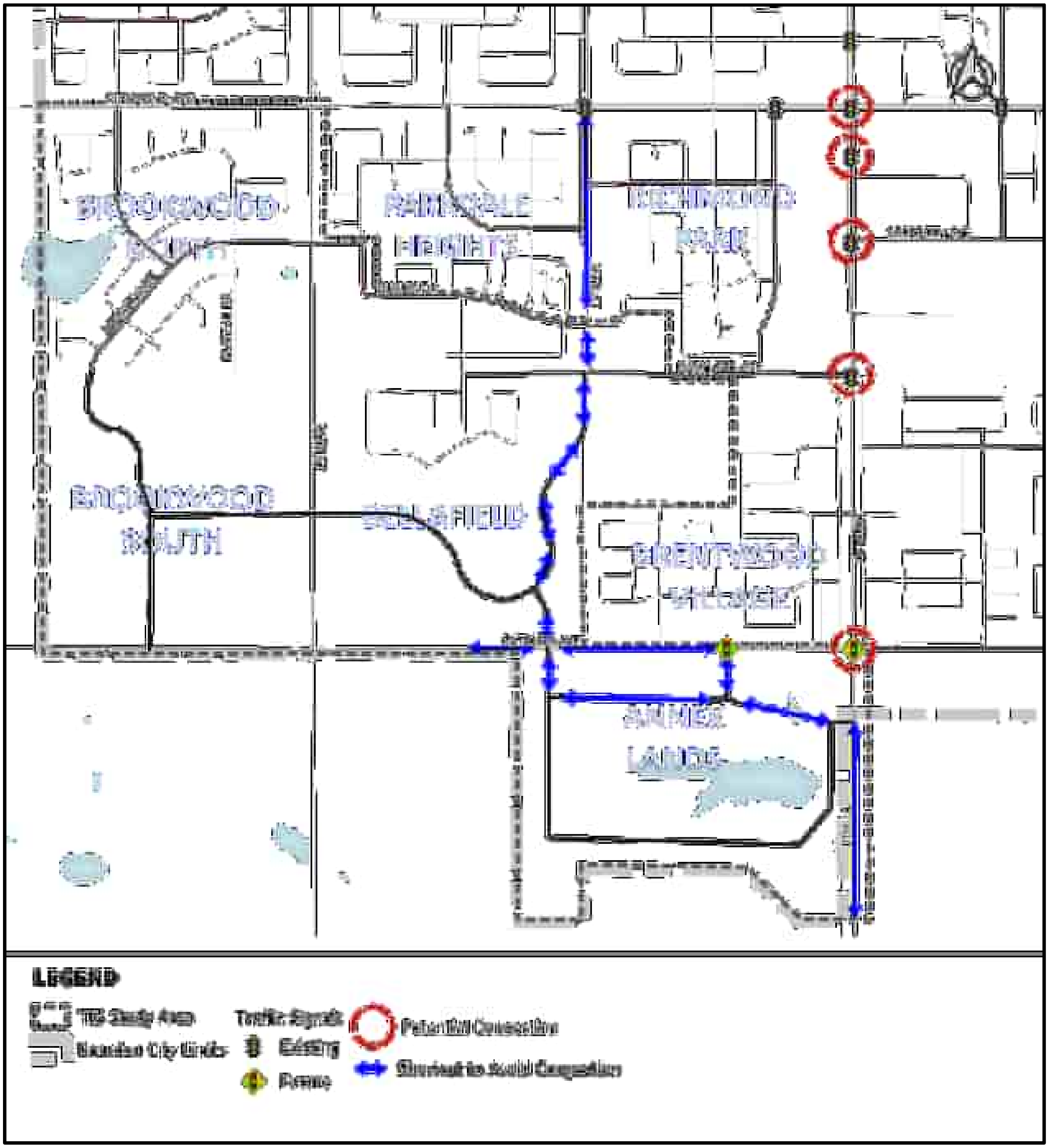


FIGURE 23: SHORTCUTTING TO AVOID CONGESTION

The attractiveness of 26th Street as a short-cut depends on relative differences in congestion between it and 18th Street, as well as the design and operation of 26th Street. This reinforces the need to prioritize either traffic flow (by limiting access and allowing for future widening) or access (by including speed limiting measures like traffic calming). A lower-than-typical speed limit, like a 40 km/h speed limit, could also be considered, in light of the findings from the 2022 40 km/h posted speed limit trial on Durum Drive.

Additionally, some motorists travelling between the study area and the south on PTH 10 may choose to use the collector streets in the Annex Lands to avoid congestion at 18th Street and Patricia Avenue. Those streets are forecast to have high traffic volumes independent of any shortcutting, so issues around high volumes may already be present.

Long and Straight Alignments

The study team was aware that long, straight segments on collector streets can enable vehicle speeds that are incompatible with a comfortable and safe environment for pedestrians. However, the study team did not have a metric to identify whether a given segment of collector street had an alignment that was too long and/or two straight.

The study team considered Durum Drive, where residents have complained about vehicle speeds. Durum Drive is not a perfect reference as it has a very wide pavement (approximately 12 m wide from curb to curb) that is not representative of typical collector street pavements. However, the study team considered the length of the long and relatively straight segments as a reasonable measure of where a collector street may be too long. The study team identified a segment approximately 300 m long on Durum Drive west of Marquis Crescent, and a segment approximately 325 m long east of Marquis Crescent. The study team thus identified other collector street segments in the study area with straight or gently curved alignments and lengths of at least 300 m. Measurements were taken on street segments between traffic control devices (stop signs, roundabouts, traffic signals) and segments with more significant curves.

Figure 24 shows the collector street segments that met that threshold, along with some other segments with lengths noted for reference.

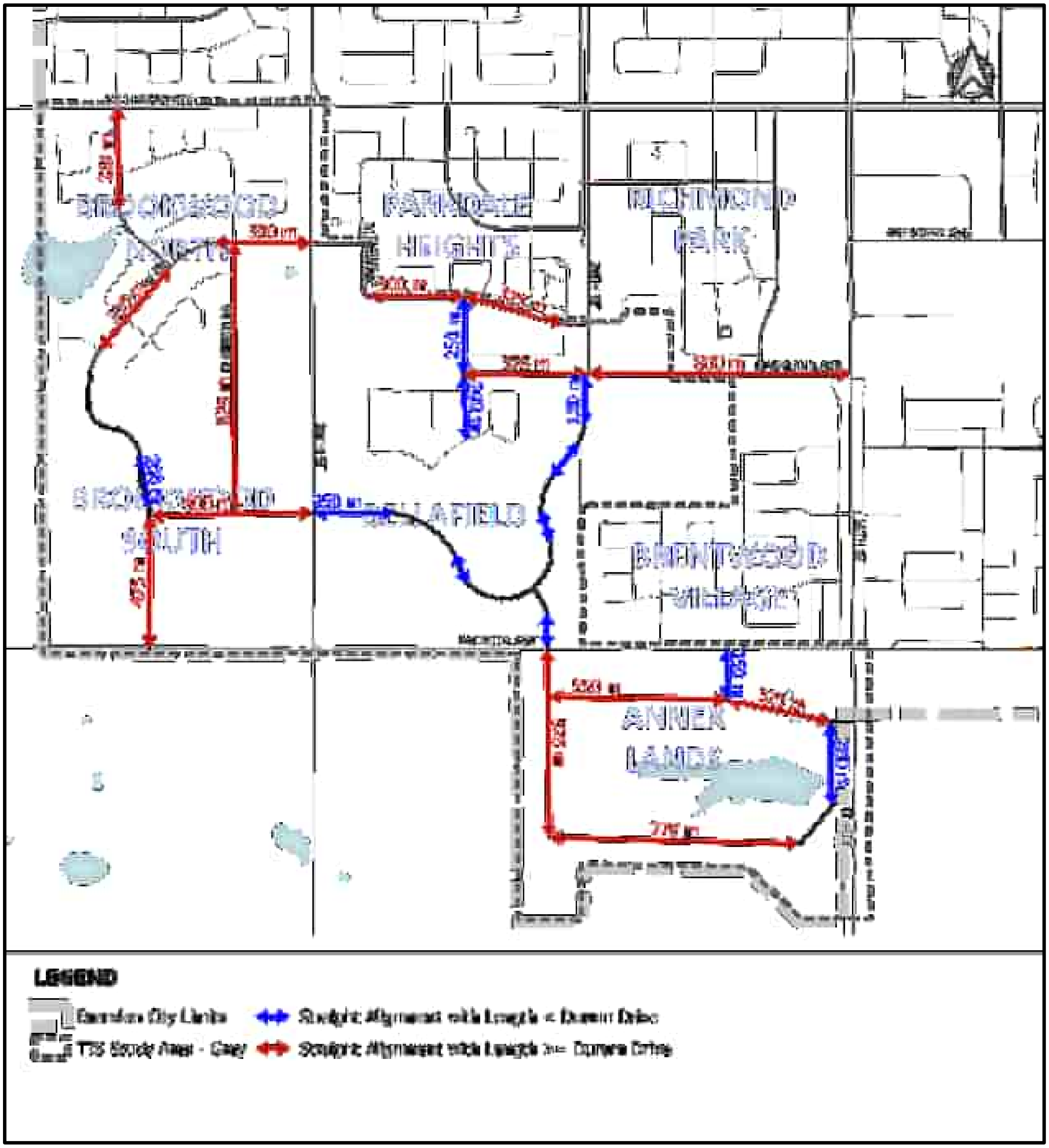


FIGURE 24: COLLECTOR STREETS WITH LONG STRAIGHT ALIGNMENTS

Existing segments of Lakeview Drive and Brookwood Drive (in Brookwood North) had straight or gently curved segments at least 300 m long. Similar—and longer—lengths were identified in Brookwood South (including Plateau Drive with an 825 m long segment) and the Annex Lands. Maryland Avenue had long and straight segments on either side the intersection with 26th Street, including a segment approximately 800 m long from 26th Street to 18th Street. Note that while Marquis Drive may draw increased traffic volumes, the segments lengths are less than Durum Drive, which may help to control speeds.

The segments listed above would potentially enable high vehicle speeds, and thus may be candidates for traffic calming treatments.

Note that while the 26th Street extension is forecast to see high traffic volumes, the alignment includes many substantial curves, and straight segments are limited in length. That may help to control speeds, although traffic calming may still be appropriate.

Traffic Calming

The study team consulted the TAC *Canadian Guide to Traffic Calming* for guidance on selecting traffic calming measures for the candidate streets noted in the previous subsections. The *Guide* notes that it is important to understand the problem(s) that traffic calming is attempting to solve—different problems may require different solutions.

Traffic calming could address:

- **High traffic volumes** like those forecast on the 26th Street extension and on Derlago Drive (Marquis Drive) south of Maryland Avenue and on the collector streets in the Annex Lands. High traffic volumes can make the street environment less inviting to pedestrians due to increased noise and emissions and reduced crossing opportunities.
- **High speeds** which are possible on Plateau Drive, Durum Drive, and Maryland Avenue given the combination of straight alignments and wide pavements. High speeds give motorists less time to recognize and avoid conflicts and collisions and increase the severity when collisions do occur.

From the *Guide* and the study team's judgement, the following treatments are appropriate means of addressing those issues:

- **Roundabouts** as intersection traffic control devices with traffic calming properties, via the horizontal deflection that vehicles experience when they enter, circulate, and exit the roundabout. Roundabouts thus help to limit vehicle speeds, and the central island provides space for landscaping.
- **Curb Extensions** which narrow the pavement width to as little as 6 m. The reduced freedom for vehicle movement can help to reduce speeds and volumes, as discretionary vehicle trips may divert to other streets. Curb extensions also narrow crossing distances for pedestrians and make pedestrians more visible to drivers. They can also provide space for streetscaping treatments.

  Figure 25 shows an example of curb extensions from Rosser Avenue in Downtown Brandon.

FIGURE 25: CURB EXTENSION IN BRANDON (SOURCE: GOOGLE STREETVIEW)

- **Speed Cushions** are similar to speed bumps or tables in that they include vertical deflection, but the raised elements are not continuous across the whole pavement. The cushions are spaced such that vehicles with wider axle spacing (like buses and emergency vehicles) can navigate through the cushion without being deflected, while passenger vehicles traverse the cushion and thus limit their speed. This treatment is primarily effective at reducing speeds.

  As far as the study team is aware, speed cushions have not been used in Manitoba. They have been used in Ottawa. Figure 26 shows an example from the City of Ottawa.

FIGURE 26: SPEED CUSHION IN OTTAWA (SOURCE: CITY OF OTTAWA)

- **Raised Crossings** involve changing the grading of pedestrian crossings to be more continuous with the sidewalk, thus imposing some vertical deflection on vehicles and improving motorist visibility of pedestrians. These can be paired with curb extensions to provide high quality pedestrian crossings.

  Figure 27 shows an example of a raised crossing, from a mall in suburban Winnipeg.

FIGURE 27: RAISED CROSSING IN WINNIPEG (SOURCE: GOOGLE STREETVIEW)

For all treatments, winter maintenance can be somewhat complicated as compared to an untreated street. Uncareful maintenance can result in damage to the treatments.

The following points outline the study teams recommendations for traffic calming, applied to the study area:

- Collector streets in Manitoba often have pavement widths of approximately 10 m. This allows for parking on one side and one lane of travel in each direction. However, when parking is not utilized, there is little side friction for vehicles, and speeds can increase to levels that are uncomfortable for the community—like on Durum Drive. If curb extensions were included as a standard treatment on collector streets, they would provide some friction without relying on parking utilization. The extensions would also improve motorists' visibility of crossing pedestrians and reduce pedestrian crossing distances. Costs can be negligible—and potentially net negative—if road slabs are truncated at the extensions. In the study team's judgement, this combination of benefits is worth the disbenefit of more difficult snow clearing, and curb extensions should be included on all new collector streets in the SPA. New collector streets can thus have a 10 m pavement width, narrowed to 6 m to 7 m at all street intersections. This provides between 3 m and 3.5 m in each direction at the curb extensions.
    - Curb extensions can also be considered as a retrofit on both sides of Durum Drive (12 m pavement width) and on one side of Plateau Drive (10 m pavement width).

  - Marquis Drive/Derlago Drive appears to have an 8 m pavement, so there is more inherent friction and less need for extensions.
  - Maryland Avenue has a rural cross-section and a pavement width of approximately 7 m. Curb extensions are not feasible with that design.
  - Existing segments of Lakeview Drive have dual 6 m wide pavements separated by a median. That cross-section avoids the 10 m clear pavement width noted above. As such, curb extensions are less critical for existing Segments of Lakeview Drive. However, they could be considered for traffic calming if there is reason to believe that the 6 m clear width is contributing to unacceptable vehicle speeds.
  - Brookwood Drive has a pavement width of approximately 10 m in the segments between Aurora Crescent and Lakeview Drive, a length of approximately 265 m. Those segments could be considered for curb extensions if vehicle speeds are unacceptable.

- Speed cushions can be added where speeding issues are present. This could include Durum Drive—although it may be worthwhile to record data on speed changes and community perception of speed after curb extensions are installed—and Maryland Avenue. Speed data can also be used to determine whether cushions are required to bring speeds on Maryland Avenue closer to the 50 km/h posted speed limit. Speed cushions could also be added to Derlago Drive / Marquis Drive if speeding issues occur.

  Speed cushions would be appropriate as a pre-emptive treatment on Plateau Drive, to help limit vehicle speeds to 30 km/h and thus allow Plateau Drive to function as a neighbourhood greenway.

- Raised crossings can be added at locations with high crossing demand. This could include intersections around the proposed BSD School in Brookwood South, intersections in Brookwood South where collector streets have moderate-density development on one side and a park on the other side, and near the access to Brentwood Village, which also provides access to Christian Heritage School. Raised crossings are less appropriate on Maryland Avenue near the DSFM school, due to the rural cross-section on Maryland Avenue.

- Traffic calming with curb extensions would be appropriate for the collector street in the residential portion of the Annex Lands, but less appropriate in the commercial areas where four lane sections will be present. Speed cushions can be considered where speed issues arise, and raised crossings can be considered at key locations, which will likely be driven by the location of key generators—details which were not available when this TIS was completed.

Figure 28 illustrates the recommended traffic calming treatments. For context, the figure also shows the existing and proposed AT path network, the location of schools, and roundabouts proposed in the Secondary Plan or found to be required from the traffic operations analysis in Section 4.6.

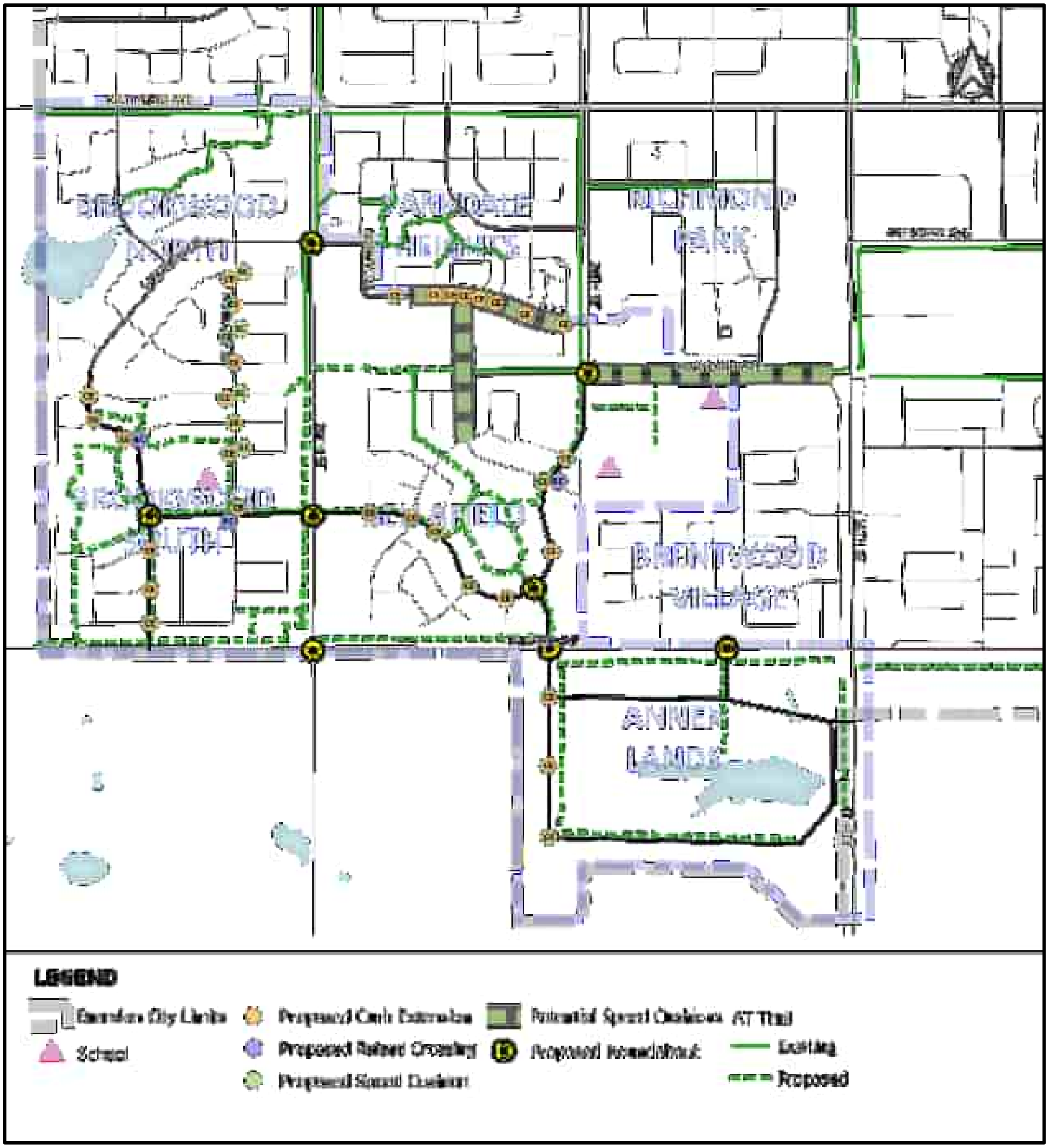


FIGURE 28: RECOMMENDED TRAFFIC CALMING TREATMENTS

Other Applications

The following points outline the study team's judgement for additional ways that Safe Systems principles would apply to the study area:

- Roundabouts force vehicles to travel slowly at junctions, which is consistent with the functionality and biomechanics principles. Traffic signals rely on separating conflicting traffic flows in time, while still allowing higher speeds through the intersection. Roundabouts are the preferred intersection treatment for managing vehicle speed and reducing the potential for severe conflicts.

- Two-way stop-controlled intersections allow right-angle conflicts, and should not be used on streets where vehicles operate at speeds greater than 50 km/h. This is consistent with access management principles which limit uncontrolled access points on higher-speed roads, although the 50 km/h cut-off is likely lower than typically used thresholds for considering roads unsafe for uncontrolled access.
  - Access to lands along higher-speed roads should be provided via other, lower-speed streets, or via frontage roads that connect to the higher-speed road at junction with signalized or—ideally—roundabout control.
- Vehicles should be limited to 30 km/h operating speeds where cyclists are intended to operate on the street but are not provided with physically separated facilities.
  - Streets intended for use by cyclists should have physically separated facilities, or they should operate as traffic calmed streets with 30 km/h operating speeds.
- Aberdeen Avenue approaches Durum Drive with a pavement that is approximately 7 m wide, widening to 13 m—wide enough for four lanes—at the "T" intersection where Aberdeen Avenue ends. City of Brandon staff indicated that motorists are sometimes confused by that change in pavement width. The wide pavement and lack of landmarks (such as a raised median) mean that motorists approaching on Aberdeen Avenue do not always make right or left-turns from the same location, and motorists turning onto Aberdeen Avenue from Durum Drive may not always turn to the same part of the pavement. This violates the Psychologics principle, which states that the street environment should be understandable and consistent with user expectations. This can be addressed by either reducing the pavement width to a width more typical for streets with one lane in each direction. The study team's recommended design is included in Section 5.

4.4 Transit Review

Recall from Section 2.4.4 that the existing transit network near the study area is focused around providing service to Downtown, with routes running primarily north-south in looping patterns, with northbound and southbound service often separated by distances of 800 m or more. Looping patterns at that spacing do not allow any locations to be within close distance of service in both directions. A residence may be within 100 m of southbound service, but would then be 700 m or more from northbound service. There is limited east-west service to serve neighbourhood to neighbourhood trips.

The study team proposed service extensions with the goal of providing service in both directions on centrally located collector streets within the study area, to maximize the number of residences and destinations that would be within short distances of transit service.

Figure 29 shows the proposed service extensions.

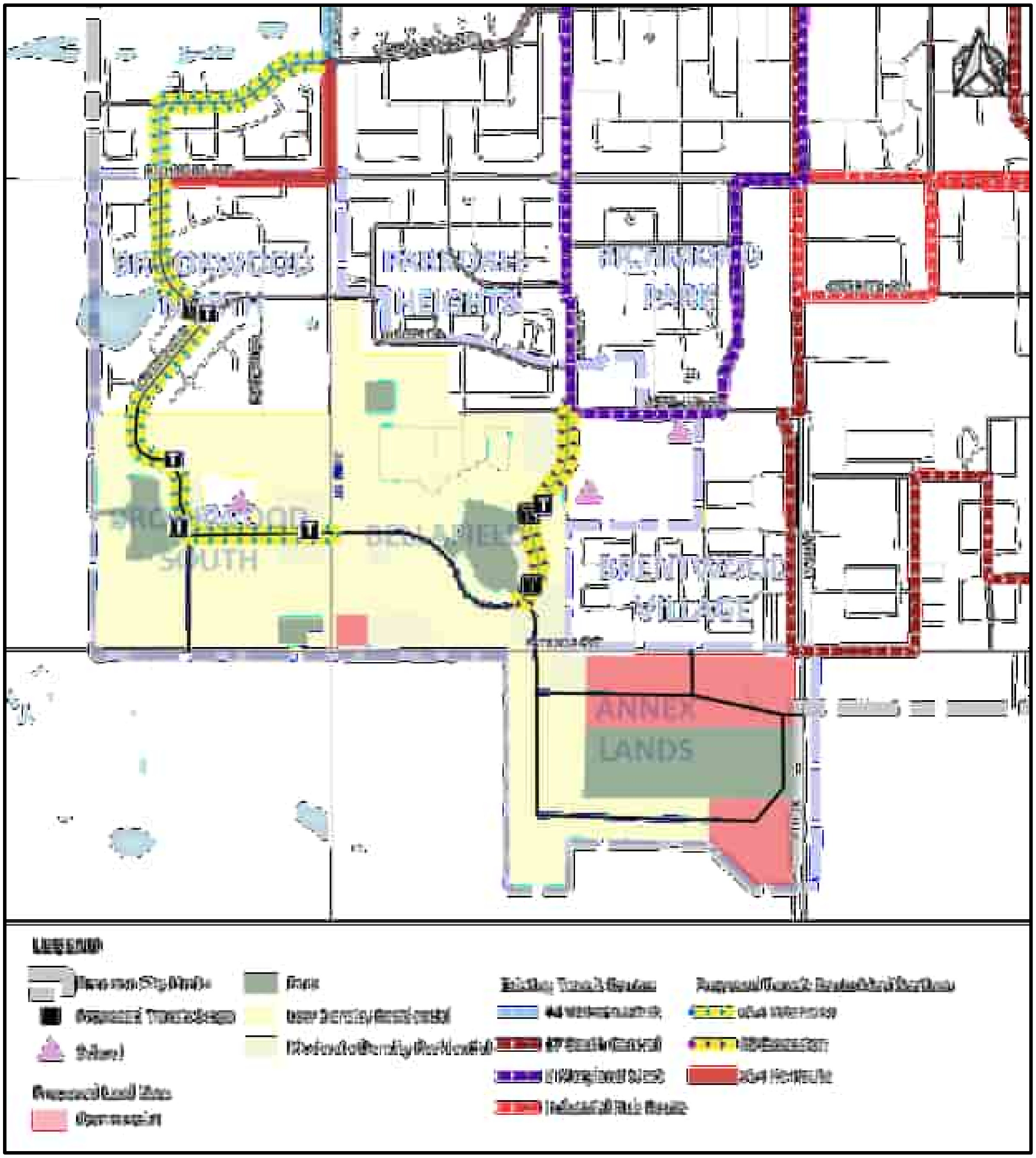


FIGURE 29: EXISTING AND PROPOSED TRANSIT SERVICE

Route 14 could be extended south through Brookwood North on Brookwood Drive and Lakeview Drive, continuing into Brookwood South, before turning onto the proposed east-west collector street, and then ending the route by turning around at the roundabout on 34th Street. The route would then return north via the same route on the east-west collector street, Lakeview Drive, and Brookwood Drive.

Route 8 could be extended south into Bellafield on 26th Street, turning around at the roundabout at the proposed east-west collector street.

New transit stops could be located in Brookwood North near the intersection of Lakeview Drive and Brookwood Drive, in Brookwood south near the intersection of Lakeview Drive and the proposed east-west collector, and further east on that collector near moderate density residential development just west of 34th Street. Additional stops could be added in Bellafield near the connection to Brentwood Village and Christian Heritage School, and near the intersection of 26th Street and the proposed east-west collector.

The study team considered that an extension of Route 17 into the Annex Lands may only bring service 100 to 200 m further into the Annex Lands—a relatively small benefit—but would incur several more turns in the route and potentially more movements through signalized intersections, which would lead to a longer running time for the route. That would entail reduced frequency on the route and/or a requirement for more resources to service the route. The study team considered that the benefits may not justify the costs.

There may be merit to a wider network study to provide better east-west and neighbourhood-to-neighbourhood service, as opposed to the existing Downtown-focused network, and/or moving away from the loop-pattern network. However, this was outside the scope of the TIS.

4.5 Emergency Access and Truck Route Review

The study team understands that the City of Brandon typically considers an area to have acceptable emergency services access if access is provided from at least two arterial streets, or—where that is not possible—two accesses from the same arterial street.

The collector street network allows each part of the study area to be connected to have multiple connections to the arterial street network, as shown in Figure 30.

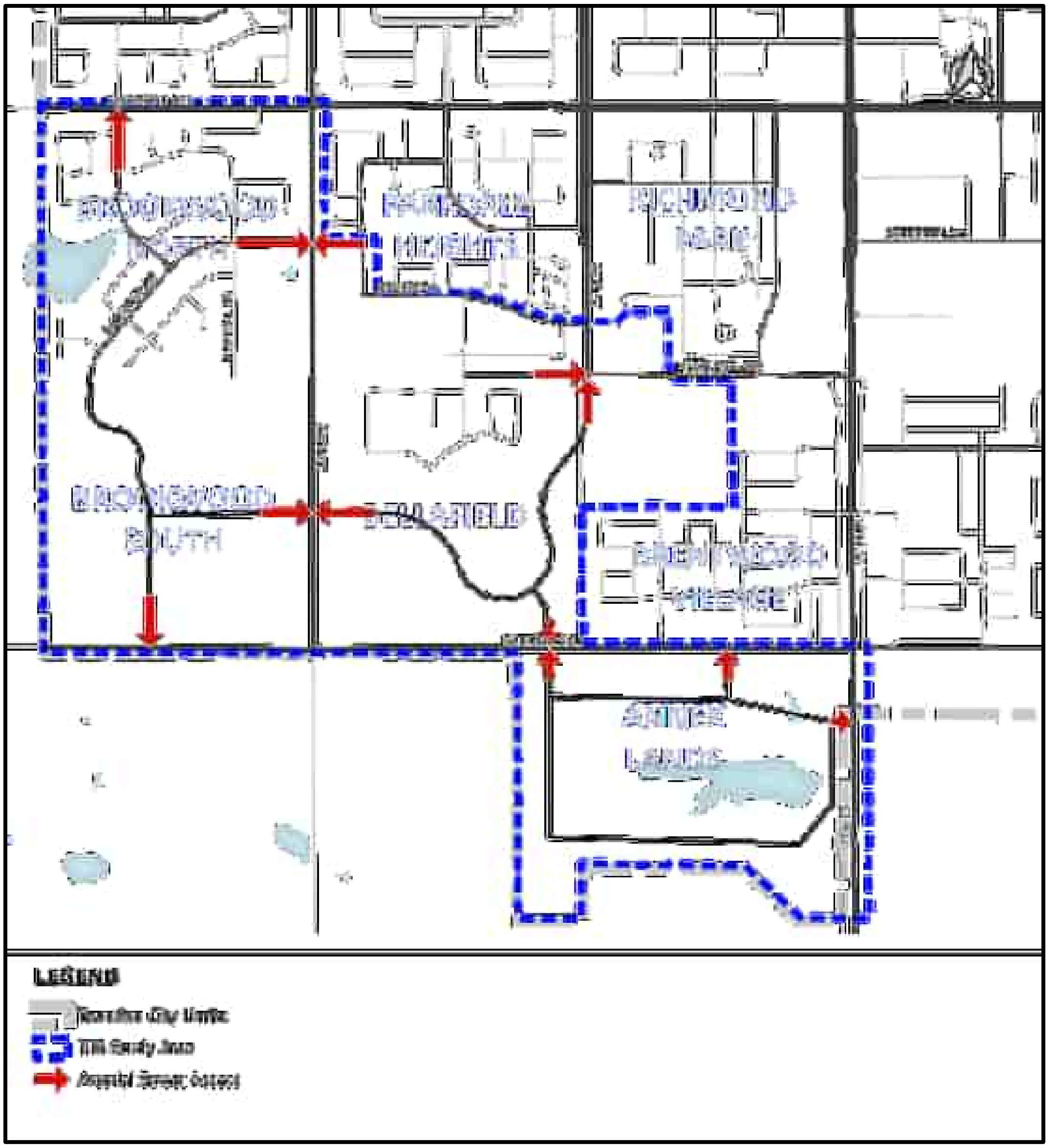


FIGURE 30: EMERGENCY ACCESS CONNECTIONS

Recall from Section 2.4.2 that the existing truck route network in the study area is limited to 18th Street. Commercial development in the Annex Lands would likely be the only part of the SPA development to generate significant truck trips, and that area is accessible directly from 18th Street. The study team judged that no expansion of the truck route network would be required to service the SPA. Additionally, the potential expansion of the truck route network to include 34th Street and Patricia Avenue (see Section 2.4.2) would be compatible with the proposed development in the SPA.

4.6 Traffic Operations Analysis

Traffic operations were analyzed based on the methodology outlined in the U.S. Transportation Research Board's *Highway Capacity Manual 2000* (HCM), using the *Synchro Studio 9* software package. Synchro returned performance measures including delay, LOS, volume to capacity ratios, and queue estimates. Appendix A includes definitions for the different LOS categories, and Appendix C includes analysis reports.

Analyses were completed for all of the study intersections listed in Section 1.1. Analyses were conducted for AM and PM peak hour conditions for the 2022 existing conditions scenario and the 2052 post-development scenario representing full build out. Analyses for interim scenarios are discussed in the sensitivity analysis in Section 4.9.

For each scenario, overall intersection performance is reported in terms of delay and level of service. Individual movement performance is reported for “notable movements” where performance was nearing (or at) unacceptable levels. Notable movements were defined as movements where operations met at least one of the following criteria:

- LOS D or worse
- Volume to capacity (v/c) ratio of 0.75 or more
- 95th percentile queue length exceeds available storage

For movements meeting at least one of the criteria, performance is reported in terms of LOS, delay, v/c ratio, and 95th percentile queue lengths.

The study team considered further analysis with modified intersections configurations where movements met at least one of the following criteria:

- LOS F or worse
- v/c ratio of 0.95 or more
- 95th percentile queue length exceeds available storage

Any modifications found to be required for the 2022 existing conditions scenario were carried forward to the 2052 post-development scenario.

4.6.1 Analysis Assumptions

The following points outline analysis assumptions:

- Saturated flow rates were set to a default value of 1,900 vehicles per hour per lane (vphpl).
- Operating speeds were set to the posted speed limits.
- In the analysis for the existing scenario, Peak Hour Factors (PHFs) were based on observed PHFs from the existing traffic counts, as noted in Section 3.1.1. Where PHFs were not available, they were set to a default value of 0.92. For the 2052 scenario, PHFs were assumed to regress to the default value of 0.92.
- Heavy vehicle percentages (HV%) were set using the following assumptions:
    - Arterial street through movements: 5%
    - Movements to/from collector streets: 2%

  - Movements to/from the south at 34th Street and Patricia Avenue: 10%, given that an industrial facility is the main generator in that area

- In analyses with traffic signals, signal timings were set based using Synchro's signal timing optimization features, with additional tweaks by the study team.
- Analyses with traffic signals assumed 4 second amber intervals and 2 second all-red intervals for all traffic signal phases.
- Roundabouts were modeled using the roundabout methodology from the 2010 version of the HCM.

4.6.2 Intersection Configurations

Figure 31 illustrates the existing intersection configurations at the existing study intersections.

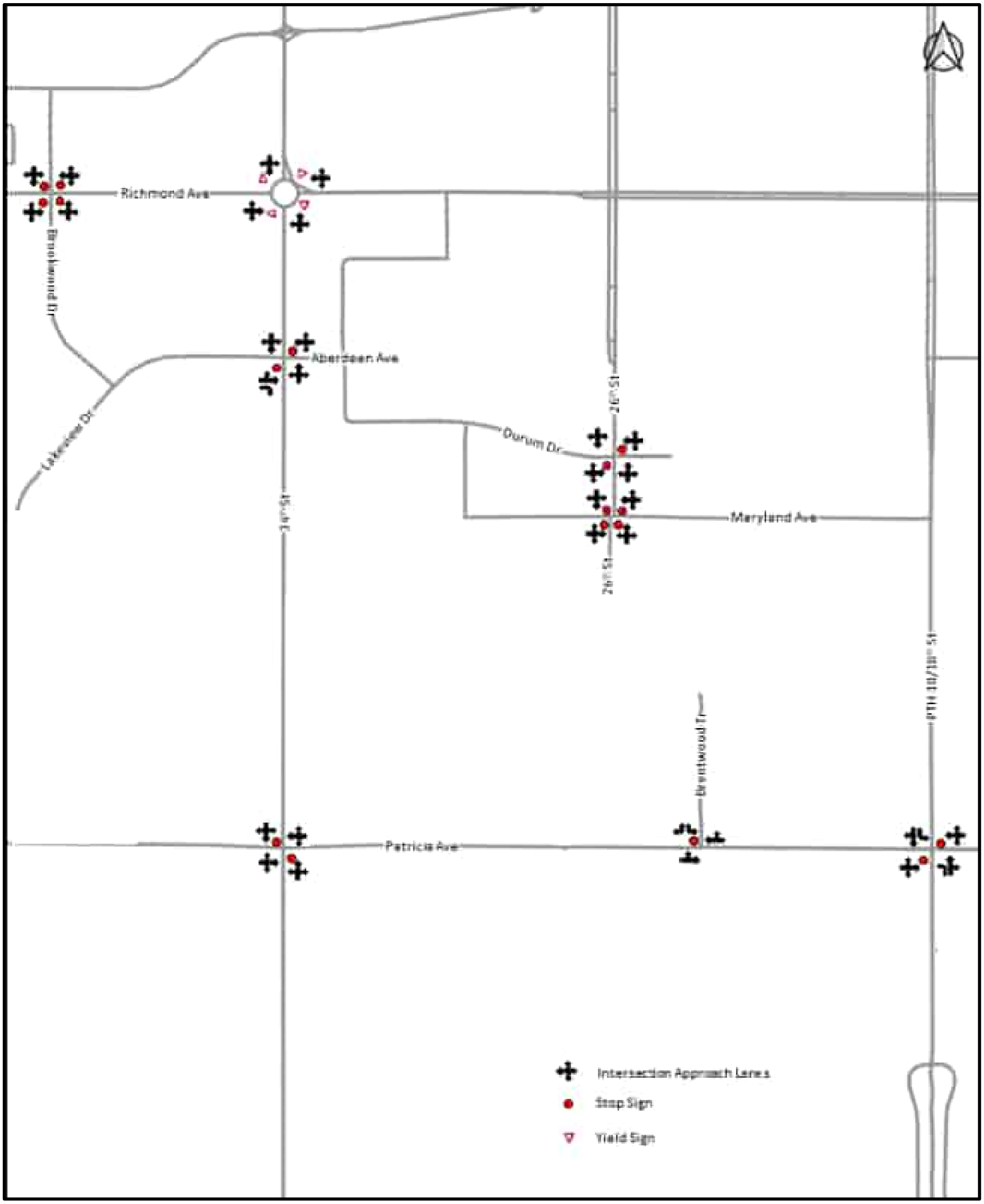


FIGURE 31: EXISTING INTERSECTION CONFIGURATIONS

The study intersections also included new intersections to provide access to the SPA, and the Secondary Plan indicated that some of them were expected to include roundabout or traffic signal control. Those intersections were modeled in initial configurations as two-way stop-control intersections, and then modeled with the control type indicated in the Secondary Plan. This served to evaluate whether the control listed in the Secondary Plan would provide a traffic operations benefit. Those configurations are noted with the analysis results in the following sections.

4.6.3 Analysis Results

There were nine study intersections in the 2022 scenario analysis, and 15 study intersections in the 2052 scenario analysis. To avoid a large and unwieldy results table, results are presented in a series of tables:

- Table 9 shows the results from the intersections near Brookwood North (Richmond Avenue at Brookwood Drive, Richmond Avenue at 34th Street, and 34th Street at Aberdeen Avenue).
- Table 10 shows the results from the intersections near Brookwood South (34th Street at Patricia Avenue, Patricia Avenue at the proposed extension of Lakeview Drive, 34th Street at the proposed east-west collector, and the proposed east-west collector at the proposed extension of Lakeview Drive). Per the Secondary Plan, roundabouts were considered on the proposed east-west collector street at the extension of Lakeview Drive, and at 34th Street.
- Table 11 shows the results from the intersections near Bellafield (26th Street at Durum Drive, 26th Street at Maryland Avenue, proposed 26th Street extension at the proposed east-west collector, and the proposed 26th Street extension at Patricia Avenue). Per the Secondary Plan, roundabouts were considered on 26th Street at Maryland Avenue, the proposed east-west collector street, and at Patricia Avenue.
- Figure 32 shows the results from the intersections near the Annex Lands (Patricia Avenue at Brentwood Trace, Patricia Avenue at the proposed access to the commercial area in the Annex Lands, Patricia Avenue at 18th Street, and the proposed commercial access on 18th Street). Per the Secondary Plan, traffic signals were considered on Patricia Avenue at the commercial access, at 18th Street, and at the proposed commercial access on 18th Street.

In each table, results are shown first for the AM peak hour, with PM peak hour results following in parentheses. Results representing modified intersection configurations (to address shortcomings with the existing intersections) are highlighted in each table.

Findings are summarized in Section 4.6.4.

TABLE 9: TRAFFIC OPERATIONS ANALYSIS RESULTS – BROOKWOOD NORTH

Intersection	Overall Intersection Performance [LOS / Delay]	Notable Movement Performance [Mvmt. / LOS / Delay / v/c Ratio / 95th pctl. Queue]
2022 Existing Conditions		
Richmond Avenue at Brookwood Drive - Two-Way Stop Control	A / 6 (A / 4)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Richmond Avenue at 34th Street - Roundabout	B / 10 (A / 9)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
34th Street at Aberdeen Avenue - Two-Way Stop Control	A / 9 (A / 6)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
2052 Post-Development Conditions		
Richmond Avenue at Brookwood Drive - Two-Way Stop Control	A / 5 (A / 4)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Richmond Avenue at 34th Street - Roundabout	C / 16 (C / 25)	NB / C / 24 / 0.78 / 55 m (WB / D / 27 / 0.81 / 55 m) (SB / E / 36 / 0.88 / 80 m)
34th Street at Aberdeen Avenue - Two-Way Stop Control	C / 22 (D / 31)	EB / F / 81 / 0.94 / 65 m (EB / F / 241 / 1.29 / 80 m)
Modified Option 1 + Roundabout	A / 8 (B / 13)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Modified Option 2 + Traffic Signals	B / 11 (B / 12)	All movements LOS C or better, v/c < 0.75 (SB / B / 11 / 0.76 / 125 m)
Modified Option 2A + Traffic Signals + Left-Turn Lanes	- (A / 9)	- (All movements LOS C or better, v/c < 0.75) (SB / A / 9 / 0.65 / 80 m)

AM (PM) Analysis Results

There were no traffic operations performance issues at the intersections around Brookwood North in the 2022 existing conditions scenario.

In the 2052 post-development scenario the roundabout at Richmond Avenue and 34th Street had some movements nearing capacity, particularly in the PM peak hour. Delays were still within reasonable levels (no worse than LOS E), and no movements were at or over capacity.

At 34th Street and Aberdeen Avenue the two-way stop-controlled intersection was over capacity in the PM peak hour for the 2052 post-development scenario, and nearly at capacity in the AM peak hour. That performance warranted consideration of alternatives. Additional analyses showed that a single lane roundabout would provide good performance, as would a signalized intersection. However, there may be some queueing on the southbound approach in the PM peak hour, unless left-turn lanes are added on 34th Street. The study team selected a roundabout as the preferred treatment, based on the Safe Systems approach discussed in Section 4.3.

Table 10 shows the analysis results from the intersections near Brookwood South. Note that the new intersections included in the 2052 scenario were initially modeled with basic two-way stop-controlled configurations (and all-way stop at the Lakeview Drive / new east-west collector intersection), and then modeled with the roundabouts shown in the Secondary Plan.

TABLE 10: TRAFFIC OPERATIONS ANALYSIS RESULTS – BROOKWOOD SOUTH

Intersection	Overall Intersection Performance [LOS / Delay]	Notable Movement Performance [Mvmt. / LOS / Delay / v/c Ratio / 95th pctl. Queue]
2022 Existing Conditions		
34th Street at Patricia Avenue - Two-Way Stop Control	A / 7 (A / 8)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
2052 Post-Development Conditions		
34th Street at Patricia Avenue - Two-Way Stop Control	A / 7 (C / 21)	All movements LOS C or better, v/c < 0.75 (SB / F / 56 / 0.90 / 70 m)
Modified Option 1 + Roundabout	A / 6 (A / 8)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Modified Option 2 + Traffic Signals	A / 9 (B / 13)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
34th Street at Proposed East-West Collector - Two-Way Stop Control	C / 24 (B / 17)	EB / F / 53 / 0.89 / 75 m (EB / F / 70 / 0.82 / 45 m) (WB / E / 38 / 0.63 / 30 m)
Modified per Secondary Plan + Roundabout	A / 8 (A / 9)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Patricia Avenue at Proposed Lakeview Dr. Ext. - Two-Way Stop Control	A / 4 (A / 3)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Proposed Lakeview Dr. Ext. at Proposed East-West Collector - Four-Way Stop Control	A / 8 (A / 9)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Modified per Secondary Plan + Roundabout	A / 5 (A / 5)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)

AM (PM) Analysis Results

The intersection of 34th Street and Patricia Avenue provided acceptable operations in the 2022 existing conditions scenario, but in the 2052 post-development scenario the southbound approach operated at LOS

F in the PM peak hour, with a v/c ratio of 0.90, indicating that the intersection was nearly at capacity. Further analysis showed that a signal lane roundabout or a traffic signal would provide good performance. In the option with the traffic signal, no turning lanes were required to give good performance.

The intersection of 34th Street and the new east-west collector could not provide acceptable performance without the roundabout identified in the Secondary Plan. The other new intersections in Brookwood South could provide acceptable performance with simple two-way stop-control configurations. Roundabouts would also provide good performance, but they were not required for traffic operations.

Table 11 shows the analysis results from the intersections near Bellafield. Note that the intersection of 26th Street and Maryland Avenue was modeled in the existing staggered configuration for the 2022 existing conditions scenario, but for the 2052 scenario—with 26th Street extended to the south—the intersection was assumed to be re-aligned to a single intersection, with four-way stop control, per the traffic analysis and geometric review noted in Section 2.3. New intersections included in the 2052 scenario were initially modeled with basic two-way stop-controlled configurations (and four-way stop control at the intersection of 26th Street and the new east-west collector), and then modeled with the roundabouts shown in the Secondary Plan.

TABLE 11: TRAFFIC OPERATIONS ANALYSIS RESULTS – BELLAFIELD

Intersection	Overall Intersection Performance [LOS / Delay]	Notable Movement Performance [Mvmt. / LOS / Delay / v/c Ratio / 95th pctl. Queue]
2022 Existing Conditions		
26th Street at Durum Drive - Two-Way Stop Control	A / 4 (A / 4)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
26th Street (NB) at Maryland Avenue - Two-Way Stop Control	A /6 (A /6)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
26th Street (SB) at Maryland Avenue - All-Way Stop Control	A / 9 (A / 9)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
2052 Post-Development Conditions		
26th Street at Durum Drive - Two-Way Stop Control	A / 3 (A / 4)	All movements LOS C or better, v/c < 0.75 (EB / D / 29 / 0.44 / 20 m) (WB / D / 27 / 0.17 / 5 m)
26th Street at Maryland Avenue - Four-Way Stop Control	D / 31 (F / 99)	NB / E / 46 / 0.92 / -* (WB / E / 45 / 0.88 / -*) (NB / F / 83 / 1.06 / -*) (SB / F / 161 / 1.27 / -*)
Modified per Secondary Plan + Roundabout	B / 11 (C / 16)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Proposed 26th Street Ext. at Proposed East-West Collector - Four-Way Stop Control	B / 13 (40 / E)	All movements LOS C or better, v/c < 0.75 (NB / E / 44 / 0.91 / -*) (SB / F / 47 / 0.94 / -*)
Modified per Secondary Plan + Roundabout	A / 8 (B / 12)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
Proposed 26th Street Ext. at Patricia Avenue - Two-Way Stop Control	B / 10 (Error)	SB / D / 29 / 0.58 / 25 m (SB / Error)
Modified per Secondary Plan + Roundabout	A / 8 (C / 24)	All movements LOS C or better, v/c < 0.75 (WB / D / 30 / 0.91 / 100 m)
Modified Option 2 + Roundabout + Westbound Right-Turn Lane	- (B / 13)	- (All movements LOS C or better, v/c < 0.75)

AM (PM) Analysis Results
* *HCM 2000* Methodology does not include queue estimates for four-way stop controlled intersections

In the 2022 existing conditions scenario the intersections on 26th Street provided acceptable performance, with all movements operating at LOS C or better and with v/c ratios not exceeding 0.75.

In the 2052 post-development scenario the four-way stop control intersection at 26th Street and Maryland Avenue was nearing capacity in the AM peak hour, and over capacity in the PM peak hour, with the northbound and southbound movements operating at LOS F, with v/c ratios of more than 1.00. The roundabout identified in the Secondary Plan provided good performance, allowing all movements to operate at LOS C or better and have v/c ratios below 0.75.

The intersections on the 26th Street extension—at the new east-west collector and at Patricia Avenue—required roundabouts for good traffic operations performance. At the new east-west collector intersection four-way stop control had the southbound movements operating at LOS F in the PM peak hour, with a v/c ratio of 0.97—nearly at capacity. The intersection on Patricia Avenue had extreme delays in the PM peak hour with two-way stop control, such that Synchro returned errors. Roundabouts at both intersections eliminated nearly all performance issues, except for westbound queueing and near-capacity issues on Patricia Avenue in the PM peak hour. Those issues could be resolved with the addition of a westbound right-turn lane.

Table 12 shows the analysis results from the study intersections near the Annex Lands. Like the other intersections, new intersections near the Annex Lands were initially modeled with two-way stop control configurations, and then modeled with modifications identified in the Secondary Plan. In this case, those modifications were traffic signal control. The study team also investigated the performance of roundabouts as an alternative method of control that is more consistent with safe systems principles (see Section 4.3).

TABLE 12: TRAFFIC OPERATIONS ANALYSIS RESULTS – ANNEX LANDS

Intersection	Overall Intersection Performance [LOS / Delay]	Notable Movement Performance [Mvmt. / LOS / Delay / v/c Ratio / 95th pctl. Queue]
2022 Existing Conditions		
Patricia Avenue at Brentwood Trace - Two-Way Stop Control	A / 2 (A / 2)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
18th Street at Patricia Avenue - Two-Way Stop Control	A / 5 (A / 6)	All movements LOS C or better, v/c < 0.75 (EB / D / 27 / 0.39 / 15 m)
2052 Post-Development Conditions		
Patricia Avenue at Brentwood Trace - Two-Way Stop Control	A / 1 (A / 1)	All movements LOS C or better, v/c < 0.75 (SB / E / 49 / 0.22 / 5 m)
Patricia Avenue at Proposed Commercial Access - Two-Way Stop Control	A / 6 (Error)	All movements LOS C or better, v/c < 0.75 (NB / Error)
Modified per Secondary Plan + Traffic Signals	C / 21 (D / 36)	WBL / D / 40 / 0.46 / 20 m NBL / D / 40 / 0.25 / 35 m (WBL / D / 44 / 0.77 / 60 m) (NBL / D / 48 / 0.89 / 170 m)
Modified Alternate + Roundabout w/ Slip Lanes	A / 6 (B / 13)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)
18th Street at Patricia Avenue - Two-Way Stop Control	Error (Error)	EB / Error WB / Error (EB / Error) (WB / Error)
Modified per Secondary Plan + Traffic Signals	C / 24 (C / 28)	EBL / D / 44 / 0.72 / 50 m + 5 Other Movements LOS D/E (EBL / D/ 54 / 0.92 / 115 m) (+ 2 Other Movements LOS E)
Modified Alternate + Two Lane Roundabout	A / 8 (D / 31)	All movements LOS C or better, v/c < 0.75 (SBT/R / F / 51 / 0.95 / 100 m) (+ 3 Other Movements LOS D/E)

Intersection	Overall Intersection Performance [LOS / Delay]	Notable Movement Performance [Mvmt. / LOS / Delay / v/c Ratio / 95th pctl. Queue]
18th Street at Proposed Commercial Access - Two-Way Stop Control	A / 4 (Error)	All movements LOS C or better, v/c < 0.75 (EB / Error)
Modified per Secondary Plan + Traffic Signals	B / 14 (C / 21)	EBL / D / 56 / 0.58 / 40 m NBL / E / 57 / 0.43 / 25 m (EBL / D / 54 / 0.80 / 100 m) (NBL / E / 56 / 0.59 / 40 m)
Modified Alternate + Two Lane Roundabout	A / 5 (A / 9)	All movements LOS C or better, v/c < 0.75 (All movements LOS C or better, v/c < 0.75)

AM (PM) Analysis Results

In the 2022 existing conditions scenario the existing intersections on Patricia Avenue at Brentwood Trace and at 18th Street gave good performance, with all movements operating at LOS C or better, except for the eastbound movements at Patricia Avenue in the PM peak hour; those movements operated at LOS D in the PM peak hour.

In the 2052 post-development scenario the intersection of Patricia Avenue and Brentwood Trace continued to provide good performance in its existing configuration, but the southbound approach operated at LOS E in the PM peak hour. The v/c ratio was still low (0.22), so capacity was still available. The study team considered that performance to be acceptable.

At the proposed commercial access on Patricia Avenue a signalized intersection provided good performance, allowing all movements to operate at LOS D or better. The study team assumed that the four-lane section on Patricia Avenue would carry to the intersection, based on the daily traffic volume presented in Section 4.3. The intersection was modeled in coordination with the signal at 18th Street, with a 120 second cycle length. The study team also included dual westbound left-turn lanes and an eastbound right-turn lane at the intersection. Figure 32 illustrates the intersection layout.

The study team also modeled the intersection with a roundabout, as an alternative that may be more consistent with the safe systems principles noted in Section 4.3. The resulting design included a single lane roundabout plus a westbound bypass lane, a northbound right-turn lane (making use of the four lane sections on the south and east legs), and an eastbound right-turn lane. That alternative allowed all movements to operate at LOS C or better—better performance than the signalized intersection alternative.

At 18th Street and Patricia Avenue the existing intersection was well over capacity, as indicated by Synchro returning errors. The Secondary Plan identified traffic signals as a potential traffic control treatment. The study team assumed a four-lane section on 18th Street and on Patricia Avenue west of 18th Street, consistent with the findings from Section 4.3, and added turn lanes as required. The final signalized intersection configuration is shown on Figure 32.

Note that the intersection includes left-turn lanes and right-turn lanes in all directions, with continuous right-turn lanes on the west leg. That intersection configuration offered better performance, although movements were nearing capacity in the PM peak hour, with v/c ratios of up to 0.92. The study team also modeled intersection performance with a roundabout with two lanes on 18th Street and one lane on Patricia Avenue, and found that it provided somewhat worse delays, with movements nearly at capacity.

At the proposed commercial access on 18th Street a signalized intersection provided good performance, with all movements operating at LOS D or better (except for several movements where delays just crossed the LOS D/E threshold), and with v/c ratios not exceeding 0.80. That intersection included a northbound left-turn lane, a southbound right-turn lane, and a two lane eastbound approach. Figure 32 shows the intersection.

At the three intersections shown in Figure 32, traffic signals or roundabouts could provide reasonably good performance for the 2052 post-development scenario. The study team considered that compared to traffic signals, single lane roundabouts were more consistent with the Safe Systems principles listed in Section 4.3, because they both reduce the number of conflict points and their deflection physically limits vehicle speeds at those conflict points. Two lane roundabouts have less of an advantage over traffic signals: they retain some speed limiting properties, but their deflection is less effective due to the geometry required to support multi-lane travel. Similarly, two lane roundabouts have more conflict points than single lane roundabouts.

With that in mind, the study team judged that the single lane roundabout alternative was preferable at the proposed commercial access on Patricia Avenue. On 18th Street, the study team concluded that traffic signals were the best alternative, given their superior traffic performance vs the two lane roundabout option, and consistency with the rest of the 18th Street corridor. Those points would also apply to the proposed commercial access on 18th Street.

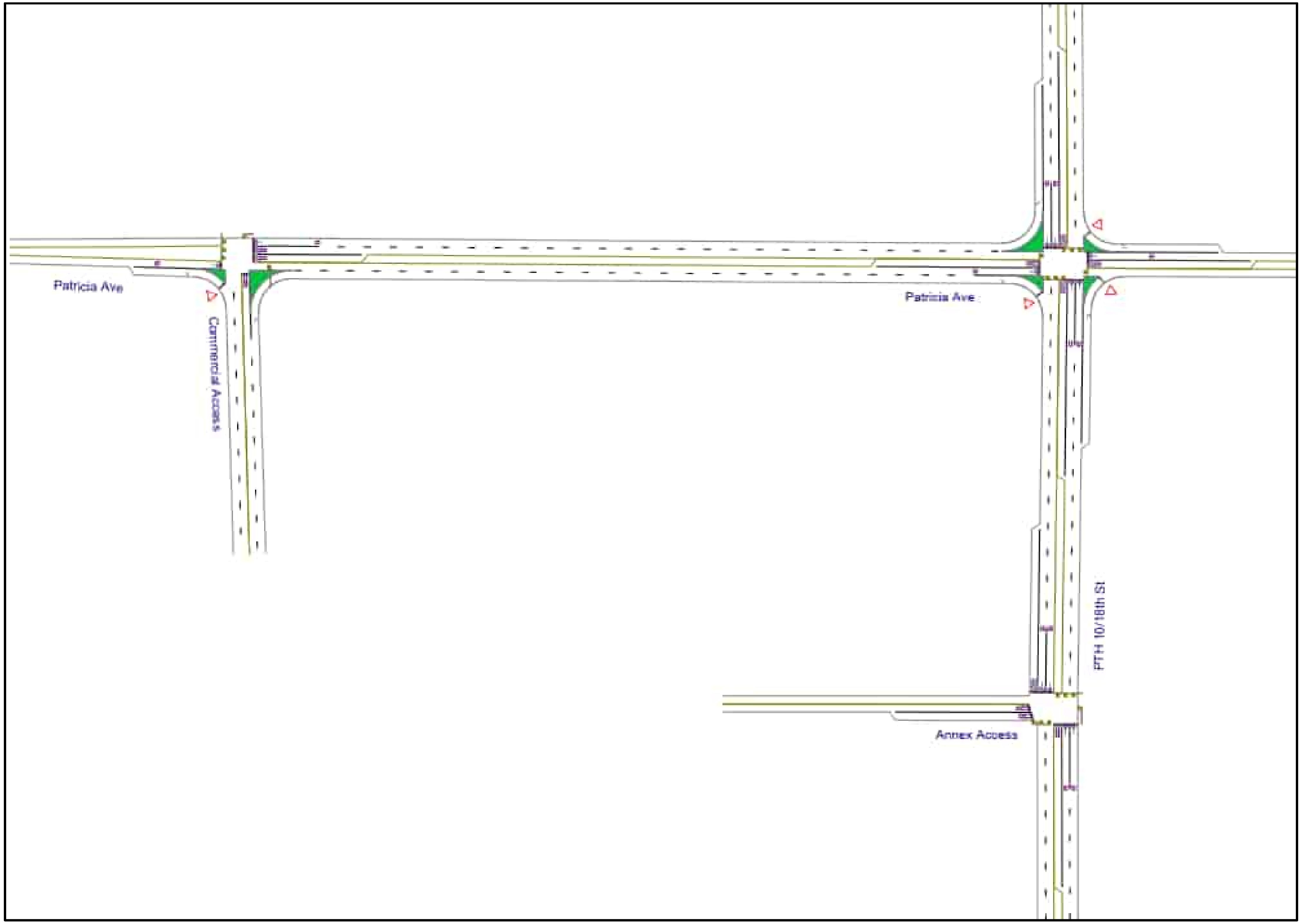


FIGURE 32: ANNEX LAND SIGNALIZED INTERSECTION CONFIGURATIONS

4.6.4 Summary

The traffic operations analyses found that the following treatments would be required for the 2052 post-development scenario:

- **Lakeview Drive Extension at the Proposed East-West Collector**
  A single-lane roundabout (not required for traffic operations, but appropriate for Safe Systems and consistent with Secondary Plan expectation)
- **34th Street at Aberdeen Avenue**
  A single-lane roundabout
- **34th Street at the Proposed East-West Collector**
  A single-lane roundabout
- **34th Street at Patricia Avenue**
  A single-lane roundabout
- **26th Street at Maryland Avenue**
  A single-lane roundabout
- **26th Street Extension at the Proposed East-West Collector**
  A single-lane roundabout
- **26th Street Extension at Patricia Avenue**
  A single-lane roundabout plus a westbound right-turn lane
- **Patricia Avenue at the Proposed Commercial Access**
  A single-lane roundabout plus a westbound bypass lane and northbound and eastbound right-turn lanes
- **Patricia Avenue at 18th Street**
  Traffic signal control plus turning lanes (see Figure 32).
- **18th Street at the Proposed Commercial Access**
  Traffic signal control plus turning lanes (see Figure 32).

4.7 Traffic Signal Warrant Analysis

The study team conducted Traffic Signal Warrant Analyses (TSWAs) using the process from the TAC *Traffic Signal and Pedestrian Signal Head Warrant Handbook*. The analysis was conducted for each study intersection that was not already controlled by a roundabout. The analyses began with the 2052 post-development scenario. Where traffic signal control was found to be warranted, the study team conducted additional analysis for the 2022 background scenario to identify whether the need for signals was already present, or if it was driven by development traffic.

Warrants used traffic volumes from the peak six hours of the day, which were estimated using the relationship between the AM and PM peak hours—the focus of the traffic volumes in Section 3 and the peak six hours from available intersection turning movement counts. Where a count was not available for an intersection, an expansion factor was used from a similar intersection. All counts showed expansion factors between 2.09 and 2.48, representing the sum of the peak six-hour traffic divided by the sum of the AM and PM peak hour traffic.

The TSWA process also considers pedestrian crossing volumes. Those were set to 15 crossings per hour at intersections along the proposed east-west collector street and at 26th Street and Maryland Avenue—locations likely to see significant pedestrian activity.

Table 13 shows the warrant points returned from the analyses. Note that scores of 100 or more indicate that traffic signals are warranted. Note that the analysis also includes a minimum volume threshold for the minor street—where the minor street has fewer than 75 vehicles per hour (vph) making left-turns and through movements, signals are considered not warranted, regardless of warrant points. Analyses with minor street traffic below the 75 vph threshold are noted with an asterisk.

TABLE 13: TRAFFIC SIGNAL WARRANT ANALYSIS RESULTS

Intersection	Warrant Points 2022 Background	Warrant Points 2052 Post-Development
Richmond Avenue & Brookwood Drive	Not Warranted	11*
34th Street & Aberdeen Avenue	23	80
34th Street & Proposed East-West Collector	N/A	84
34th Street & Patricia Avenue	Not Warranted	42
Lakeview Drive & Proposed East-West Collector	N/A	13*
Lakeview Drive & Patricia Avenue	N/A	6
26th Street & Durum Drive	Not Warranted	51*
26th Street & Maryland Avenue	19	138
26th Street & Proposed East-West Collector	N/A	82
26th Street & Patricia Avenue	N/A	117
Patricia Avenue & Brentwood Trace	Not Warranted	47*
Patricia Avenue & Proposed Commercial Access	N/A	211
18th Street & Patricia Avenue	57	436
18th Street & Proposed Commercial Access	N/A	132

* Minor street volume below 75 vph threshold, signals not warranted

The TSWAs indicated that in the 2052 post-development traffic signals were warranted on 26th Street at Maryland Avenue and at Patricia Avenue, and at the three intersections around the Annex Lands: the commercial accesses on Patricia Avenue and on 18th Street, and at the intersection of 18th Street and Patricia Avenue. Those intersections either did not exist or did not warrant signalization in the 2022 background scenario, indicating that development traffic was the main driver of the need for signalization.

The traffic operations analysis found that signals were also required to provide good peak hour operations on 34th Street at Aberdeen Avenue, the proposed east-west collector street, and at Patricia Avenue. Similar performance was noted on 26th Street at the proposed east-west collector street—all intersections that returned fewer than 100 warrant points. The lack of agreement between the traffic operations results and the TSWAs illustrates the difference in methodology between the methods: one is focused on detailed performance at critical times, while the other—the TSWAs—consider potential conflicts averaged over a longer time period. In this case, the study team considered the more detailed traffic operations analyses as an indication that stop control was insufficient at those intersections.

Note that the warrant primarily indicates where stop control is insufficient, and they do not necessarily indicate that traffic signal control is optimal. At those intersections roundabouts can also be appropriate means of traffic control.

Traffic signal warrant analysis reports are included in Appendix D.

4.8 Pedestrian Crossing Control Analysis

The study team reviewed the need for pedestrian crossing control using guidance from the Transportation Association of Canada (TAC) *Pedestrian Crossing Control Guide, 3rd Edition* (PCCG). The PCCG includes guidance on identifying locations for pedestrian crossing control and selecting appropriate control types at candidate locations.

The study team reviewed all locations where paths proposed in the Secondary Plan or identified in earlier sections of this TIS crossed collector or arterial streets. Many of the paths are on-street paths that would cross at intersections. Crossing control analyses were not completed for intersections with identified recommendations for roundabouts or traffic signals per the traffic operations analysis in Section 4.6, since those methods of intersection control would include some provision for pedestrian crossing control.

Figure 33 shows the locations considered in the analysis. The figure includes relevant features from analyses noted in the preceding sections, including new collector street connections and AT path alignments and intersection traffic control.

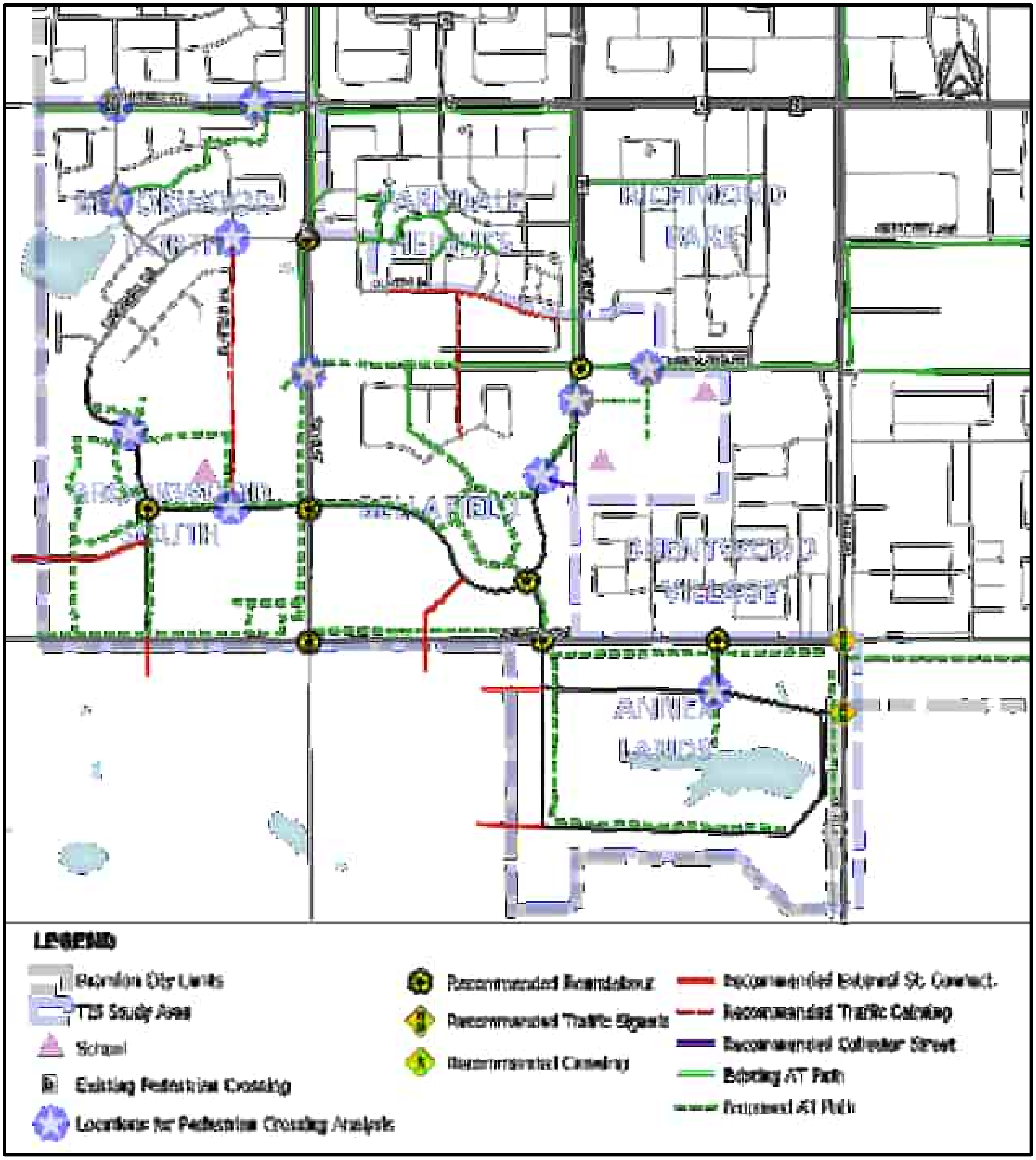


FIGURE 33: PEDESTRIAN CROSSING CONTROL ANALYSIS LOCATIONS

For each location shown in Figure 33, the study team used the PCCG to determine if the location should be a candidate for crossing control, and if so, what form of control would be most appropriate.

The following points summarize the findings from the analysis:

- Nearly all the sites can be considered candidates for pedestrian crossing control, except for Brookwood Drive south of Richmond Avenue, and Lakeview Drive at Plateau Drive. Those locations were not critical for system connectivity, which was the key factor that made the other locations candidates for crossing control.

- The PCCG treatment selection matrix indicated that Ground Mounted signs were appropriate treatments for all the candidate locations. Enhanced crossings were appropriate for three of the locations: Richmond Avenue west of Brookwood Drive, Richmond Avenue west of 34th Street, 34th Street south of Aberdeen Avenue. According to the PCCG, enhanced crossings should include zebra crosswalk pavement markings (as opposed to twin parallel line markings) and (ideally) additional overhead crossing signage.

- The PCCG provides flexibility for practitioners to select higher-level treatments based on location characteristics. In the study team's judgement, the crossing on 34th Street south of Aberdeen Avenue should have an RRFB as higher-tier crossing treatment. This judgement is due to the relatively high traffic volume forecast on 34th Street, the significance of the crossing in the AT network, and the lack of edge friction on 34th Street, which made lead to higher vehicle speeds.

4.9 Sensitivity Analysis

The sensitivity analysis considered:

- Need for treatments at the interim horizon years. This allowed the study team to identify the level of development that would trigger the need for any recommended treatments. This review also considered requirements for access during construction.

- Treatment robustness against changes in traffic volumes representing different levels of development, including a scenario representing development at the higher end of potential demand forecast by the City of Brandon, increased demand for travel to/from the south on 34th Street representing a future PTH 110 extension and connection to 34th Street, and a scenario with the BSD school near the intersection of 26th Street and Maryland Avenue instead of in Brookwood South.

The following sections outline the considerations and findings for each part of the sensitivity analysis.

4.9.1 Triggers

The study team identified triggers for each recommended treatment, as well as the collector street and AT path segments in the study area. Triggers were tied to:

- **Access to developing areas.** In some cases, development of an area triggered the need for infrastructure, such as a collector street access to an arterial street.

- **Construction access.** In some cases, it would be advantageous to have an additional access to the arterial street network to allow construction traffic to be separated from general traffic.

- **Construction staging.** This was particularly relevant for roundabouts. Converting an existing traditional intersection to a roundabout requires complex traffic staging. Staging difficulty and impacts on traffic increase as traffic volumes increase, so in some cases it would be preferable to construct a roundabout before it is required for traffic operations.

- **Impact on other neighbourhoods.** Some street connections were needed to avoid routing too much new development traffic onto local and collector streets in other neighbourhoods.
- **Presence of schools.** Some active transportation and traffic calming treatments can be deferred until future schools are developed.
- **Capacity.** This applied to the signalized intersections and widening on 18th Street and Patricia Avenue. Those treatments were not required for development access, construction access, or to avoid impacts on other neighbourhoods, so their triggers were tied directly to traffic operations. This required additional traffic operations analysis. Capacity was also considered for the extension of 26th Street and the roundabout at Maryland Avenue. Capacity analyses found that the roundabout and street extension could be deferred until required for development access, without unacceptable traffic operations. Analysis reports are included in Appendix E.
- **Speed Studies.** Traffic calming on Durum Drive, Maryland Avenue, and Derlago Drive (Marquis Drive) was tied to the need for speed studies to better understand the nature of any collector street speed issues. Those studies can be conducted on an on-going basis and/or as complaints are received.
- **External Development.** Connections to areas west or south of the SPA would only be required once those areas develop, which is forecast to be beyond the 2052 study horizon.

The City of Brandon provided data on forecast development absorption in the study area, plus direction on which areas would likely develop earlier or later in the 2022 to 2052 study period. The study team used this information to assign a level of development progress in the analysis zones from Section 3.3, at each of the interim horizon years (2027, 2032, 2037, 2042, 2047). This allowed the study team to identify forecast horizon years for each of the triggers. Figure 8 from Section 3.3.4 is included below for reference.

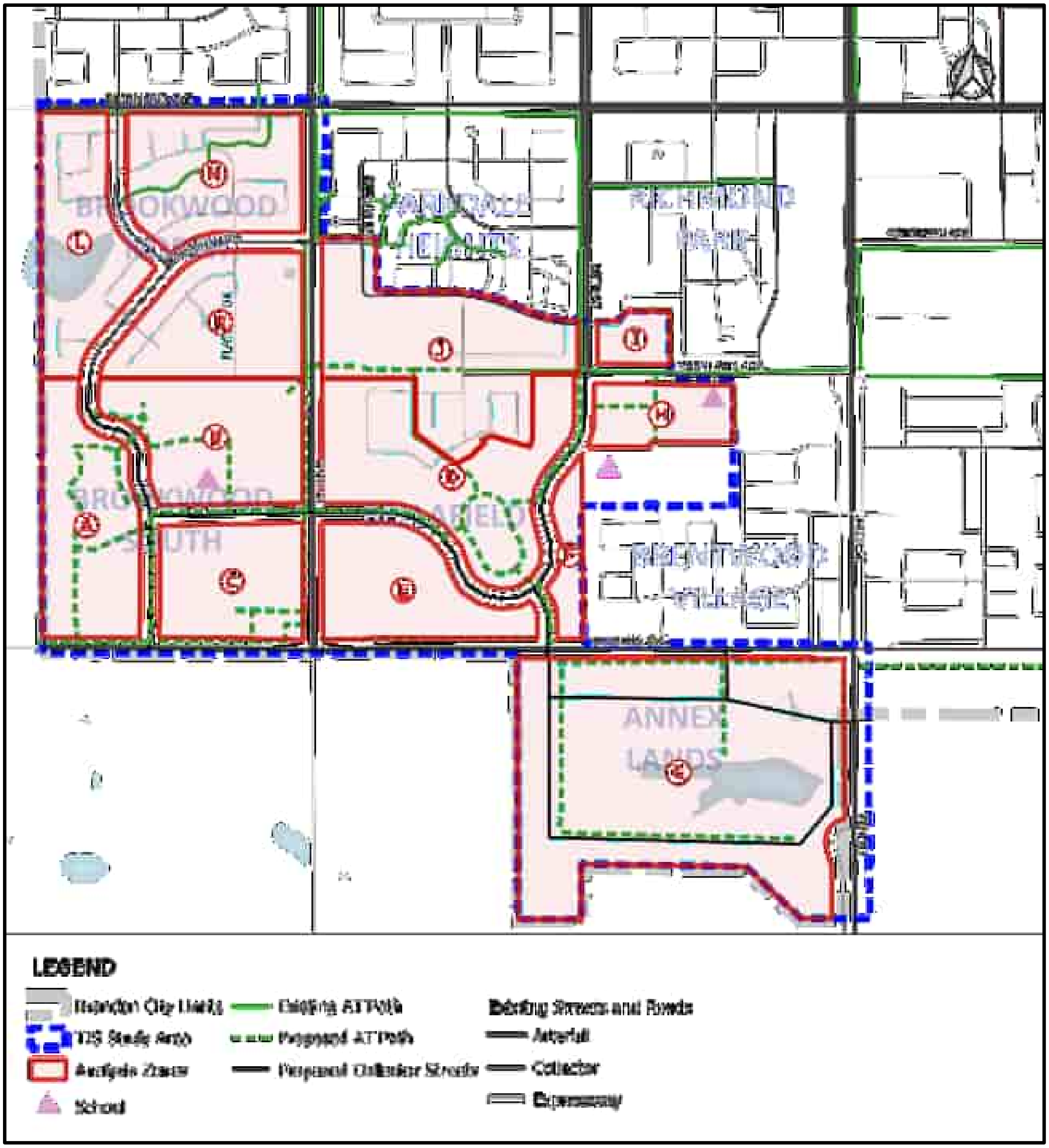


FIGURE 8: ANALYSIS ZONES (FROM SECTION 3.3.4)

Table 14 through Table 16 present the list of triggers and forecast horizon years, along with rationale for each trigger. Figure 34 through Figure 38 illustrate the forecast development progress and required treatments at the 2027, 2032, 2037, and 2042 horizon years. Note that all the recommended treatments were forecast to be required by 2042, so there were no triggers for the 2047 interim year. Further, treatments with triggers related to speed studies or external development were not assigned a forecast horizon year.

TABLE 14: TRIGGERS - COLLECTOR STREETS, ARTERIAL ROADS, AND EXTERNAL CONNECTIONS

Item	Trigger	Forecast Horizon	Trigger Rationale
Collector Streets			
Brookwood South - Connection to Lakeview Drive	Start of Zone B Development	2027	Required to provide access to Zone B Area
Brookwood South - Connection to Plateau Drive	Start of Zone B Development	2027	Required for second point of access to Zone B
Brookwood South - Connection to 34th Street	Zone B >25% Development (75 units)	2027	Provide an outlet for Zone B to prevent more than 500 vpd additional on Plateau Drive
Brookwood South - Connection to Patricia Avenue	Brookwood South Phase 2 Development	2032	Required for convenience and construction access, not capacity.
Lakeview Drive Extension - North Portion	Brookwood South Phase 4 Development	2042	Required for convenience and construction access for Phase 4, not capacity.
Lakeview Drive Extension - South Portion	Brookwood South Phase 2 Development	2032	Required for convenience and construction access, not capacity.
Proposed East-West Collector - Brookwood South	Zone B >25% Development	2027	Provide an outlet for Zone B to prevent more than 500 vpd additional on Plateau Drive
Bellafield - 26th Street Extension	Start of Zone F Development	2032	Provide access to Zone F
Bellafield - Connection to 34th Street	Start of Zone D Development	2027	Construction Access for Zone D - formalize to proper street when roundabout constructed
Bellafield - Connection to Patricia Avenue	Start of Zone F Development	2032	Access to Zone F, provide second access for construction
Proposed East-West Collector - Bellafield	Start of Zone E Development	2037	Provide access to Zone E
Annex Lands - Residential Connection to Patricia	Start of Zone G Residential Development	2027	Provide access to Annex Lands
Annex Lands - Commercial Connection to Patricia	Start of Zone G Commercial Development	2027	Provide Access to Annex Lands
Annex Lands - Commercial Connection to 18th Street	Need for Improvements at 18th & Patricia	2027	Can't include without improvements to 18th Street, wait for improvements at Patricia
Annex Lands Residential Collector	With residential development in Zone G	2027-42	Provide as required for residential development
Annex Lands Internal Commercial Collectors	With commercial development in Zone G	2027-42	Provide as required for commercial development
Arterial Roads			
Patricia Ave Paving - Brentwood Trace to 26th Street	Start of Zone G Residential Development	2027	Provide paved surface to Annex Lands connection at 26th Street
Patricia Ave Paving - 26th Street to 34th Street	Zone G 50% Comm. Development (320,000 ft^2)	2027	Forecast ADT 3500 vpd vs 1000 vpd existing
Patricia Ave Paving - 34th Street to West	Brookwood South Phase 2 Development	2032	Provide paved surface to Brookwood South Connection to Patricia
Patricia Ave Widening	Need for Improvements at 18th & Patricia	2027	Include with improvements at 18th Street and Patricia Avenue
18th Street Widening	Need for Improvements at 18th & Patricia	2027	Include with improvements at 18th Street and Patricia Avenue
External Street Connections			
Brookwood South to West	Future External Development	N/A	Not required until development to west of SPA
Brookwood South to South	Future External Development	N/A	Not required until development to south of SPA
Bellafield to South	Future External Development	N/A	Not required until development to south of SPA
Bellafield to Brentwood Village	Start of Zone F Development	2032	Include with 26th Street extension
Annex Lands to West	Future External Development	N/A	Not required until development to south of SPA

TABLE 15: TRIGGERS – INTERSECTIONS AND TRAFFIC CALMING

Item	Trigger	Forecast Horizon	Trigger Rationale
Intersections			
34th Street & Aberdeen Avenue Roundabout	As soon as possible	2022	Construction staging will be easier with less traffic
Aberdeen Avenue & Durum Drive	As soon as possible	2022	Construct as part of roundabout project at 34th Street
34th Street & Proposed Collector Roundabout	Zone B >25% Development (75 units)	2027	Construct as part of collector street connection
34th Street & Patricia Avenue Roundabout	Zone G 50% Comm. Development (320,000 ft^2)	2027	Include as part of paving on Patricia Avenue to the east
Lakeview Drive & Proposed Collector Roundabout	Brookwood South Phase 2 Development	2032	Include with south portion of Lakeview Drive
26th Street & Maryland Avenue Roundabout	Start of Zone F Development	2032	Include with 26th Street Extension
26th Street & Proposed Collector Roundabout	Start of Zone F Development	2032	Include with 26th Street Extension
26th Street & Patricia Avenue Roundabout	Start of Zone G Development	2027	Include with Annex Lands access
Patricia Avenue Commercial Access Roundabout	Start of Zone G Development	2027	Include with Annex Lands access
18th Street & Patricia Avenue Signals + Turn Lanes	Need for Improvements at 18th & Patricia	2027	Traffic operations performance at 18th Street and Patricia Avenue
18th Street Commercial Access Signals + Turn Lanes	Need for Improvements at 18th & Patricia	2027	Include with improvements at 18th Street and Patricia Avenue
Traffic Calming			
Plateau Drive Curb Extensions and Speed Cushions	Start of Zone B Development	2022	Minimize impact of development traffic
Durum Drive Curb Extensions	As soon as possible	2022	Reduce pavement clear width
Durum Drive Curb Speed Cushions	Monitor Speeds	N/A	Understand nature of speed problems before implementing calming measures
Derlago Drive / Marquis Drive Speed Cushions	Monitor Speeds	N/A	Understand nature of speed problems before implementing calming measures
Maryland Avenue Speed Cushions	Monitor Speeds	N/A	Understand nature of speed problems before implementing calming measures

TABLE 16: TRIGGERS – ACTIVE TRANSPORTATION AND TRANSIT

Item	Trigger	Forecast Horizon	Trigger Rationale
Active Transportation - Paths			
Brookwood South - West of Lakeview	Brookwood South Phase 2 Development	2032	Proceed with development of collector street and local street network
Brookwood South - Connection to 34th Street	Zone B >25% Development (75 units)	2027	Wait for some demand from Brookwood South
Brookwood South - 34th Street	Zone B >25% Development (75 units)	2027	Proceed with development in Zone B and Zone C, path along collector
Brookwood South - Proposed East-West Collector	Zone B >25% Development (75 units)	2027	Proceed with development of collector street network
Brookwood South - Patricia Avenue	Brookwood South Phase 2 Development	2032	Wait for development to start reaching the south end of the SPA
Bellafield - Maryland Avenue ROW Connect to 34th	Zone B >25% Development (75 units)	2027	Wait for some demand from Brookwood South
Bellafield - Maryland Avenue ROW Zone J	Zone J Local Streets	2022	Proceed with local streets in Zone J
Bellafield - West of Derlago (Marquis) Drive	Zone D Local Streets	2027	Proceed with development of local street network
Bellafield - Park Area	Start of Zone F Development	2032	Proceed with development of local street network
Bellafield - Proposed East-West Collector	Start of Zone E Development	2037	Proceed with development of collector street network
Bellafield - 26th Street Extension	Start of Zone F Development	2032	Proceed with development of collector street network
Bellafield - Patricia Avenue	Patricia Avenue Paving	2027	Include as part of Patricia Avenue paving
Paths around DSFM School	Completion of DSFM School	2027	Wait for school
Annex Lands - Proposed Residential Collector	With development in Zone G	2027	Proceed with development of collector street network
Annex Lands - Internal	With development in Zone G	2027	Proceed with development of collector street network
Annex Lands - Patricia Avenue Commercial Access	With development in Zone G	2027	Proceed with development of collector street network
Annex Lands - 18th Street Commercial Access	With development in Zone G	2027	Proceed with development of collector street network
Active Transportation - Crossings			
Richmond Avenue West of 34th Street	Existing desire line	2022	Warrant for crossing under existing conditions
34th Street south of Aberdeen Avenue	Zone B >25% Development (75 units)	2027	Construct as part of corridor connecting Brookwood South and Bellafield
Brookwood South - Lakeview Drive north	Brookwood South Phase 4 Development	2042	Include in initial construction
Brookwood South - Proposed Collector at Plateau Drive (Raised)	BSD School	2042	Wait for school
Bellafield - 26th Street at Connection to Brentwood Village (Raised)	Start of Zone F Development	2032	Include in initial construction
Bellafield - 26th Street at Connection to DSFM School	Start of Zone F Development	2032	Wait for school
Maryland Avenue at Connection to DSFM School	Completion of DSFM School	2027	Include in initial construction
Annex Lands - Patricia Avenue Commercial Access at Internal Collector	With development in Zone G	2027	Include in initial construction
Transit			
Service to Brookwood South	Brookwood South Phase 4 Development	2042	Wait until collector network in place, substantial demand
Service to Bellafield	Start of Zone E Development	2037	Wait until collector network in place, substantial demand

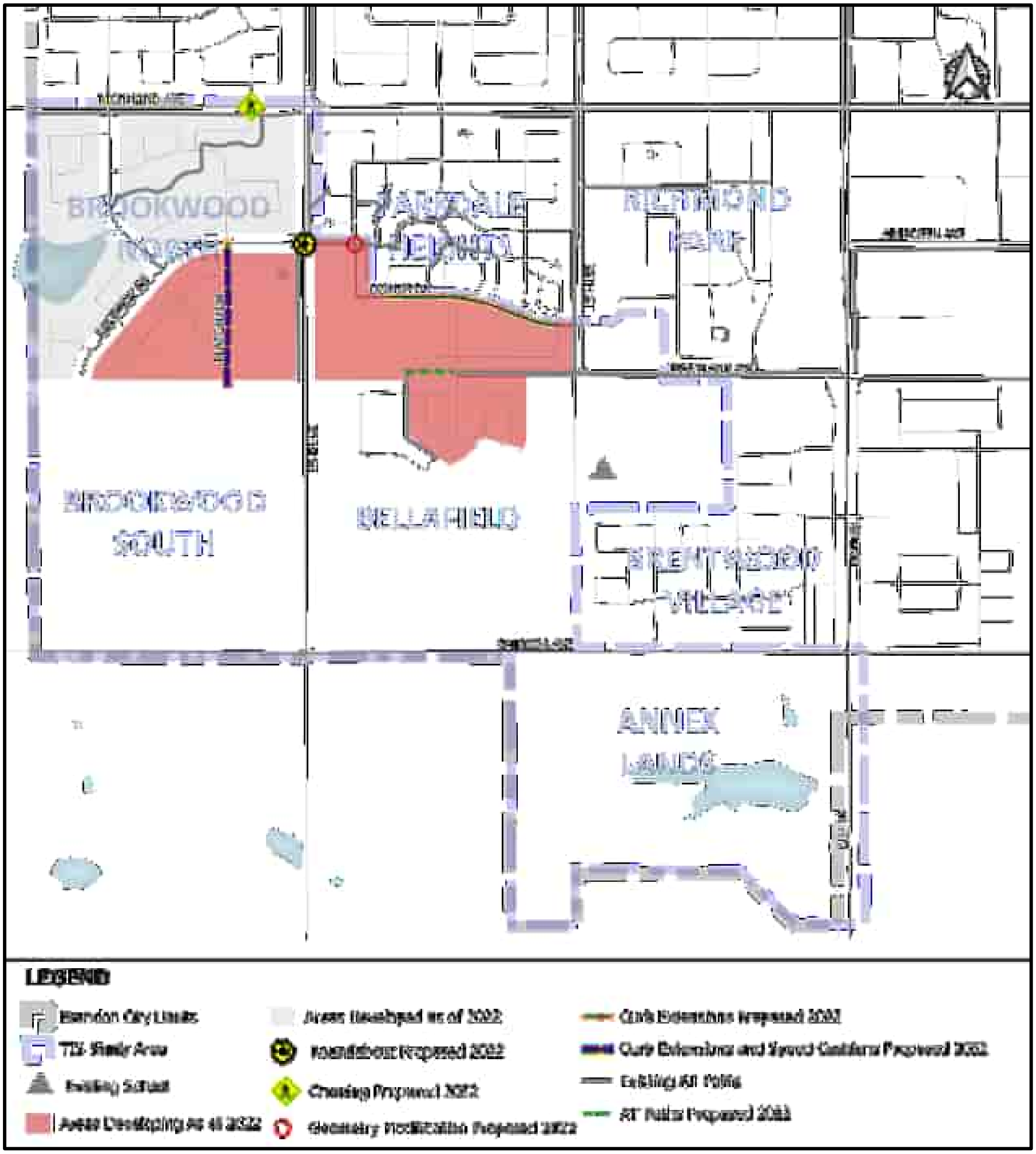


FIGURE 34: RECOMMENDED INFRASTRUCTURE TRIGGERED IN 2022

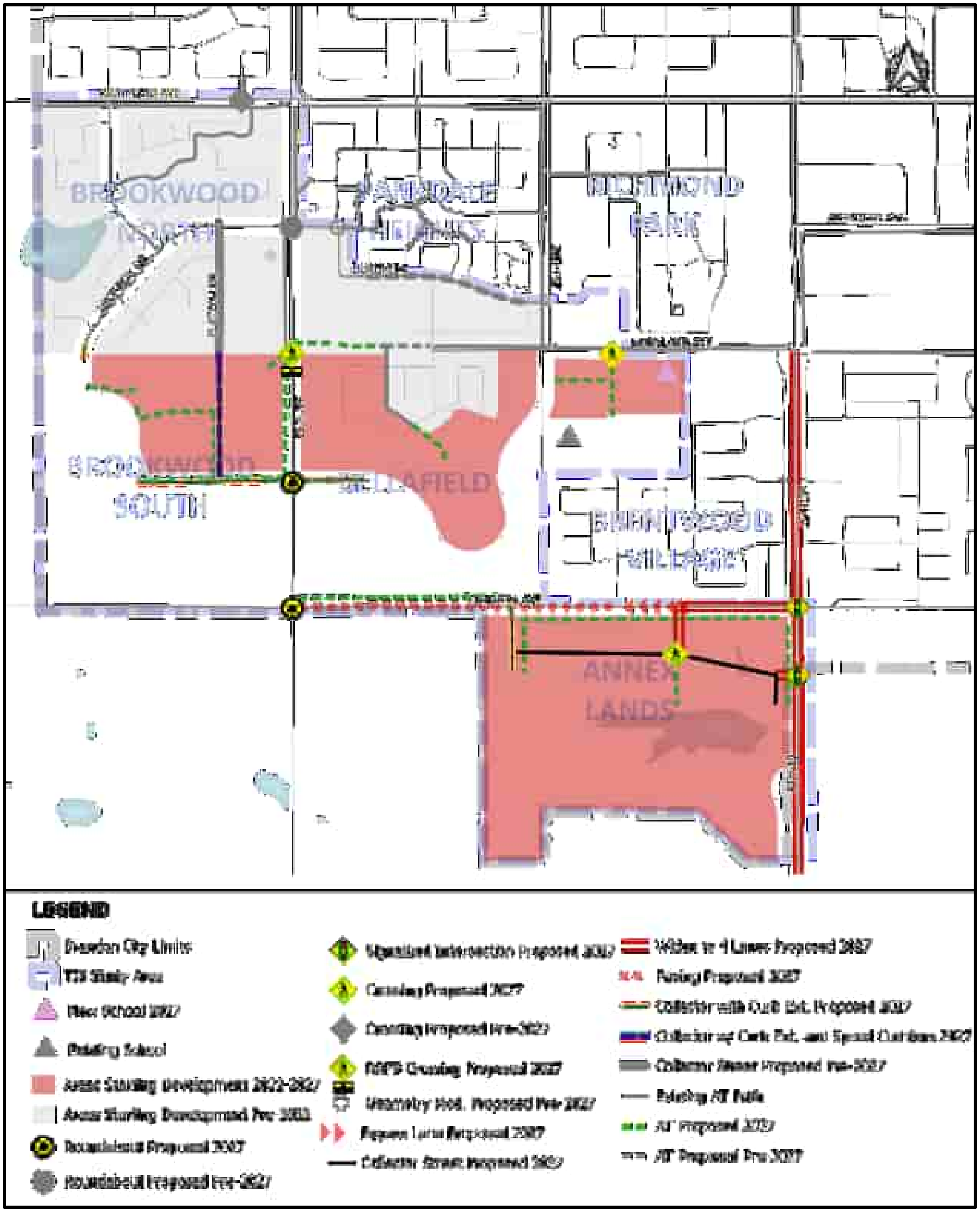


FIGURE 35: RECOMMENDED INFRASTRUCTURE TRIGGERED IN 2027

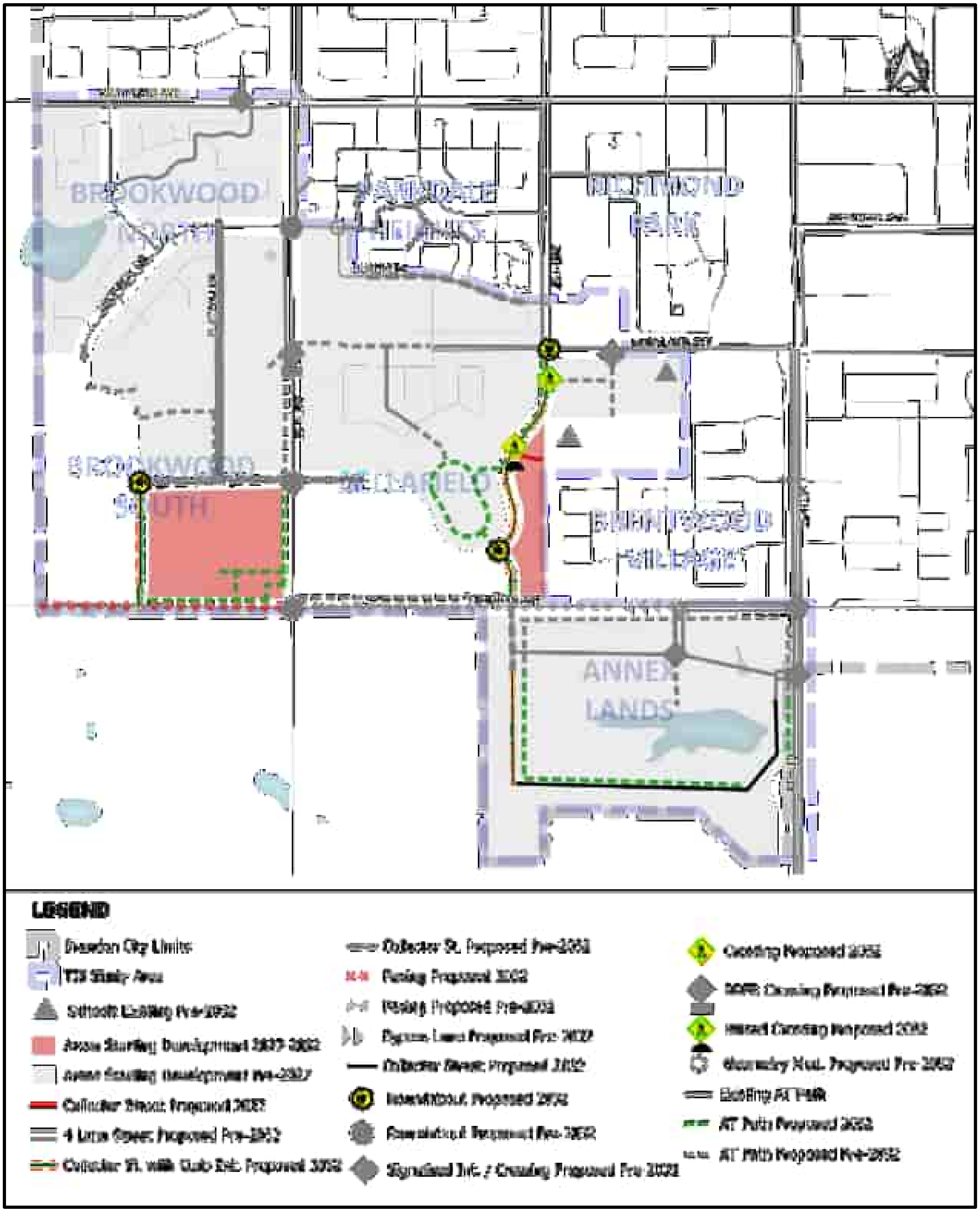


FIGURE 36: RECOMMENDED INFRASTRUCTURE TRIGGERED IN 2032

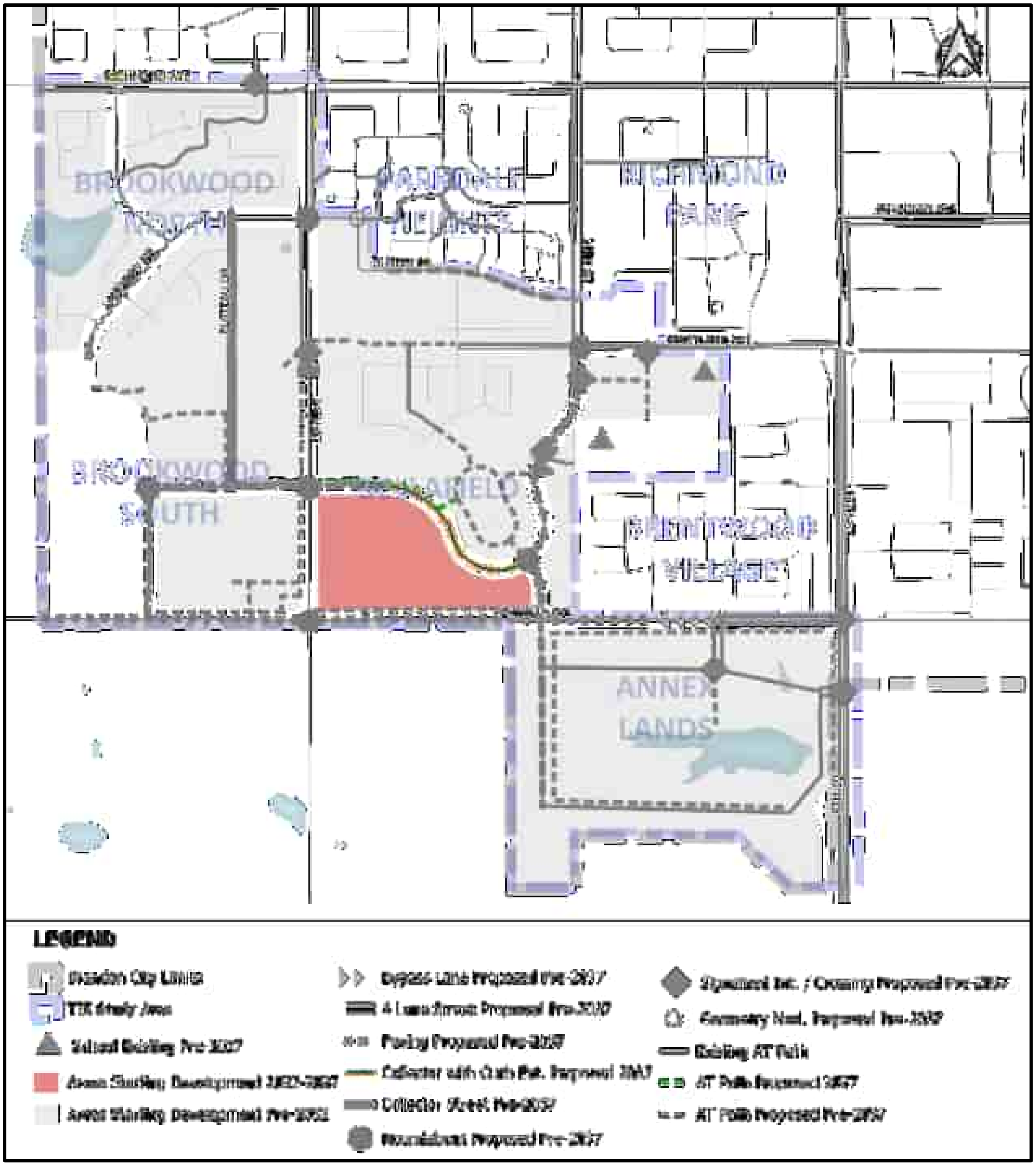


FIGURE 37: RECOMMENDED INFRASTRUCTURE TRIGGERED IN 2037

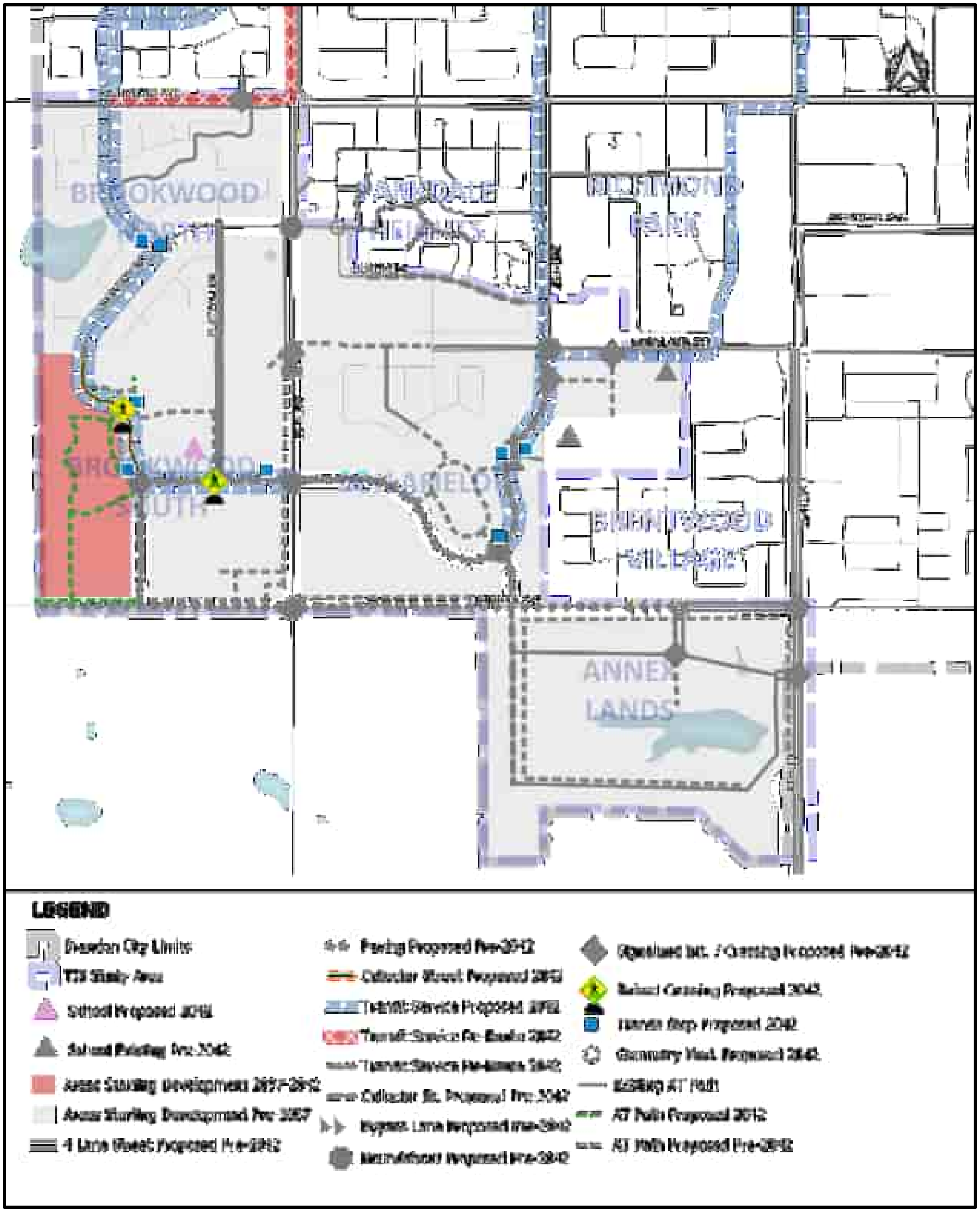


FIGURE 38: RECOMMENDED INFRASTRUCTURE TRIGGERED IN 2042

4.9.2 Funding

Funding considerations were identified based on the study team's understanding of the factors creating the need for each recommended component of the transportation infrastructure. The following points summarize the funding considerations:

- Much of the infrastructure was required simply to provide access to the SPA. As such, that infrastructure was assessed 100% to development funding. That applied to all proposed collector streets and active transportation paths and crossings (except one crossing), and the recommended future transit stops and service.
- The only recommended infrastructure required solely based on background conditions was a pedestrian crossing on Richmond Avenue west of 34th Street, where existing path connections create a desire line that development in the SPA does not influence significantly.
- Recommended infrastructure related to traffic capacity was assessed based on the share of development and background traffic forecast to drive the need for the infrastructure, using volumes from the 2052 post-development scenario. Splits ranged from 75% background traffic driven (resolving existing wide pavement issues at Aberdeen Avenue and Durum Drive), to 95% development-driven (improvements to Patricia Avenue).

Appendix E includes a table showing the assessed background and development splits, with rationale.

4.9.3 Robustness

The study team tested the robustness of the recommended intersection treatment in terms of capacity to accommodate future traffic growth, in four scenarios:

1. A "maximum density" development scenario, using the "maximum development quantity" unit counts from Table 1 in Section 2.2.
2. A scenario with the BSD School located northeast of the intersection of 26th Street and Maryland Avenue, instead of in Brookwood South.
3. A scenario to test the capacity of 34th Street to accommodate increased traffic volumes, representing a future scenario with PTH 110 extended west and connected to 34th Street.
4. A scenario with Maryland Avenue extended from Marquis Drive to 34th Street.

The study team estimated traffic volumes for each scenario, and found:

- Development at the maximum density would increase the residential unit count by approximately 4%, and the commercial floor area by approximately 9%. These increases had only a marginal effect on traffic volumes, and did not result in any substantial changes in intersection performance in the 2052 post-development scenario.
- If the BSD school were relocated to the northeast quadrant at 26th Street and Maryland Avenue, the roundabout at that intersection would perform somewhat worse in the 2052 post-

development AM peak hour, with overall intersection delay degrading from 11 seconds (in the base 2052 post-development scenario) to 18 seconds, and performance on the northbound approach would degrade from LOS B to LOS D, with the v/c ratio increasing from 0.61 to 0.83. This indicates that the school would use up some of the unused capacity at the roundabout, but the roundabout would still provide acceptable operations. Synchro traffic analysis reports are included in Appendix E. Additionally, the presence of the school may increase demand for pedestrian crossings at the intersection, which may create a need for higher-order crossing control, such as rectangular rapid flashing beacon control. That can be assessed in the future when vehicle and crossing volumes can be assessed empirically rather than using projections.

- Volumes on 34th Street could be increased by approximately 500 vph in each direction before reaching capacity at the proposed roundabout at Patricia Avenue. The resulting through volume on 34th Street at the roundabout would be similar to the forecast volumes on 18th Street at Patricia Avenue for the 2052 post-development scenario.

- It is not necessary to extend Maryland Avenue from Marquis Drive to 34th Street for transportation system capacity. The other arterial roads and collector streets in the study area have sufficient capacity to accommodate the forecast traffic volumes from development in the SPA, without a Maryland Avenue extension.

  However, a Maryland Avenue extension would provide an east-west route between 26th Street and 34th Street, parallel to—and more direct than—Durum Drive, which may help to reduce traffic volumes on that street. Figure 18 in Section 4.2.3 shows an estimated 700 vehicles per day added to Durum Drive and Aberdeen Avenue between 34th Street and Marquis Drive. A Maryland Avenue extension may result in nearly all that traffic re-routing off Durum Drive, giving a forecast 2052 post-development volume of 1,300 to 1,500 vehicles per day (vpd) rather than the 2,000 vpd in the base forecast.

  Further, Maryland Avenue could be extended west of 34th Street to provide an additional connection between Brookwood South and 34th Street, which may reduce traffic volumes on Plateau Drive.

  A Maryland Avenue extension could therefore be considered as an option to address neighbourhood traffic concerns. However, the extension would likely be much more expensive than the curb extensions and speed cushions noted in Section 4.3.2. As such, the extension should only be considered if traffic calming interventions fail to alleviate current volume and speed issues on Durum Drive and if the net cost-benefit of the extension is acceptable to the city.

The additional analysis indicated that the recommended intersection treatments were robust enough to accommodate development at the maximum density, a change in the location of the BSD School, and significantly increased traffic on 34th Street at Patricia Avenue. A Maryland Avenue extension to 34th Street can be considered as an option to address neighbourhood traffic concerns, although traffic calming methods should be attempted first, as they are likely more cost-effective means of addressing those concerns.

5 CONCEPT DESIGN

Concept design sketches were developed for the intersection traffic control recommendations noted in Section 4.6.4 and illustrated on Figure 11 in Section 4.1. The intent of the sketches was to illustrate approximate right-of-way requirements for the recommended intersection treatments, based on realistic, but conservative (larger) geometry. Note that typical right-of-way widths are to be established in Brandon's *Municipal Servicing Standards*, which were under development at the time this TIS was completed (see Section 2.3). As such, the geometry included in this Section is more representative than definitive. This pertains especially to space required for grading, drainage, and snow storage.

Roundabout geometry was primarily drawn from the National Cooperative Highway Research Program (NCHRP) Report 672: *Roundabouts: An Informational Guide (2nd Edition)* and checked against geometry at the existing roundabouts in Brandon at 34th Street and Richmond Avenue, and at 9th Street and Maryland Avenue. Geometry for signalized intersections was taken from the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads, 2017* (GDG).

General notes on geometry and the approach to the sketches include:

- Roundabouts were drawn with 40 m inscribed diameters. This is a typical minimum value for roundabouts with a WB-20 design vehicle. It is also a typically used value for roundabouts involving collector streets, like many of the recommended roundabouts.
- Splitter islands were drawn 50 m long, representing the painted and raised portion of the island. No attempt was made to illustrate the raised portion of the island—that can be assessed at a more detailed level of design.
- Entry radii were—in most cases—set to 20 m, while exit radii were set to 30 m in most cases. Different values were used when available space did not permit use of these typical values.
- Pedestrian crossings were set back 6 m from the roundabout entries, allowing for storage of one vehicle between the yield line and the crossing.
- Multi-use path and sidewalk locations were set based on the recommended infrastructure on Figure 11. Specific alignments were selected with consideration for utility conflicts and available right-of-way around each intersection. Collector streets were assumed to have sidewalks on both sides, with the sidewalks superseded by multi-use-paths, where present.
- Multi-use paths and sidewalks were offset 3 m from the edge of pavement (where space was available) to provide space for grading and snow storage.
- Multi-use paths and sidewalks were either set to 0.5 m from the edge of right-of-way, or where new right-of-way was required, it was set 0.5 m beyond the edge of the proposed paths and sidewalks.

Notes related to specific locations include:

- The sketch for 34th Street at Aberdeen Avenue (Figure 40) includes the geometry modifications at Aberdeen Avenue and Durum Drive, which involves carrying the 8 m pavement width from near 34th Avenue, through to the intersection at Durum Drive.
    - The roundabout at 34th Street was shifted slightly to the west to avoid impacting the property in the southeast quadrant. The entry and exit on the west leg are aligned to the median lanes on Lakeview Drive, with islands providing some channelization.
- The roundabout on 34th Street at the proposed east-west collector street (Figure 39) had its alignment shifted to the south to avoid impacting a property in the northeast quadrant, resulting in a larger requirement from the property in the southeast quadrant. The multi-use path on the west side of 34th Street was set outside of the 34th Street right-of-way, to avoid utility poles.
- The roundabout at 34th Street and Patricia Avenue (Figure 41) was centered on the existing intersection, resulting in small property requirements in the southeast and southwest quadrants. The northeast quadrant was also impacted, as the multi-use path was set on that property to avoid conflicts with utility poles on Patricia Avenue. Impacts on the (undeveloped) properties to the south could be eliminated if the alignment was shifted north, resulting in more impact on the property in the northeast quadrant, currently developed with a single-family home.
    - For all locations on Patricia Avenue, multi-use paths were aligned outside of the existing right-of-way to avoid conflicts with utility poles. The drawings show a 3 m wide path, offset 3 m from the existing edge of right-of-way, with another 0.5 m buffer between the outside edge of the path and the proposed edge of right-of-way, for a proposed 6.5 m total property acquisition along Patricia Avenue. The City's typical 9 m "urban reserve" dedication would likely be sufficient, barring unforeseen utility conflicts or severe grading issues.
- The roundabout at 26th Street and Maryland Avenue (Figure 41) could be shifted east to eliminate any property impacts on the west side of 26th Street. Impacts would be limited to the property in the southeast quadrant—which would be impacted solely by the 26th Street re-alignment to correct the skew at Maryland Avenue—and in the northeast quadrant, where approximately 50 m^2 of property would be required. Property requirements could be further reduced by reducing the buffer space between the edge of the circulatory roadway and the AT paths.
- The westbound bypass lane for the roundabout at the Annex Lands commercial access (Figure 43) was set to continue to the intersection with Brentwood Trace. This would provide approximately 125 m for motorists on the bypass to merge into the lane continuing west of Brentwood Trace. The study team considered that this may create a weaving conflict with vehicles turning right to access Brentwood Trace, however, that forecast 2052 post-development right-turn volume was low (55 vehicles per hour) and many of those vehicles may already be coming from the east and thus using the bypass lane and not contributing to a weaving conflict.
    - The roundabout was aligned such that only the bypass lane extended north of the existing north edge of pavement. This was a measure to reduce drainage impacts on the

north side of Patricia Avenue. This increased the impact on the Annex Lands, which was already impacted by the need to accommodate the multi-use path on the south side of Patricia Avenue.

- Similar logic was used for the design at 18th Street and Patricia Avenue (Figure 44), where widening on Patricia Avenue was shifted completely to the south side, into the Annex Lands. Existing all-direction accesses on Patricia Avenue were assumed to become right-in right-out with the advent of a raised median in the four-lane divided section on Patricia Avenue. 18th Street was assumed to be widened about the existing centreline. Any widening on 18th Street would require co-ordination with Manitoba Transportation and Infrastructure (MTI).
    - If all widening on Patricia Avenue was located on the south side of the right-of-way, a 9 m “urban reserve” dedication would likely be sufficient for the recommended geometry, assuming that the south side of the street had an urban (covered drainage) section, and barring unforeseen utility conflicts or severe grading issues. Further, the south-side property requirements could be reduced if the widened road was centered in the right-of-way, rather than having all widening on the south side. That would impact drainage on the north side, and it may impact existing street intersections and driveway access to the north.

The sketches are presented on Figure 39 through Figure 45, which make up the remainder of this section.

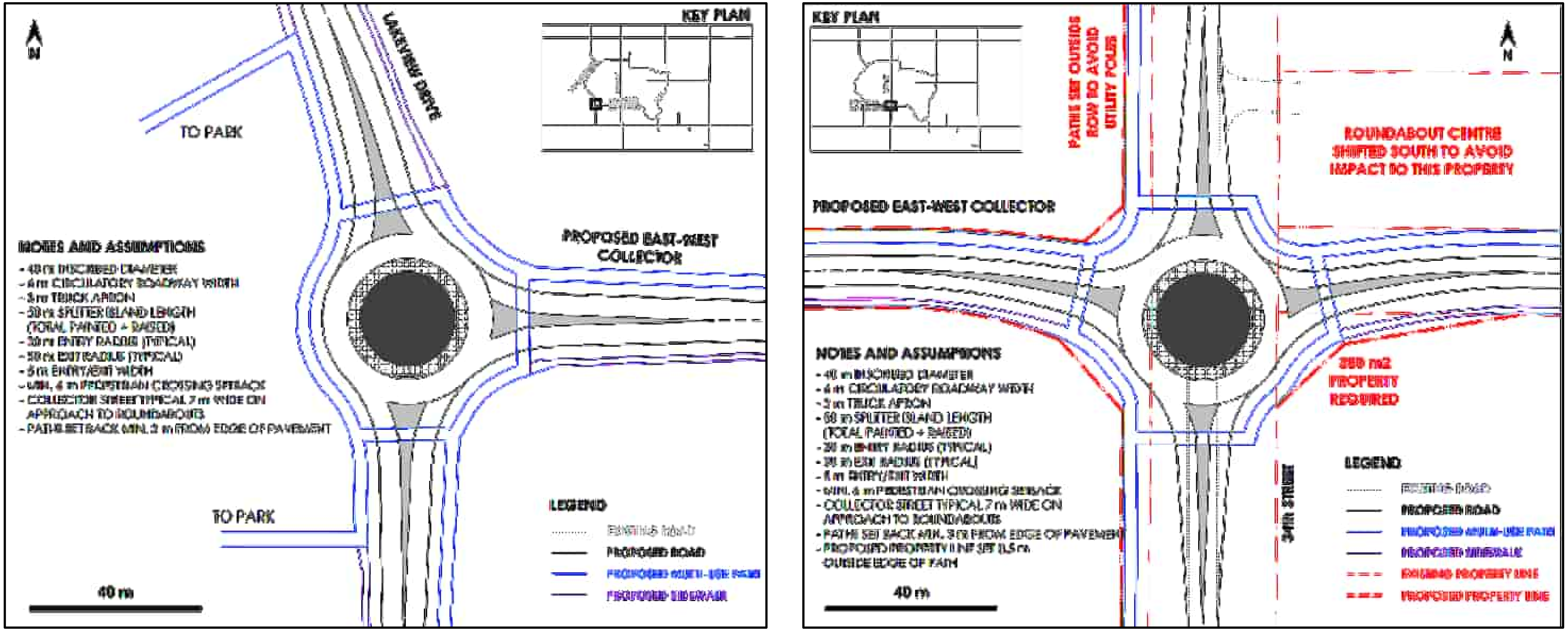


FIGURE 39: DESIGN SKETCH – PROPOSED EAST-WEST COLLECTOR AT LAKEVIEW DRIVE (LEFT) AND AT 34TH STREET (RIGHT)

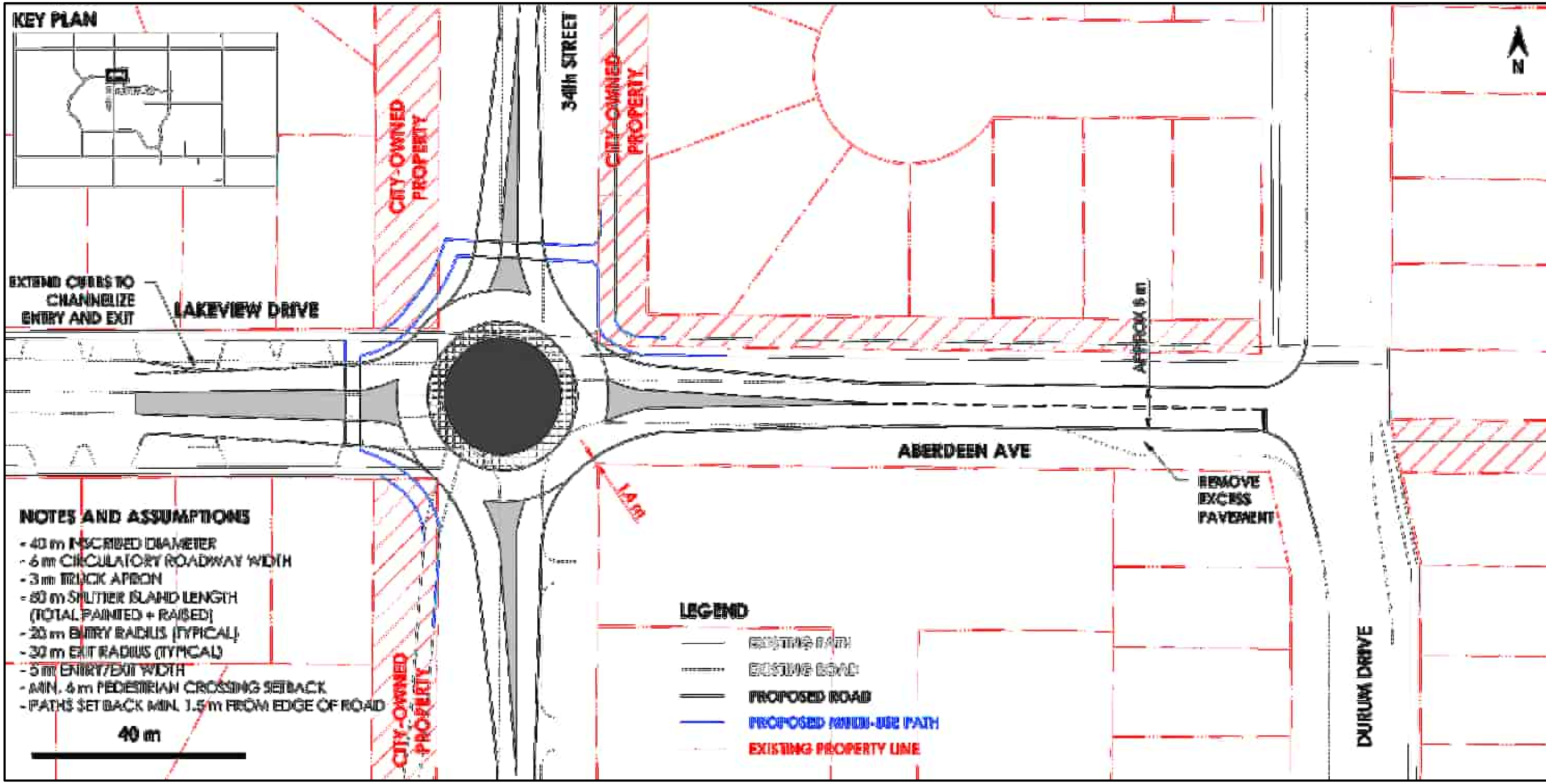


FIGURE 40: DESIGN SKETCH - 34TH STREET AT ABERDEEN AVENUE

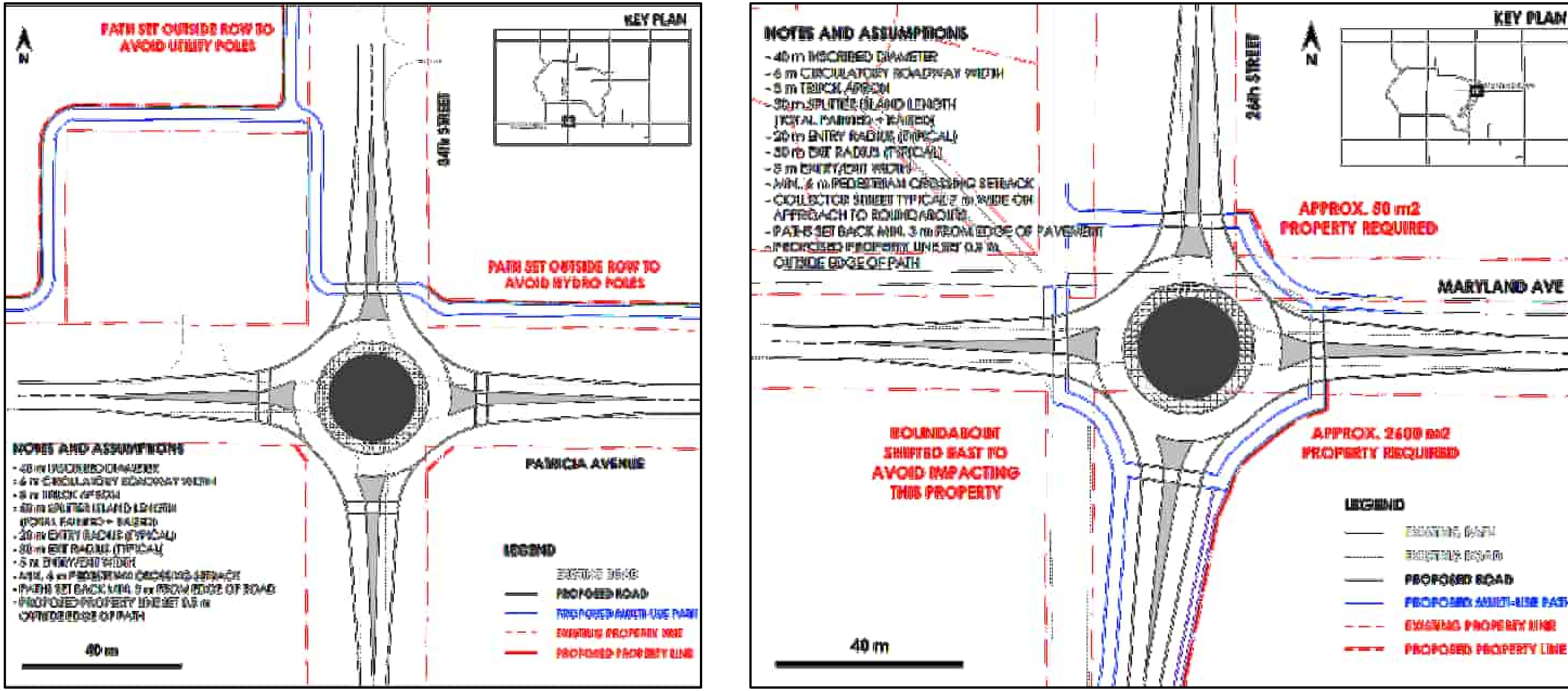


FIGURE 41: DESIGN SKETCH - 34TH STREET AT PATRICIA AVENUE (LEFT), 26TH STREET AT MARYLAND AVENUE (RIGHT)

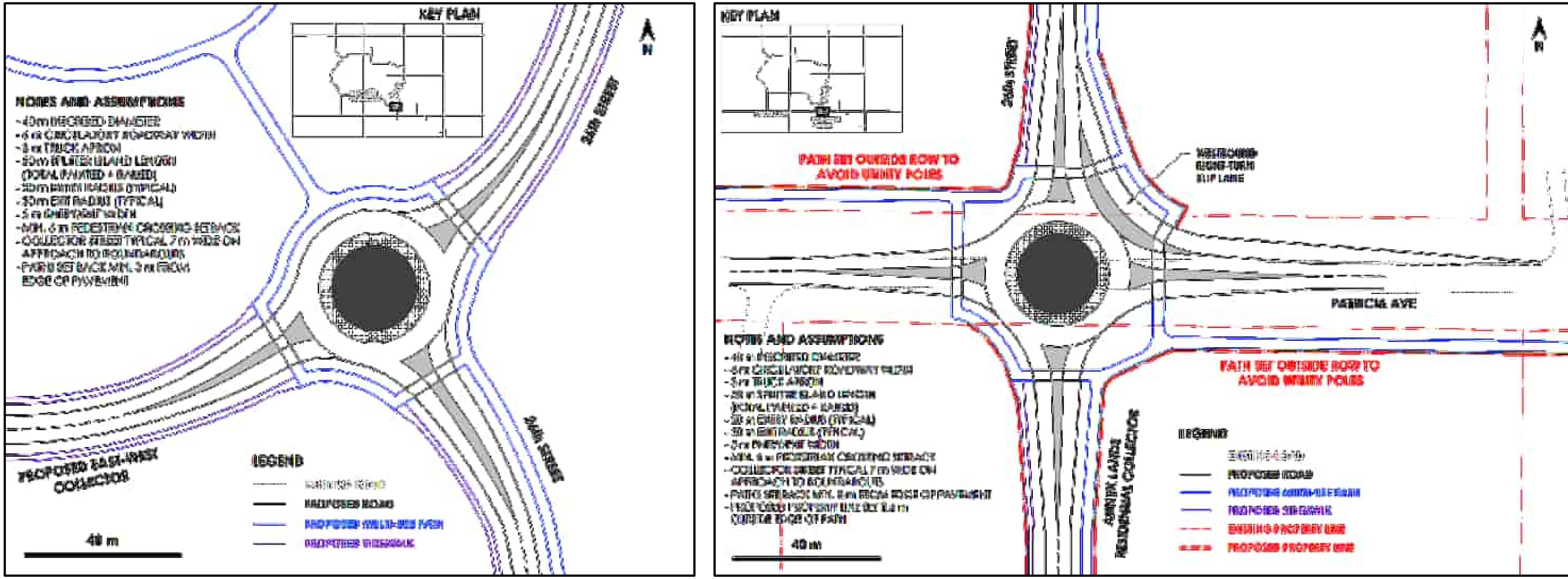


FIGURE 42: DESIGN SKETCH – 26TH STREET AT PROPOSED EAST-WEST COLLECTOR (LEFT) AND AT PATRICIA AVENUE (RIGHT)

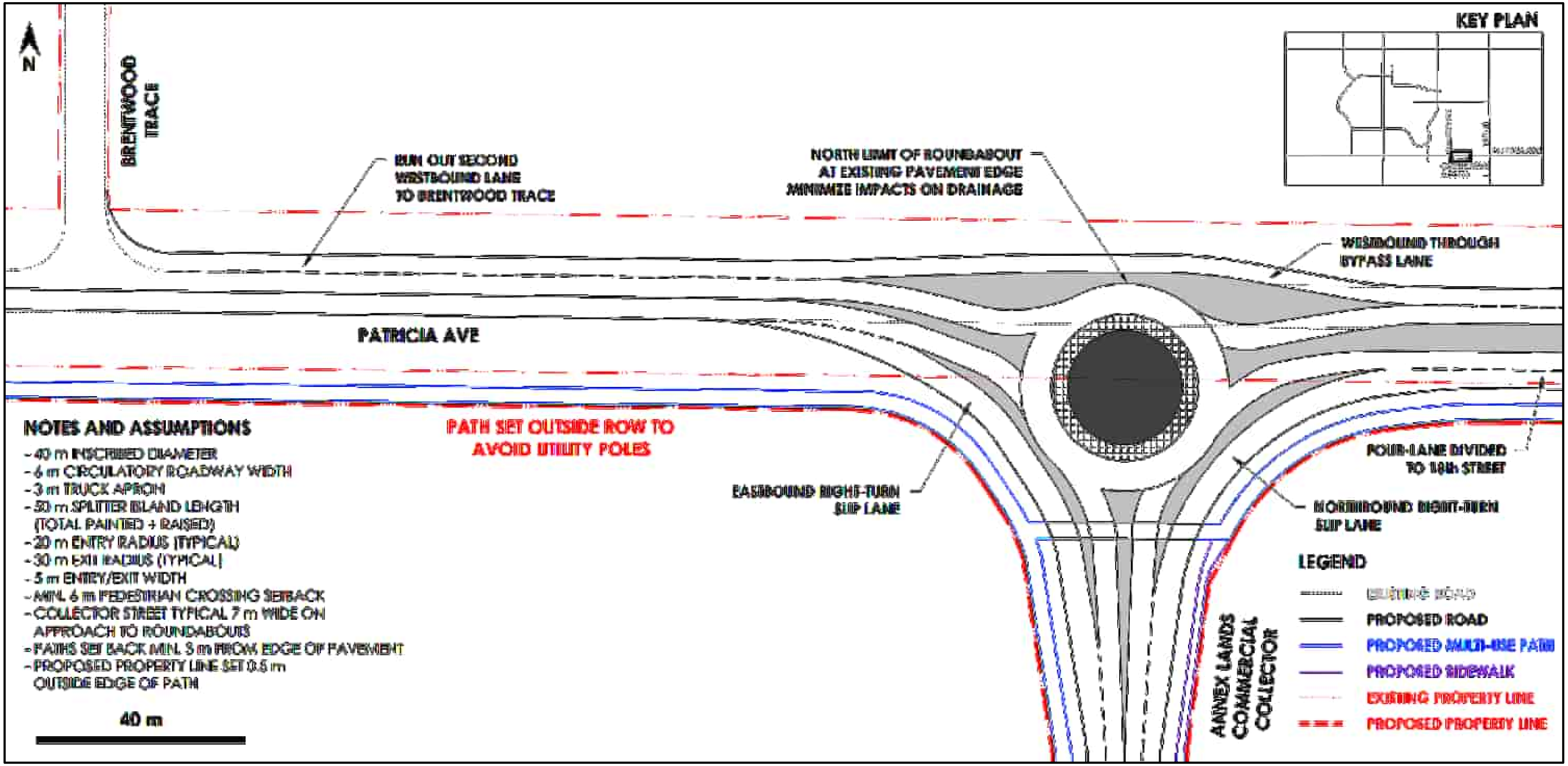


FIGURE 43: DESIGN SKETCH – PATRICIA AVENUE AT ANNEX LANDS COMMERCIAL ACCESS

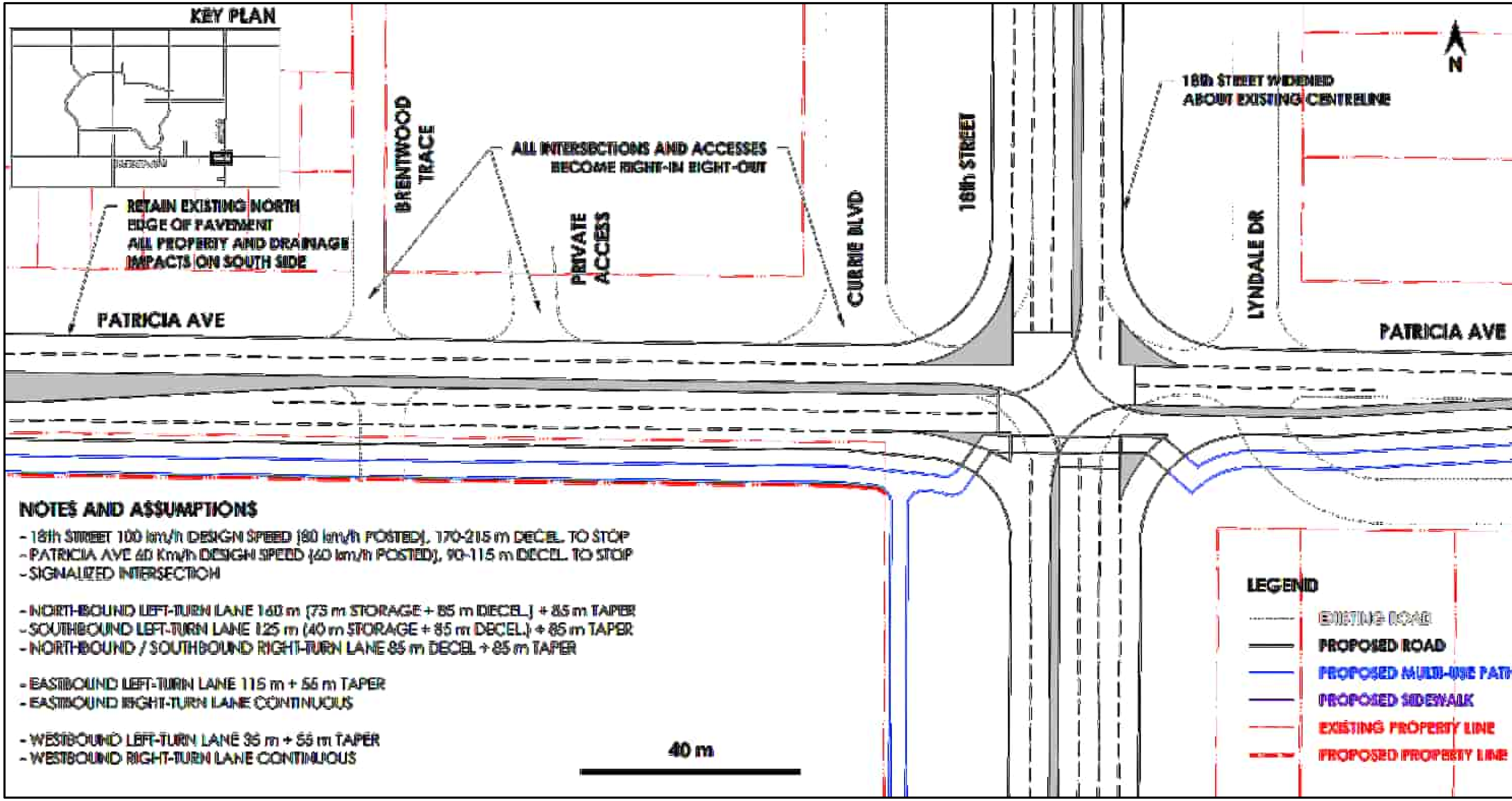


FIGURE 44: DESIGN SKETCH - 18TH STREET AT PATRICIA AVENUE

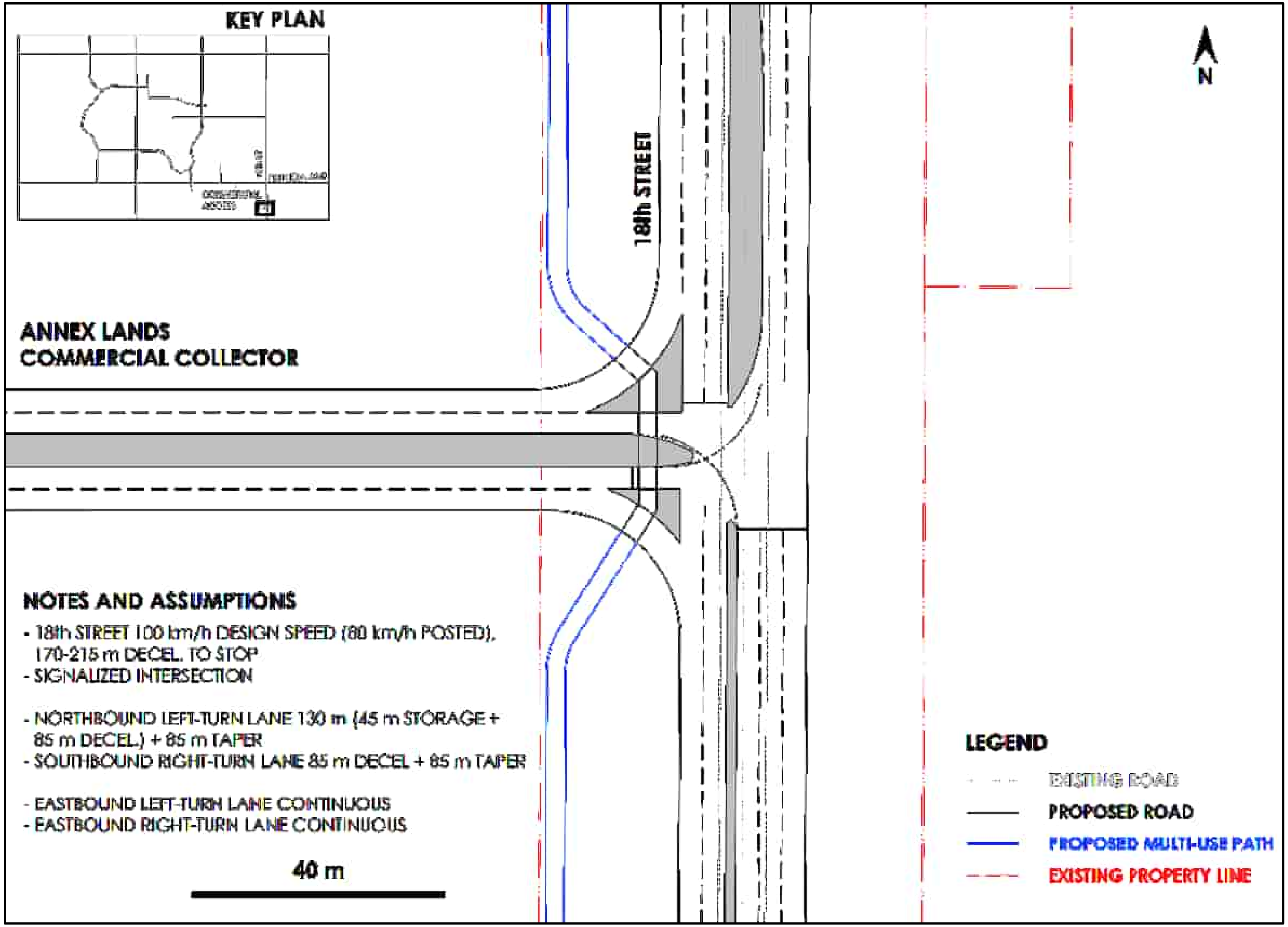


FIGURE 45: DESIGN SKETCH - 18TH STREET AT ANNEX LANDS COMMERCIAL ACCESS

6 CONCLUSIONS AND RECOMMENDATIONS

The following points summarize the study team's findings as noted in the preceding Sections:

- Development in the Secondary Plan Area (SPA) is forecast to generate 2,712 trips during the AM peak hour, 4,492 trips during the PM peak hour, and 47,824 daily trips. The big-box commercial land use is forecast to be the largest individual trip generator, accounting for nearly half of the forecast PM peak hour and daily vehicle trip generation.
- The study area is at the edge of Brandon, representing the area that is likely to represent growth in Southwest Brandon through the 2052 study horizon. Additional growth in traffic from development outside of Brandon would likely have a negligible effect on the study area.
- The collector street and active transportation path networks proposed in the Secondary Plan provide good connectivity and coverage in the study area. The active transportation network connectivity could be improved with a controlled crossing at 34th Street near the projection of the Maryland Avenue right-of-way.
- Two lane cross-sections (one lane in each direction) are sufficient for nearly all collector streets and arterial roads in the study area. Four-lane cross sections are forecast to be required on 18th Street through the study area, and on Patricia Avenue from 18th Street to the proposed Annex Lands access approximately 385 m west of 18th Street. Collector streets in the commercial area of the Annex Lands are also forecast to require four lane sections where they meet 18th Street and Patricia Avenue.
- A *Safe Systems* approach to road safety has several applications to development of transportation infrastructure in the study area. The approach can be used to identify potential safety issues in the study area, including issues related to incompatibility between traffic flow and neighbourhood functions, issues around understandability, and issues around speed.
    - Traffic calming treatments including curb extensions, speed cushions, and raised crossings can help to control vehicle speeds and make collector street environments more inviting to people on foot, cycling, or using transit.
- Existing transit service near the study area is focused on Downtown. Existing routes can be extended into the SPA once the collector street network is developed.
- Roundabouts are forecast to be an effective form of traffic control at most of the busier intersections in the study area. However, traffic signals are likely a better method of traffic control for intersections on 18th Street under forecast 2052 post-development conditions.
- Transportation infrastructure found to be required for the forecast 2052 post-development scenarios is robust against a change in location of a future Brandon School Division School and against marginal increases in development density.

- It is not necessary to extend Maryland Avenue from Marquis Drive to 34th Street for transportation system capacity. A Maryland Avenue extension to 34th Street can be considered as an option to address neighbourhood traffic concerns, although traffic calming methods should be attempted first, as they are likely more cost-effective means of addressing those concerns.

The study team offers the following recommendations:

- New collector streets in the study area should generally have 10 m cross-sections, which will provide one lane in each direction, plus a parking lane on one side. Curb extensions should be provided at intersections, to reduce the clear width to as little as 6 m wide, and no more than 7 m wide. Curb extensions can help to limit vehicle speeds by introducing edge friction, define parking areas, and improve visibility for crossing pedestrians.
- A street connection between the south extension of 26th Street and the Brentwood Village neighbourhood should be designed as a collector street, rather than a local street.
- Right of way should be reserved for potential future collector street connections to the west and south of the study area.
- Multi-use paths at 3 m pavement widths should be used for the active transportation network, both for off-street and on-street alignments. When used on collector street alignments, multi-use paths can replace the sidewalk on one side of the street, while the other side should retain a typical sidewalk.
- Implement a controlled pedestrian crossing on 34th Street south of Aberdeen Avenue, along the projection of the Maryland Avenue right of way. Sign-controlled pedestrian crossing should be provided where AT paths cross collector or arterial streets at locations other than roundabout or traffic signal-controlled intersections. Raised crossings should be provided at crossings near schools, except on Maryland Avenue, where the rural cross-section would be less amenable to a raised crossing.
- Add curb extensions on Durum Drive, to reduce the lack of side friction resulting from the wide pavement. This will provide some friction even when parking demand is low.
- Add curb extensions and speed cushions to Plateau Drive, to prevent any speed issues from arising due to the combination of its straight alignment, wide pavement width, and connections to developing areas in Brookwood South.
- Monitor speeds on Durum Drive, Maryland Avenue, and Derlago Drive (Marquis Drive). If speeds are unacceptably high, consider implementing speed cushions as a means of controlling vehicle speeds.
- Develop study area intersections with the geometry illustrated in Section 5.
- Transit routes can be extended to provide service on the south extension of Lakeview Drive and on the 26th Street extension.

Recommendations are summarized on Figure 11, shown below and in Section 4.1.

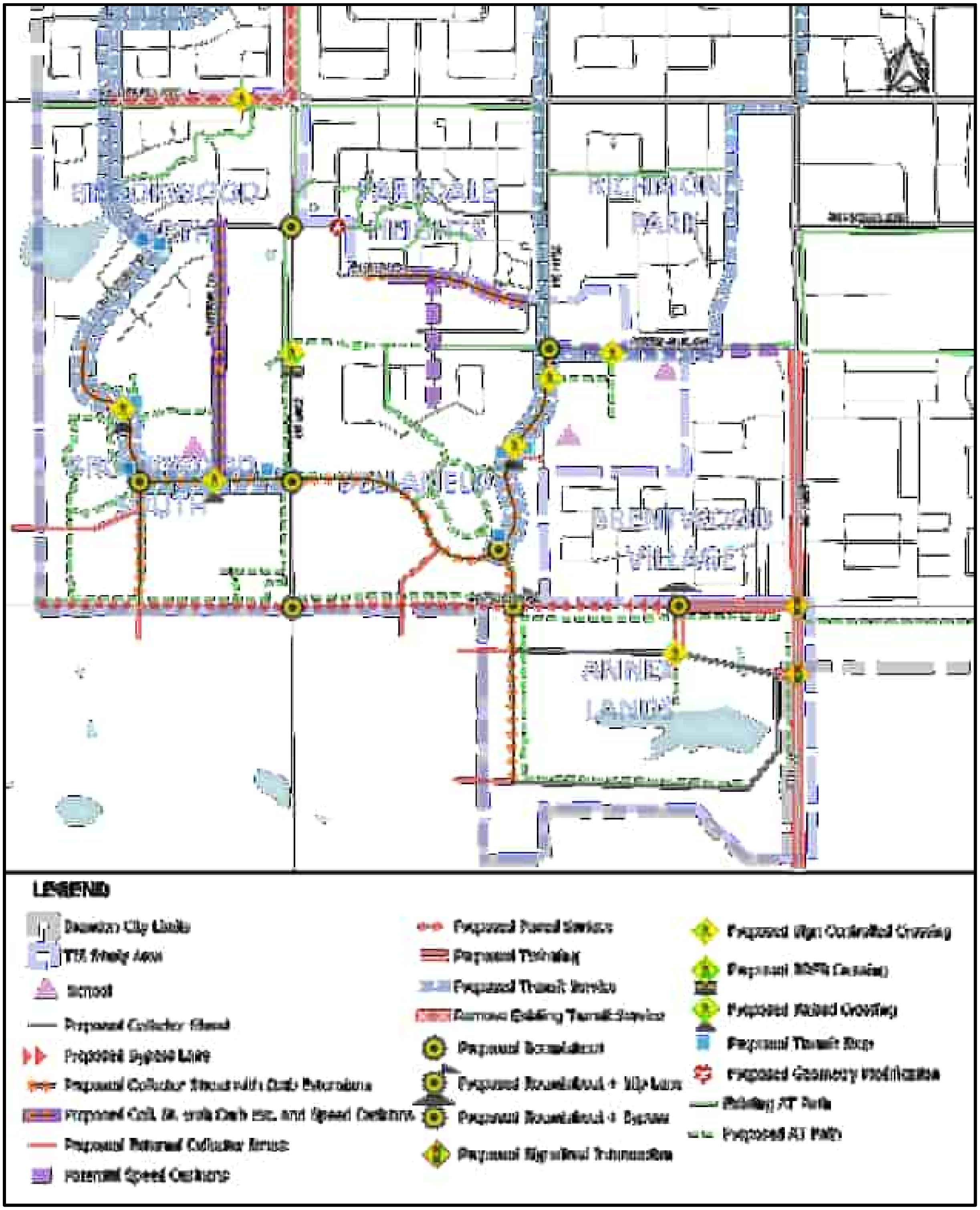


FIGURE 11: RECOMMENDED TRANSPORTATION INFRASTRUCTURE

APPENDIX A: Level of Service Definitions

Appendix

A

LEVEL OF SERVICE

Level of Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers.

Highway Capacity Manual Level of Service (HCM LOS)

The 2010 Highway Capacity Manual (HCM) identifies control delay as the primary service measure with LOS determined from the control delay estimate. Control delay is defined as the component of delay that results when a traffic control device causes a lane group to reduce speed or stop; it is measured against the uncontrolled condition.

Six Levels of Service are defined (briefly described below) with LOS A representing the best operating conditions, and LOS F the worst. It should be noted that there is often significant variability in the amount of delay experienced by individual drivers. The LOS criteria for stop-controlled intersections are different than that used for a signalized intersection, this is primarily because of the different driver expectance at these two environments.

LOS A: This level of service describes the highest quality of traffic flow and is referred to as free flow. The approach appears open, turning movements are easily made and drivers have freedom of operation. Control delay is less than 10 seconds/vehicle.

LOS B: This level of service is referred to as a stable flow. Drivers feel somewhat restricted and occasionally may have to wait to complete minor movement. Control delay is 10 – 15 seconds/vehicle for unsignalized intersections and 10 – 20 seconds/vehicle for signalized intersections.

LOS C: At this level, the operation is stable. Drivers feel more restricted and may have to wait, with queues developing for short periods. Control delay is 15 – 25 seconds/vehicle at unsignalized intersection and 20 – 35 seconds/vehicle at signalized intersections.

LOS D: At this level, traffic is approaching unstable flow. The motorist experiences increasing restriction and instability of flow. There are substantial delays to approaching vehicles during short peaks within the peak period, but there are enough gaps to lower demand to permit occasional clearance of developing queues and prevent excessive back-ups. Control delay is 25 – 35 seconds/vehicle at unsignalized intersections and 35 – 55 seconds/vehicle at signalized intersections.

LOS E: At this level, maximum capacity occurs. Long queues of vehicles exist and delays to vehicles may extend. Control delay is 35 – 50 seconds/vehicle at unsignalized intersections and 55 – 80 seconds/vehicle at signalized intersections.

LOS F: At this level of service, the intersection has failed. Capacity of the intersection has been exceeded. Control delay exceeds 50 seconds/vehicle at unsignalized intersections and exceeds 80 seconds/vehicle at signalized intersections.

Intersection Capacity Utilization Level of Service (ICU LOS)

Intersection capacity utilization (ICU) LOS indicates how an intersection is functioning and how much extra capacity is available to handle traffic fluctuations and incidents. The ICU LOS does not predict delay, but it can be used to predict how often an intersection will experience congestion.

Eight Levels of Service are defined (briefly described below) with LOS A representing the best operating conditions, and LOS H the worst. These letter grades are defined as follows:

LOS A: ICU less than 55% - the intersection has no congestion and can accommodate 40% more traffic on all movements.

LOS B: ICU of 55% to 64% - very little congestion and can accommodate 30% more traffic on all movements.

LOS C: ICU of 64% to 73% - very little major congestion and can accommodate 20% more traffic on all movements.

LOS D: ICU of 73% to 82% - has no congestion and can accommodate 10% more traffic on all movements.

LOS E: ICU of 82% to 91% is on the verge of congested conditions.

LOS F: ICU of 91% to 100% indicates the intersection is over capacity and likely experiences congestion periods of 15 – 60 consecutive minutes.

LOS G: ICU of 100% to 109% indicates the intersection is over capacity and likely experiences congestion periods of 60 – 120 consecutive minutes.

LOS H: ICU greater than 109% indicates the intersection is over capacity and likely experiences congestion periods of more than 120 consecutive minutes.

APPENDIX B: Traffic Data and Calculations

Appendix

B

RICHMOND AVE 34th ST COUNT CONVERSION

Leg Counts

- Missing north leg individual file, have north leg daily

Leg	Facing	Period	Time	In	Out	Approach	Depart	TOTAL	% of Daily
East	East	AM	8	47	149	47	149	196	7%
East	East	PM	4	168	84	168	84	252	10%
East	East	Daily		1414	1217	1414	1217	2631	
West		AM				48	20	68	7%
West		PM				37	56	93	10%
West		Daily				450	500	950	
South	South	AM	8	77	17	77	17	94	9%
South	South	PM	4	24	66	24	66	90	8%
South	South	Daily		496	592	496	592	1088	
North	South	AM	8	16	30	30	16	46	6%
North	South	PM	4	49	26	26	49	75	10%
North	South	Daily				357	408	765	
				TOTAL	AM	202	202		
					PM	255	255		
					Daily	2717	2717		

< volumes estimated, set to balance total intersection approach and depart volumes, and give west leg volumes similar to north leg

Volume distribution by leg

Leg	AM	AM%	PM	PM	Daily	Daily%
East	196	49%	252	49%	2631	48%
South	94	23%	90	18%	1088	20%
West	68	17%	93	18%	950	17%
North	46	11%	75	15%	765	14%

Convert to Movements

- Estimate splits to turning movements
- Do daily first, because we have volumes for all legs
- Use balanced leg approach and depart volumes
- Then estimate north leg AM and PM

Daily

Manual estimate

					Target	357	408						
					Sum	357	408						
					d	0	0						
				SBR	SBT	SBL							
				15	10	332							
									WBR	383			
Target	Sum	d							WBT	465	Sum	Target	d
500	500	0							WBL	567	1415	1414	1
450	450	0	EBL	15							1218	1217	1
			EBT	420									
			EBR	15									
							NBL	NBT	NBR				
							20	10	466				
					Target	592	496						
					Sum	592	496						
					d	0	0						

- Use relationship between Daily and AM/PM to estimate AM/PM movement volumes
- Use volumes from before balancing

AM

Leg	App. Vol.	Dep. Vol.	Daily to AM Factors App. F	Dep. F
East	47	149	0.033239	0.122432
West	48	20	0.106667	0.04
South	77	17	0.155242	0.028716
North	30	16	0.084034	0.039216
TOTAL	202	202		

Calculated estimate

Manual estimate

					Target	30	16						
					Sum	30	16						
					d	0	0						
				SBR	SBT	SBL							
				1	1	28							
									WBR	14			
Target	Sum	d							WBT	18	Sum	Target	d
20	20	0							WBL	15	47	47	0
48	48	0	EBL	1							149	149	0
			EBT	46									
			EBR	1									
							NBL	NBT	NBR				
							1	1	75				
					Target	17	77						
					Sum	17	77						
					d	0	0						

PM

Leg	App. Vol.	Dep. Vol.	Daily to PM Factors App. F	Dep. F
East	168	84	0.118812	0.069022
West	37	56	0.082222	0.112
South	24	66	0.048387	0.111486
North	26	49	0.072829	0.120098
TOTAL	255	255		

Manual estimate

Calculated estimate

					Target	26	49						
					Sum	29	49						
					d	3	0						
				SBR	SBT	SBL							
				1	1	27							
									WBR	48			
Target	Sum	d							WBT	55	Sum	Target	d
56	57	1							WBL	64	167	168	-1
37	37	0	EBL	1							85	84	1
			EBT	35									
			EBR	1									
							NBL	NBT	NBR				
							1	0	23				
					Target	66	24						
					Sum	66	24						
					d	0	0						

Final Volumes

Period	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	TOTAL
AM		1	1	75		28	1	1		1	46	1		15	18	14	202
PM		1	0	23		27	1	1		1	35	1		64	55	48	257
Daily		20	10	466		332	10	15		15	420	15		567	465	383	2718

RICHMOND AVE 34th ST COUNT CONVERSION

Leg Counts
- Missing north leg individual file, have north leg daily

Leg	Facing	Period	Time	In	Out	Approach	Depart	TOTAL
East	East	AM	8	210	375	210	375	585
East	East	PM	4	424	255	424	255	679
East	East	Daily		3670	3248	3670	3248	6918
West	East	AM	8	47	149	149	47	196
West	East	PM	4	168	84	84	168	252
West	East	Daily		1414	1217	1217	1414	2631
South	South	AM	8	257	191	257	191	448
South	South	PM	4	193	291	193	291	484
South	South	Daily		1809	1755	1809	1755	3564
North		AM				0	0	0
North	South?	PM				0	0	0
North	South?	Daily		3410	2893	2893	3410	6303
				TOTAL	AM	616	613	
					PM	701	714	
					Daily	9589	9827	

Volume distribution by leg

Leg	AM	AM%	PM	PM	Daily	Daily%
East	585	48%	679	48%	6918	36%
South	448	36%	484	34%	3564	18%
West	196	16%	252	18%	2631	14%
North		0%		0%	6303	32%

Adjust to balance approaching and departing
- Just for daily, don't have north leg for AM or PM

Approach Factor	1.01
Depart Factor	0.99

Leg	Approach	Depart
East	3716	3209
West	1232	1397
South	1831	1734
North	2929	3369
TOTAL	9708	9709

Convert to Movements
- Estimate splits to turning movements
- Do daily first, because we have volumes for all legs
- Use balanced leg approach and depart volumes
- Then estimate north leg AM and PM

Daily

Manual estimate

North leg:

Target	2929	3369
Sum	2929	3369
d	0	0

SBR	SBT	SBL
385	585	1959

West leg:

Target	Sum	d
1397	1397	0
1232	1232	0

EBL	EBT	EBR
500	500	232

East leg:

WBR	WBT	WBL
1900	900	916

Sum	Target	d
3716	3716	0
3209	3209	0

South leg:

NBL	NBT	NBR
112	969	750

Target	1734	1831
Sum	1733	1831
d	-1	0

- Use relationship between Daily and AM/PM to estimate AM/PM movement volumes
- Use volumes from before balancing

AM

Leg	App. Vol.	Dep. Vol.	Daily to AM Factors App. F	Dep. F	
East	210	375	0.05722	0.11546	
West	149	47	0.12243	0.03324	
South	257	191	0.14207	0.10883	
North	316	320	0.108	0.095	< set north leg factors to balance total approach and depart volumes, also similar to average from other legs
TOTAL	932	933			

Calculated estimate
Manual estimate

North leg:

Target	316	320
Sum	316	320
d	0	0

SBR	SBT	SBL
20	84	212

West leg:

Target	Sum	d
47	47	0
149	150	1

EBL	EBT	EBR
61	61	28

East leg:

WBR	WBT	WBL
109	22	79

Sum	Target	d
210	210	0
375	375	0

South leg:

NBL	NBT	NBR
5	150	102

Target	191	257
Sum	191	257
d	0	0

PM

Leg	App. Vol.	Dep. Vol.	Daily to PM Factors App. F	Dep. F	
East	424	255	0.11553	0.07851	
West	84	168	0.06902	0.11881	
South	193	291	0.10669	0.16581	
North	284	270	0.09708	0.08	< set north leg factors to balance total approach and depart volumes, also similar to average from other legs
TOTAL	985	984			

Manual estimate
Calculated estimate

North leg:

Target	284	270
Sum	284	270
d	0	0

SBR	SBT	SBL
78	78	128

West leg:

Target	Sum	d
168	168	0
84	84	0

EBL	EBT	EBR
35	35	14

East leg:

WBR	WBT	WBL
147	78	199

Sum	Target	d
424	424	0
256	255	1

South leg:

NBL	NBT	NBR
12	88	93

Target	291	193
Sum	291	193
d	0	0

Final Volumes

Period	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	TOTAL
AM		5	150	102		212	84	20		61	61	28		79	22	109	933
PM		12	88	93		128	78	78		35	35	14		199	78	147	985
Daily		112	969	750		1959	585	385		500	500	232		916	900	1900	9708

Process
- Have a count at 18th and Patricia from 2013, kind of old
- Have 2013 and 2019 counts on 18th at Maryland
- Check growth from 2013 to 2019 at Maryland, use to factor up 2013 count at Patricia

18th and Maryland AM PEAK HOUR
2019 Count Raw Data

	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR		
7:00		2	41			7	24	5		17	6	17		1	1	11	132	682
7:15		4	30			3	25	14		17	5	8			6	17	129	798
7:30		6	60			6	27	13		28	8	17		1	9	26	201	916
7:45		11	65			10	23	15		30	12	15			15	24	220	990
8:00		6	68			15	40	24		32	12	11			13	27	248	990
8:15		15	70			4	23	29		31	14	11			13	37	247	
8:30		19	61			8	33	18		31	23	7			33	42	275	
8:45		11	61			8	27	19		36	17	11			11	19	220	
Peak Hour		51	264	0		37	119	86		124	61	44		0	74	130	990	

PM PEAK HOUR
2019 Count Raw Data

	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR		
15:30		18	61			27	49	33		26	23	18			26	16	297	1174
15:45		17	52			31	58	36		33	30	11		1	29	20	318	1200
16:00		8	51			38	67	42		32	18	10			22	19	307	1233
16:15		8	43			22	65	29		20	19	15			11	20	252	1254
16:30		9	70			32	83	31		28	26	9			15	20	323	1297
16:45		13	68			39	87	43		22	16	10			21	32	351	
17:00		23	67			40	89	5		29	16	6			26	27	328	
17:15		12	55			33	78	23		20	25	8			18	23	295	
Peak Hour		57	260	0		144	337	102		99	83	33		0	80	102	1297	

18th & Maryland	Time Start	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	TOTAL
2013	7:45		31	339	0		52	132	102		101	47	28		0	39	93	964
2019	7:45		51	264	0		37	119	86		124	61	44		0	74	130	990
2019/2013 Factor			1.64516	0.77876	#DIV/0!		0.71154	0.90152	0.84314		1.22772	1.29787	1.57143		#DIV/0!	1.89744	1.39785	1.02697
Approach Ratio				0.85135				0.84615				1.30114				1.54545		
Approach CAGR				-2.65%				-2.75%				4.48%				7.52%		
18th St Thru CAGR				-3.39%														
West Leg CAGR												3.99%						
East Leg CAGR																4.57%		

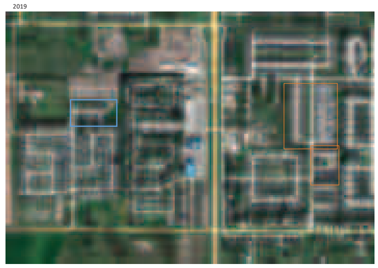
18th & Maryland	Time Start	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	TOTAL
2013	16:45		36	257			95	392	126		105	33	51		0	33	95	1223
2019	17:00		57	260			144	337	102		99	83	33		0	80	102	1297
2019/2013 Factor			1.58333	1.01167	#DIV/0!		1.51579	0.85969	0.80952		0.94286	2.51515	0.64706		#DIV/0!	2.42424	1.07368	1.06051
Approach Ratio				1.08191				0.95106				1.13757				1.42188		
Approach CAGR				1.32%				-0.83%				2.17%				6.04%		
Total 18th St Approach CAGR				-1.38%														
West Leg CAGR												2.83%						
East Leg CAGR																8.12%		

- Makes sense to have lots of growth on East and west leg given development in Bellafield and east of 18th Street, as shown below

- Aerial imagery changes from 2013 to 2019

2013

2019



- Notable changes that may impact 18th & Patricia
  - Remove mobile homes NW of Patricia & Currie (red)
  - Add mobile homes in NW part of Brentwood (blue)
  - Add townhouses east of 18th Street (orange)

- Patricia west leg growth likely slower than at Maryland--less Bellafield development impact on Patricia than on Maryland

18th and Patricia growth from 2013 to 2019
- No change on NB and SB approaches from 2013 to 2019. Apply 2% CAGR to west leg (vs 3-4% at Maryland), Apply 3% CAGR to east leg (vs 4.5-8% at Maryland)

18th and Patricia
2013 Count Data
09-May-13 AM PEAK HOUR

Time Start	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL	Hour
8:00	3	47	3	7	41	4	5	5	3	2	3	7	130	576
8:15	1	61	3	11	29	2	9	9	0	0	5	6	136	446
8:30	2	75	5	9	42	1	5	20	3	1	7	11	181	
8:45	0	46	4	7	35	2	8	7	4	3	6	7	129	
PEAK HOUR	6	229	15	34	147	9	27	41	10	6	21	31	576	576
													PHF	0.79558
CAGR 2013 to 2019	2.00%	0.00%	3.00%	3.00%	0.00%	2.00%	2.00%	2.00%	2.00%	3.00%	3.00%	3.00%		

Project to 2022
- Use growth rates calculated from 2013 to 2019 counts

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL	Hour
18th & Patricia	7	229	20	44	147	11	32	49	12	8	27	40	626	626

18th and Patricia
2013 Count Data
09-May-13 PM PEAK HOUR

Time Start	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL	Hour
16:45	6	57	4	8	63	10	5	8	2	4	13	9	122	554
17:00	6	49	0	17	91	12	7	9	6	4	14	3	163	540
17:15	6	39	3	10	84	13	9	5	3	2	2	8	136	
17:30	4	53	2	11	70	11	5	10	4	4	9	9	133	
17:45	4	38	6	9	67	6	6	7	0	2	3	8	108	
PEAK HOUR	22	198	9	46	308	46	26	32	15	14	38	29	554	
													PHF	0.84969
CAGR 2013 to 2019	2.00%	0.00%	3.00%	3.00%	0.00%	2.00%	2.00%	2.00%	2.00%	3.00%	3.00%	3.00%		

Project to 2022
- Use growth rates calculated from 2013 to 2019 counts

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL	Hour
18th & Patricia	26	198	12	60	308	55	31	38	18	18	50	38	852	852

Input Needed
Formulated

AM PEAK HOUR

Raw Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive																			0
2010	Lakeview Drive at Brookwood Drive																			0
2015	Lakeview Drive at Plateau Drive																			0
2020	34th St & Aberdeen Ave	2021	8:15		5	45.5	3		22.5	57	60		136	21.5	10		3	14.5	53	431
2025	Durum Drive at Aberdeen Avenue																			0
3030	26th St & Durum Dr																			0
4030	Maryland Ave & 26th St	2021	8:15		9	60	41		78	34	7		9	26	4		47	35	95	445
5010	Lakeview & Marylicia																			0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia																			0
6010	Lakeview & Patricia Ave																			0
6020	34th St & Patricia Ave	2019	7:00			10	4		7	15			2	5			5	2	12	62
6030	Patricia Ave & 26th St																			0
6035	Patricia & Brentwood Trace	2022							20		3		3	47				27	3	103
6040	Patricia Ave & West Access																			0
6050	18th St & Partrica Ave	2013	8:00		6	229	15		34	147	9		27	41	10		6	21	31	576
6250	18th St & South Patricia New Access																			0

Notes
- 34th & Aberdeen had counts from a Friday and the following Monday, in December 2021. Volumes averaged from the two counts.

Peak Hour Factor

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		
1020	Richmond Ave & 34th St	2022																		
1510	Brookwood Drive at Plateau Drive																			
2010	Lakeview Drive at Brookwood Drive																			
2015	Lakeview Drive at Plateau Drive																			
2020	34th St & Aberdeen Ave	2021	8:15																	0.74
2025	Durum Drive at Aberdeen Avenue																			
3030	26th St & Durum Dr																			
4030	Maryland Ave & 26th St	2021	8:15																	0.65
5010	Lakeview & Marylicia																			
5020	34th St & Marylicia																			
5030	26th St & Marylicia																			
6010	Lakeview & Patricia Ave																			
6020	34th St & Patricia Ave	2019	7:00																	0.57
6030	Patricia Ave & 26th St																			
6035	Patricia & Brentwood Trace	2022																		0.78
6040	Patricia Ave & West Access																			
6050	18th St & Partrica Ave	2013	8:00																	0.80
6250	18th St & South Patricia New Access																			

Notes
- 34th & Aberdeen PHFs averaged from two counts.

Heavy Vehicle Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive																			0
2010	Lakeview Drive at Brookwood Drive																			0
2015	Lakeview Drive at Plateau Drive																			0
2020	34th St & Aberdeen Ave	2021	8:15																	0
2025	Durum Drive at Aberdeen Avenue																			0
3030	26th St & Durum Dr																			0
4030	Maryland Ave & 26th St	2021	8:15																	0
5010	Lakeview & Marylicia																			0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia																			0
6010	Lakeview & Patricia Ave																			0
6020	34th St & Patricia Ave	2019	7:00																	0
6030	Patricia Ave & 26th St																			0
6035	Patricia & Brentwood Trace	2022																		0
6040	Patricia Ave & West Access																			0
6050	18th St & Partrica Ave	2013	8:00		2	12			1	9			0	3	0		0	0	1	28
6250	18th St & South Patricia New Access																			0

Input Needed
Formulated

AM PEAK HOUR

Heavy Vehicle %

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022			2%	2%	2%		2%	2%	2%		2%	5%	2%		2%	5%	2%	
1020	Richmond Ave & 34th St	2022			2%	5%	2%		2%	5%	2%		2%	5%	2%		2%	5%	2%	
1510	Brookwood Drive at Plateau Drive																			
2010	Lakeview Drive at Brookwood Drive																			
2015	Lakeview Drive at Plateau Drive																			
2020	34th St & Aberdeen Ave	2021	8:15		2%	5%	2%		2%	5%	2%		2%	2%	2%		2%	2%	2%	
2025	Durum Drive at Aberdeen Avenue																			
3030	26th St & Durum Dr																			
4030	Maryland Ave & 26th St	2021	8:15		2%	2%	2%		2%	2%	2%		2%	2%	2%		2%	2%	2%	
5010	Lakeview & Marylicia																			
5020	34th St & Marylicia																			
5030	26th St & Marylicia																			
6010	Lakeview & Patricia Ave																			
6020	34th St & Patricia Ave	2019	7:00		10%	10%	10%		2%	10%	2%		2%	5%	10%		10%	5%	2%	
6030	Patricia Ave & 26th St																			
6035	Patricia & Brentwood Trace	2022																		
6040	Patricia Ave & West Access																			
6050	18th St & Partrica Ave	2013	8:00		33%	5%	0%		3%	6%	0%		0%	7%	0%		0%	0%	3%	
6250	18th St & South Patricia New Access				2%	5%				10%	2%		2%		2%					

Notes
- City of Brandon counts do not include vehicle classification--can't get truck % from data
- Assume 5% trucks on Arterial Street thrus, 2% everywhere else, except near industrial generators like the south leg at Patricia & 34th

Pedestrian Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive																			0
2010	Lakeview Drive at Brookwood Drive																			0
2015	Lakeview Drive at Plateau Drive																			0
2020	34th St & Aberdeen Ave	2021	8:15												8					8
2025	Durum Drive at Aberdeen Avenue																			0
3030	26th St & Durum Dr																			0
4030	Maryland Ave & 26th St	2021	8:15												1					1
5010	Lakeview & Marylicia																			0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia																			0
6010	Lakeview & Patricia Ave																			0
6020	34th St & Patricia Ave	2019	7:00																	0
6030	Patricia Ave & 26th St																			0
6035	Patricia & Brentwood Trace	2022																		0
6040	Patricia Ave & West Access																			0
6050	18th St & Partrica Ave	2013	8:00																	0
6250	18th St & South Patricia New Access																			0

Cyclist Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive																			0
2010	Lakeview Drive at Brookwood Drive																			0
2015	Lakeview Drive at Plateau Drive																			0
2020	34th St & Aberdeen Ave	2021	8:15																	0
2025	Durum Drive at Aberdeen Avenue																			0
3030	26th St & Durum Dr																			0
4030	Maryland Ave & 26th St	2021	8:15																	0
5010	Lakeview & Marylicia																			0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia																			0
6010	Lakeview & Patricia Ave																			0
6020	34th St & Patricia Ave	2019	7:00																	0
6030	Patricia Ave & 26th St																			0
6035	Patricia & Brentwood Trace	2022																		0
6040	Patricia Ave & West Access																			0
6050	18th St & Partrica Ave	2013	8:00																	0
6250	18th St & South Patricia New Access																			0

Input Needed
Formulated

AM PEAK HOUR

Volumes After Adjustments (2022 Background Volumes)

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022		0	1	1	75	0	28	1	1	0	1	46	1	0	15	18	14	202
1020	Richmond Ave & 34th St	2022		0	5	150	102	0	212	84	20	0	61	61	28	0	79	22	109	933
1510	Brookwood Drive at Plateau Drive																			0
2010	Lakeview Drive at Brookwood Drive																			0
2015	Lakeview Drive at Plateau Drive																			0
2020	34th St & Aberdeen Ave	2021	8:15		6	50	4		31	78	82		149	27	12		4	18	58	519
2025	Durum Drive at Aberdeen Avenue																			0
3030	26th St & Durum Dr				28	120	18		13	79	14		36	2	38		5	2	15	370
4030	Maryland Ave & 26th St	2021	8:15	0	9	62	42	0	80	35	7	0	9	27	4	0	48	36	98	457
5010	Lakeview & Marylicia																			0
5020	34th St & Marylicia					60				92										152
5030	26th St & Marylicia																			0
6010	Lakeview & Patricia Ave													5				5		10
6020	34th St & Patricia Ave	2019	7:00		5	15	10		30	20	42		15	10	5		5	5	20	182
6030	Patricia Ave & 26th St													50				30		80
6035	Patricia & Brentwood Trace	2022							20	0	3		3	47				27	3	103
6040	Patricia Ave & West Access													67				30		97
6050	18th St & Partrica Ave	2013	8:00		7	229	20		44	147	11		32	49	12		8	27	40	626
6250	18th St & South Patricia New Access					256				167										423

Notes
- Richmond & Brookwood turning movement volumes estimated from leg counts from north, east, and south legs
- Richmond & 34th turning movement volumes estimated from leg volumes--see Richmond&34th sheet
- Richmond & 34th leg approach and depart volumes set to count volumes, except for north leg (north leg estimated)

- 34th & Aberdeen (2021 count) north leg balanced to 34th & Richmond NB factor 1.095949 SB factor 1.369176 Avg. factor 1.232562
- 34th & Aberdeen use north leg average factor to bump up volumes on movements other legs--represents growth from 2021 to June 2022

- 34th and Patricia has a new hockey school on the west leg. School opened in 2021, was not present for 2019 count. 40 students and 1 teacher.
  - School trips estimated assuming 41 trips in during AM, 41 trips out during PM. Split 2/3 to EBL/SBR, 1/3 to EBT/WBT.
  - Bump up other movements to give a bit of growth since the 2019 count--especially SBL and WBR.
- Allow imbalance on 34th between Aberdeen and Patricia (12 houses between, imbalance should not be huge) NB imbalanc 10 SB Imbalance -2

- 18th & Patricia count from 2013 adjusted to 2022 using 2013/19 counts at 18th & Maryland

- Maryland & 26th count from 2021 probably pretty close. Grow by 3% to 2022, accounting for new development in Zone J.

- 26th & Durum count only has daily approach and depart volumes by leg. Estimate turning movement volumes from the daily volumes.
  - Count was taken while Marquis Dr was closed between Durum and Maryland. May have caused some trips from new development south of Maryland to use Maryland instead of continuing north to Durum. Likely small effect, no adjustments.
  - North leg volumes seem way too high. Set turning movements to work with count volumes on south and west legs, guessed on east leg (not counted) and did not match on north leg.
  - Set AM and PM volumes to 10% of daily and adjust to balance at 26th & Maryland.

- Patricia and Brentwood PM EBT and WBR adjusted up to give reasonable imbalance to 18th

Future Growth

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
6050	18th St & Partrica Ave				3					2	30									35
6250	18th St & South Patricia New Access					3				2										5

Notes
- Background growth only considers development at 2222 Currie Blvd Commercial. PM volumes from TIS, AM calculated with ITE rates and distribution from TIS.

Land Use	Quantity	Rate	% In	Trips	In	Out
932	7.13	9.57	55%	68	37	31
875	30	0.58	64%	17	11	6

62% in from the north, via Patricia Ave
5% in from the south, via Patricia Ave

Input Needed
Formulated

AM PEAK HOUR

2052 Post Development

ID	Intersection	Year	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2052	0	11	5	86	0	28	6	1	0	1	68	4	0	17	50	14	291
1020	Richmond Ave & 34th St	2052	0	36	311	185	0	213	181	20	0	61	72	50	0	104	25	112	1370
1510	Brookwood Drive at Plateau Drive	2052	0	0	25	0	0	0	10	0	0	0	0	0	0	0	0	0	35
2010	Lakeview Drive at Brookwood Drive	2052	0	7	18	13	0	0	5	5	0	0	1	0	0	5	3	1	58
2015	Lakeview Drive at Plateau Drive	2052	0	5	0	27	0	0	0	0	0	0	13	2	0	9	4	0	60
2020	34th St & Aberdeen Ave	2052	0	9	238	4	0	60	181	93	0	181	28	19	0	4	18	113	948
2025	Durum Drive at Aberdeen Avenue	2052	0	32	0	0	0	0	0	0	0	0	0	24	0	0	0	0	56
3030	26th St & Durum Dr	2052	0	51	409	18	0	14	225	14	0	36	3	63	0	9	6	15	863
4030	Maryland Ave & 26th St	2052	0	10	272	190	0	114	154	24	0	72	68	6	0	131	47	137	1225
5010	Lakeview & Marylicia	2052	0	0	20	201	0	23	48	0	0	0	0	0	0	96	0	14	402
5020	34th St & Marylicia	2052	0	67	129	10	0	17	160	26	0	91	174	85	0	16	118	30	923
5030	26th St & Marylicia	2052	0	72	139	0	0	0	128	164	0	263	0	94	0	0	0	0	860
6010	Lakeview & Patricia Ave	2052	0	0	0	0	0	52	0	10	0	3	27	0	0	0	37	21	150
6020	34th St & Patricia Ave	2052	0	5	15	10	0	182	20	59	0	25	74	5	0	5	41	156	597
6030	Patricia Ave & 26th St	2052	0	90	41	87	0	164	18	3	0	2	209	56	0	24	110	80	884
6035	Patricia & Brentwood Trace	2052	0	0	0	0	0	20	0	3	0	3	458	0	0	0	211	3	698
6040	Patricia Ave & West Access	2052	0	93	0	102	0	0	0	0	0	0	331	148	0	119	121	0	914
6050	18th St & Partrica Ave	2052	0	71	304	47	0	67	240	129	0	164	167	128	0	33	88	56	1494
6250	18th St & South Patricia New Access	2052	0	46	320	0	0	0	297	105	0	103	0	41	0	0	0	0	912

Includes background growth from development at 2222 Currie Blvd

Input Needed
Formulated

PM PEAK HOUR

Raw Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021	16:15		11	50	5		37	74	126.5		71.5	16	11		4.5	20.5	29.5	456.5
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0																		0
4030	Maryland Ave & 26th St	2021	15:45		4	57	42		108	37	14		9	16			38	41	117	483
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave	0																		0
6020	34th St & Patricia Ave	2019	16:30			19	8		18	7	2		6	12			5	5	15	97
6030	Patricia Ave & 26th St	0																		0
6035	Patricia & Brentwood Trace	2022							18		3		4	42				34	23	124
6040	Patricia Ave & West Access	0																		0
6050	18th St & Partrica Ave	2013	16:45		22	198	9		46	308	46		26	32	15		14	38	29	783
6250	18th St & South Patricia New Access	0																		0

Notes
- 34th & Aberdeen had counts from a Friday and the following Monday, in December 2021. Volumes averaged from the two counts.

Peak Hour Factor

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		
1020	Richmond Ave & 34th St	2022																		
1510	Brookwood Drive at Plateau Drive	0																		
2010	Lakeview Drive at Brookwood Drive	0																		
2015	Lakeview Drive at Plateau Drive	0																		
2020	34th St & Aberdeen Ave	2021	16:15																	0.90
2025	Durum Drive at Aberdeen Avenue	0																		
3030	26th St & Durum Dr	0																		
4030	Maryland Ave & 26th St	2021	15:45																	0.73
5010	Lakeview & Marylicia	0																		
5020	34th St & Marylicia																			
5030	26th St & Marylicia	0																		
6010	Lakeview & Patricia Ave	0																		
6020	34th St & Patricia Ave	2019	16:30																	0.81
6030	Patricia Ave & 26th St	0																		
6035	Patricia & Brentwood Trace	2022																		0.73
6040	Patricia Ave & West Access	0																		
6050	18th St & Partrica Ave	2013	16:45																	0.85
6250	18th St & South Patricia New Access	0																		

Notes
- 34th & Aberdeen PHFs averaged from two counts.

Heavy Vehicle Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021	16:15																	0
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0																		0
4030	Maryland Ave & 26th St	2021	15:45																	0
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave	0																		0
6020	34th St & Patricia Ave	2019	16:30																	0
6030	Patricia Ave & 26th St	0																		0
6035	Patricia & Brentwood Trace	2022																		0
6040	Patricia Ave & West Access	0																		0
6050	18th St & Partrica Ave	2013	16:45		1	9	1		0	8	0		0	2	0		0	0	0	21
6250	18th St & South Patricia New Access	0																		0

Input Needed
Formulated

PM PEAK HOUR

Heavy Vehicle %

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022			2%	2%	2%		2%	2%	2%		2%	5%	2%		2%	5%	2%	
1020	Richmond Ave & 34th St	2022			2%	5%	2%		2%	5%	2%		2%	5%	2%		2%	5%	2%	
1510	Brookwood Drive at Plateau Drive	0																		
2010	Lakeview Drive at Brookwood Drive	0																		
2015	Lakeview Drive at Plateau Drive	0																		
2020	34th St & Aberdeen Ave	2021	16:15		2%	5%	2%		2%	5%	2%		2%	2%	2%		2%	2%	2%	
2025	Durum Drive at Aberdeen Avenue	0																		
3030	26th St & Durum Dr	0																		
4030	Maryland Ave & 26th St	2021	15:45		2%	2%	2%		2%	2%	2%		2%	2%	2%		2%	2%	2%	
5010	Lakeview & Marylicia	0																		
5020	34th St & Marylicia																			
5030	26th St & Marylicia	0																		
6010	Lakeview & Patricia Ave	0																		
6020	34th St & Patricia Ave	2019	16:30		10%	10%	10%		2%	10%	2%		2%	5%	10%		10%	5%	2%	
6030	Patricia Ave & 26th St	0																		
6035	Patricia & Brentwood Trace	2022																		
6040	Patricia Ave & West Access	0																		
6050	18th St & Partrica Ave	2013	16:45		5%	5%	11%		0%	3%	0%		0%	6%	0%		0%	0%	0%	
6250	18th St & South Patricia New Access	0			2%	5%				5%	2%		2%		2%					

Notes
- City of Brandon counts do not include vehicle classification--can't get truck % from data
- Assume 5% trucks on Arterial Street thrus, 2% everywhere else, except near industrial generators like the south leg at Patricia & 34th

Pedestrian Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021	16:15												19					19
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0																		0
4030	Maryland Ave & 26th St	2021	15:45				7								3					10
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave	0																		0
6020	34th St & Patricia Ave	2019	16:30																	0
6030	Patricia Ave & 26th St	0																		0
6035	Patricia & Brentwood Trace	2022																		0
6040	Patricia Ave & West Access	0																		0
6050	18th St & Partrica Ave	2013	16:45																	0
6250	18th St & South Patricia New Access	0																		0

Cyclist Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021	16:15																	0
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0																		0
4030	Maryland Ave & 26th St	2021	15:45																	0
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave	0																		0
6020	34th St & Patricia Ave	2019	16:30																	0
6030	Patricia Ave & 26th St	0																		0
6035	Patricia & Brentwood Trace	2022																		0
6040	Patricia Ave & West Access	0																		0
6050	18th St & Partrica Ave	2013	16:45																	0
6250	18th St & South Patricia New Access	0																		0

Input Needed
Formulated

PM PEAK HOUR

Volumes After Adjustments (2022 Background Volumes)

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022		0	1	0	23	0	27	1	1	0	1	35	1	0	64	55	48	257
1020	Richmond Ave & 34th St	2022		0	12	88	93	0	128	78	78	0	35	35	14	0	199	78	147	985
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021	16:15		14	64	6		45	91	155		91	20	14		6	26	38	570
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0			38	129	18		13	100	14		36	2	50		10	2	15	427
4030	Maryland Ave & 26th St	2021	15:45	0	4	59	43	0	111	38	14	0	9	16	0	0	39	42	121	496
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia					84				95										179
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave	0												5				5		10
6020	34th St & Patricia Ave	2019	16:30		5	25	10		40	15	40		37	10	5		10	10	20	227
6030	Patricia Ave & 26th St	0												60				40		100
6035	Patricia & Brentwood Trace	2022							18	0	3		5	55				37	35	153
6040	Patricia Ave & West Access	0												73				72		145
6050	18th St & Partrica Ave	2013	16:45		26	198	12		60	308	55		31	38	18		18	50	38	852
6250	18th St & South Patricia New Access	0				236				344										580

Notes
- Richmond & Brookwood turning movement volumes estimated from leg counts from north, east, and south legs
- Richmond & 34th turning movement volumes estimated from leg volumes--see Richmond&34th sheet
- Richmond & 34th leg approach and depart volumes set to count volumes, except for north leg (north leg estimated)

- 34th & Aberdeen (2021 count) north leg balanced to 34th & Richmond NB factor 1.278146 SB factor 1.225263 Avg. factor 1.251704
- 34th & Aberdeen use north leg average factor to bump up volumes on movements other legs

- 34th and Patricia has a new hockey school on the west leg. School opened in 2021, was not present for 2019 count. 40 students and 1 teacher.
  - School trips estimated assuming 41 trips in during AM, 41 trips out during PM. Split 2/3 to EBL/SBR, 1/3 to EBT/WBT.
  - Bump up other movements to give a bit of growth since the 2019 count--especially SBL and WBR.
- Allow imbalance on 34th between Aberdeen and Patricia (12 houses between, imbalance should not be huge) NB imbalance 2 SB Imbalance -16

- 18th & Patricia count from 2013 adjusted to 2022 using 2013/19 counts at 18th & Maryland
  - Have 2019 PM count on 18th at David Ave, compare to 2013 counts at Patricia Avenue NB approaching David Ave 204 SB departing David Ave 297
  2013 Count NB Departing Patricia 253 2013 Count SB Arriving Patricia 400
  - 2013 count volumes are much higher than 2019 count!
- Estimated 2022 volumes from Maryland Avenue adjustment will not be too small

- Maryland & 26th count from 2021 probably pretty close. Grow by 3% to 2022, accounting for new development in Zone J.

- 26th & Durum count only has daily approach and depart volumes by leg. Estimate turning movement volumes from the daily volumes.
  - Count was taken while Marquis Dr was closed between Durum and Maryland. May have caused some trips from new development south of Maryland to use Maryland instead of continuing north to Durum. Likely small effect, no adjustments.
  - North leg volumes seem way too high. Set turning movements to work with count volumes on south and west legs, guessed on east leg (not counted) and did not match on north leg.
  - Set AM and PM volumes to 10% of daily and adjust to balance at 26th & Maryland.

- Patricia and Brentwood PM EBT and WBR adjusted up to give reasonable imbalance to 18th

Future Growth

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
6050	18th St & Partrica Ave				4					3	45									52
6250	18th St & South Patricia New Access					4				3										7

Notes
- Background growth only considers development at 2222 Currie Blvd Commercial. PM volumes from TIS, AM calculated with ITE rates and distribution from TIS.

Input Needed
Formulated

PM PEAK HOUR

2052 Post Development

ID	Intersection	Year	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2052	0	7	1	29	0	27	2	1	0	1	86	11	0	75	101	48	389
1020	Richmond Ave & 34th St	2052	0	57	313	140	0	131	338	78	0	35	41	64	0	280	89	149	1715
1510	Brookwood Drive at Plateau Drive	2052	0	0	13	0	0	0	21	0	0	0	0	0	0	0	0	0	34
2010	Lakeview Drive at Brookwood Drive	2052	0	3	9	9	0	1	19	1	0	0	1	0	0	13	0	0	56
2015	Lakeview Drive at Plateau Drive	2052	0	1	0	18	0	0	0	0	0	0	8	2	0	30	12	0	71
2020	34th St & Aberdeen Ave	2052	0	25	334	6	0	89	406	187	0	110	20	20	0	6	26	67	1296
2025	Durum Drive at Aberdeen Avenue	2052	0	16	0	0	0	0	0	0	0	0	0	21	0	0	0	0	37
3030	26th St & Durum Dr	2052	0	49	445	22	0	16	496	14	0	36	6	65	0	13	4	15	1181
4030	Maryland Ave & 26th St	2052	0	10	337	139	0	132	367	75	0	44	38	3	0	168	81	140	1534
5010	Lakeview & Marylicia	2052	0	0	96	92	0	14	78	0	0	0	0	0	0	147	0	18	445
5020	34th St & Marylicia	2052	0	46	280	14	0	41	288	88	0	51	82	33	0	10	120	34	1087
5030	26th St & Marylicia	2052	0	171	312	0	0	0	311	213	0	156	0	154	0	0	0	0	1317
6010	Lakeview & Patricia Ave	2052	0	0	0	0	0	80	0	6	0	10	56	0	0	0	51	100	303
6020	34th St & Patricia Ave	2052	0	5	25	10	0	266	15	50	0	51	127	5	0	10	146	261	971
6030	Patricia Ave & 26th St	2052	0	30	20	48	0	325	31	2	0	6	354	45	0	81	385	389	1716
6035	Patricia & Brentwood Trace	2052	0	0	0	0	0	18	0	3	0	5	722	0	0	0	852	35	1635
6040	Patricia Ave & West Access	2052	0	551	0	386	0	0	0	0	0	0	241	502	0	369	336	0	2385
6050	18th St & Partrica Ave	2052	0	212	438	90	0	72	538	383	0	296	176	169	0	96	219	54	2743
6250	18th St & South Patricia New Access	2052	0	101	427	0	0	0	495	308	0	313	0	107	0	0	0	0	1751

Includes background growth from development at 2222 Currie Blvd

Input Needed
Formulated

Daily

Peak to Daily

Raw Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total	South	North	West	East
1010	Richmond Ave & Brookwood Dr	2022			20	10	466	0	332	10	15	0	15	420	15	0	567	465	383	2718	1,100	765	950	2633
1020	Richmond Ave & 34th St	2022			112	969	750	0	1959	585	385	0	500	500	232	0	916	900	1900	9708	3,600	6298	2629	6925
1510	Brookwood Drive at Plateau Drive	0																		0				
2010	Lakeview Drive at Brookwood Drive	0																		0				
2015	Lakeview Drive at Plateau Drive	0																		0				
2020	34th St & Aberdeen Ave	2021			87.5	422	34		276.5	476	863.5		937	171.5	102.5		37	175	339	3921	1,200	3314	2337	1032.5
2025	Durum Drive at Aberdeen Avenue	0																		0				
3030	26th St & Durum Dr	0			275	1230	175		125	975	135		360	15	450		95	15	150	4000	3,200	2975	1250	575
4030	Maryland Ave & 26th St	2021																		0	0	0	0	0
5010	Lakeview & Marylicia	0																		0	0	0	0	0
5020	34th St & Marylicia																			0				
5030	26th St & Marylicia	0																		0				
6010	Lakeview & Patricia Ave																			0				
6020	34th St & Patricia Ave	2019																		0	0	0	0	0
6030	Patricia Ave & 26th St																			0				
6035	Patricia & Brentwood Trace								191		39		41	418				382	193	1264				
6040	Patricia Ave & West Access																			0				
6050	18th St & Partrica Ave	2013																		0	0	0	0	0
6250	18th St & South Patricia New Access	0																		0	0	0	0	0

Notes
- 34th & Aberdeen had counts from a Friday and the following Monday, in December 2021. Volumes averaged from the two counts.

Heavy Vehicle Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021																		0
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0																		0
4030	Maryland Ave & 26th St	2021																		0
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave																			0
6020	34th St & Patricia Ave	2019																		0
6030	Patricia Ave & 26th St																			0
6035	Patricia & Brentwood Trace																			0
6040	Patricia Ave & West Access																			0
6050	18th St & Partrica Ave	2013																		0
6250	18th St & South Patricia New Access	0																		0

Input Needed
Formulated

Daily

Heavy Vehicle %

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022			0%	0%	0%		0%	0%	0%		0%	0%	0%		0%	0%	0%	
1020	Richmond Ave & 34th St	2022			0%	0%	0%		0%	0%	0%		0%	0%	0%		0%	0%	0%	
1510	Brookwood Drive at Plateau Drive	0																		
2010	Lakeview Drive at Brookwood Drive	0																		
2015	Lakeview Drive at Plateau Drive	0																		
2020	34th St & Aberdeen Ave	2021			0%	0%	0%		0%	0%	0%		0%	0%	0%		0%	0%	0%	
2025	Durum Drive at Aberdeen Avenue	0																		
3030	26th St & Durum Dr	0			0%	0%	0%		0%	0%	0%		0%	0%	0%		0%	0%	0%	
4030	Maryland Ave & 26th St	2021																		
5010	Lakeview & Marylicia	0																		
5020	34th St & Marylicia																			
5030	26th St & Marylicia	0																		
6010	Lakeview & Patricia Ave																			
6020	34th St & Patricia Ave	2019																		
6030	Patricia Ave & 26th St																			
6035	Patricia & Brentwood Trace								0%		0%		0%	0%				0%	0%	
6040	Patricia Ave & West Access																			
6050	18th St & Partrica Ave	2013																		
6250	18th St & South Patricia New Access	0																		

Pedestrian Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021																		0
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0																		0
4030	Maryland Ave & 26th St	2021																		0
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave																			0
6020	34th St & Patricia Ave	2019																		0
6030	Patricia Ave & 26th St																			0
6035	Patricia & Brentwood Trace																			0
6040	Patricia Ave & West Access																			0
6050	18th St & Partrica Ave	2013																		0
6250	18th St & South Patricia New Access	0																		0

Cyclist Counts

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022																		0
1020	Richmond Ave & 34th St	2022																		0
1510	Brookwood Drive at Plateau Drive	0																		0
2010	Lakeview Drive at Brookwood Drive	0																		0
2015	Lakeview Drive at Plateau Drive	0																		0
2020	34th St & Aberdeen Ave	2021																		0
2025	Durum Drive at Aberdeen Avenue	0																		0
3030	26th St & Durum Dr	0																		0
4030	Maryland Ave & 26th St	2021																		0
5010	Lakeview & Marylicia	0																		0
5020	34th St & Marylicia																			0
5030	26th St & Marylicia	0																		0
6010	Lakeview & Patricia Ave																			0
6020	34th St & Patricia Ave	2019																		0
6030	Patricia Ave & 26th St																			0
6035	Patricia & Brentwood Trace																			0
6040	Patricia Ave & West Access																			0
6050	18th St & Partrica Ave	2013																		0
6250	18th St & South Patricia New Access	0																		0

	Input Needed
	Formulated

Daily

Volumes After Adjustments (2022 Background Volumes)

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total	South	North	West	East
1010	Richmond Ave & Brookwood Dr	2022		0	20	10	466	0	332	10	15	0	15	420	15	0	567	465	383	2718	1,100	800	1000	2600
1020	Richmond Ave & 34th St	2022		0	112	969	750	0	1959	585	385	0	500	500	232	0	916	900	1900	9708	3,600	6300	2600	6900
1510	Brookwood Drive at Plateau Drive	0																		0	0	0	0	0
2010	Lakeview Drive at Brookwood Drive	0																		0	0	0	0	0
2015	Lakeview Drive at Plateau Drive	0												2600						2600	0	0	2600	2600
2020	34th St & Aberdeen Ave	2021			135	356	68		281	708	744		1062	247	137		53	231	413	4435	1,500	3600	2600	1300
2025	Durum Drive at Aberdeen Avenue	0																		0	0	0	0	0
3030	26th St & Durum Dr	0			275	1230	175		125	975	135		360	15	450		95	15	150	4000	3,200	3000	1300	600
4030	Maryland Ave & 26th St	2021			32	323	214		1153	256	105		88	224	21		201	349	1271	4237	1,000	3200	800	3400
5010	Lakeview & Marylicia	0																		0	0	0	0	0
5020	34th St & Marylicia									1,500										1500	1,800	1,500	0	0
5030	26th St & Marylicia	0																		0	0	0	0	0
6010	Lakeview & Patricia Ave													600						600	0	0	1000	1000
6020	34th St & Patricia Ave	2019			53	260	105		368	228	431		273	130	53		79	98	210	2288	800	1800	1000	1000
6030	Patricia Ave & 26th St													1000						1000	0	0	1000	1000
6035	Patricia & Brentwood Trace								191	0	39		41	418				382	193	1264	0	464	880	1184
6040	Patricia Ave & West Access													1000						1000	0	0	1000	1000
6050	18th St & Partrica Ave	2013			173	2776	168		546	2958	347		331	566	158		137	501	410	9071	6,400	7400	2100	2300
6250	18th St & South Patricia New Access	0				3,200				3,200										6400	6,400	6,400	0	0

Notes

- Richmond & 34th turning movement volumes estimated from leg volumes--see Richmond&34th sheet
- Richmond & 34th leg approach and depart volumes set to count volumes, except for north leg (north leg estimated)

- 26th & Durum Drive volumes from daily count, assumed movement distribution

- For intersections without daily counts, daily volumes estimated from peak hour using factors from Richmond & 34th and from Richmond & Brookwood

- Factors to convert AM + PM to Daily	Rich. & Brook.	Rich. & 34 th.
Overall intersection	5.921569	5.061522
Richmond Thru	5.746753	7.142857
Richmond Turns	6.758621	5.279762
Minor Street Movements	5.33125	4.533333

- Selected factors

Arterial St Thrus	6.5
Arterial St Turns at Arterial	5.25
Arterial St Turns at Collector	6.75
Collector St Movements	5.25

Future Growth

ID	Intersection	Year	Time	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Brookwood Dr	2022	0:00																	
1020	Richmond Ave & 34th St	2022	0:00																	
4030	Maryland Ave & 26th St	2021	0:00																	
2020	34th St & Aberdeen Ave	2021	0																	
6020	34th St & Patricia Ave	2019	0																	
6050	18th St & Partrica Ave	2013	0																	
3030	26th St & Durum Dr	0	0																	

Input Needed
Formulated

Daily

2052 Post Development

ID	Intersection	Year	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total	South	North	West	East
1010	Richmond Ave & Brookwood Dr	2052	0	99	23	550	0	332	23	15	0	15	910	94	0	651	955	383	4050	1,400	800	2100	3800
1020	Richmond Ave & 34th St	2052	0	596	3438	1392	0	1980	3054	385	0	500	590	716	0	1558	990	1921	17120	10,800	11300	3800	8400
1510	Brookwood Drive at Plateau Drive	2052	0	0	176	0	0	0	176	0	0	0	0	0	0	0	0	0	352	400	400	0	0
2010	Lakeview Drive at Brookwood Drive	2052	0	34	136	108	0	6	157	13	0	0	5	0	0	108	5	6	578	500	300	100	200
2015	Lakeview Drive at Plateau Drive	2052	0	17	0	213	0	0	0	0	0	0	2702	17	0	213	102	0	3264	500	0	2800	3200
2020	34th St & Aberdeen Ave	2052	0	208	3351	71	0	641	3703	985	0	1303	248	210	0	56	232	773	11781	7,600	10800	3200	2000
2025	Durum Drive at Aberdeen Avenue	2052	0	180	0	0	0	0	0	0	0	0	0	180	0	0	0	0	360	1,050	650	1,700	0
3030	26th St & Durum Dr	2052	0	388	4802	201	0	148	4547	135	0	360	43	591	0	126	43	150	11534	10,700	10100	1600	700
4030	Maryland Ave & 26th St	2052	0	68	3357	1316	0	1348	3295	587	0	570	532	57	0	1297	657	1466	14550	9,400	10600	2500	6600
5010	Lakeview & Marylicia	2052	0	0	792	1269	0	170	792	0	0	0	0	0	0	1269	0	170	4462	4,100	1900	0	2900
5020	34th St & Marylicia	2052	0	444	2015	115	0	339	3515	716	0	716	1076	444	0	115	1076	339	10910	6,600	7600	4500	3100
5030	26th St & Marylicia	2052	0	1460	3012	0	0	0	3012	1874	0	1874	0	1460	0	0	0	0	12692	8,900	9800	6700	0
6010	Lakeview & Patricia Ave	2052	0	0	0	0	0	823	0	79	0	79	1090	0	0	0	490	823	3384	0	1800	1700	3200
6020	34th St & Patricia Ave	2052	0	53	260	105	0	2825	228	548	0	390	1325	53	0	79	1293	2667	9826	800	6900	3700	8300
6030	Patricia Ave & 26th St	2052	0	431	264	684	0	3360	264	25	0	57	4196	431	0	684	3196	3392	16984	2,800	7400	8300	15500
6035	Patricia & Brentwood Trace	2052	0	0	0	0	0	191	0	39	0	41	418	0	0	0	382	193	1264	0	500	900	1200
6040	Patricia Ave & West Access	2052	0	5100	0	3932	0	0	0	0	0	0	3172	5100	0	3932	2172	0	23408	18,100	0	15500	13200
6050	18th St & Partrica Ave	2052	0	1859	5196	978	0	679	5378	3204	0	3188	2126	1844	0	947	2061	543	28003	16,200	18200	14300	7300
6250	18th St & South Patricia New Access	2052	0	1541	4428	0	0	0	4428	3689	0	3689	0	1541	0	0	0	0	19316	11,900	16200	10500	0

Peak Six Hour Volume Factors

ID	Intersection	AM Peak	PM Peak	AM 2	Mid 2	PM 2	Factor	Notes
1010	Richmond Ave & Brookwood Dr	0	0				2.095211	
2020	34th St & Aberdeen Ave	431	456.5	673	590.5	596	2.095211	Averaged from two TMCs, same as peak hour volumes
6020	34th St & Patricia Ave	62	97	85	98	147	2.075472	
3030	26th St & Durum Dr	0	0				2.210129	
4030	26th St & Maryland Ave	445	483	681	588	782	2.210129	
6035	Patricia Ave & Brentwood Trace	103	124	158	193	205	2.449339	
6050	18th St & Patricia Ave	576	783	1020	1068	1279	2.477557	

New Intersections

ID	Intersection	AM Peak	PM Peak	AM 2	Mid 2	PM 2	Factor
5010	Lakeview & Marylicia						2.095211
6010	Lakeview & Patricia Ave						2.075472
5020	34th St & Marylicia						2.095211
5030	26th St & Marylicia						2.210129
6030	Patricia Ave & 26th St						2.449339
6040	Patricia Ave & West Access						2.449339
6250	18th St & South Patricia New Access						2.477557

Conclusions

- All factors range from 2.07 to 2.48
- Use factor from 26th & Maryland for 26th & Durum, 26th & new east-west collector
- Use factor from 34th & Aberdeen for Richmond & Brookwood, new intersections in Brookwood South
- Use factor from Patricia Ave & Brentwood Trace for new intersections on Patricia Ave
- Use factor from 18th & Patricia for new access on 18th Street
- Use factor from Patricia & 34th at Patricia & Lakeview

Peak Six Hour Volumes

- Note: EB & WB order reversed to match TSWA template

2052 Post-Development

- Existing intersections - model with existing configurations

	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL	Minor Street Traffic Total	Minor Street Traffic Average
1010	Richmond Ave & Brookwood Dr	38	13	241	115	17	4	4	323	31	193	316	130	1425	183	30.5
2020	34th St & Aberdeen Ave	71	1198	21	312	1230	587	610	101	82	21	92	377	4702	824	137.3333
6020	34th St & Patricia Ave	21	83	42	930	73	226	158	417	21	31	388	865	3255	1107	184.5
3030	26th St & Durum Dr	221	1887	88	66	1594	62	159	20	283	49	22	66	4517	250	41.66667
4030	Maryland Ave & 26th St	44	1346	727	544	1151	219	256	234	20	661	283	612	6097	1434	239
6035	Patricia & Brentwood Trace	0	0	0	93	0	15	20	2890	0	0	2604	93	5715	93	15.5
6050	18th St & Partrica Ave	701	1838	339	344	1928	1269	1140	850	736	320	761	273	10499	3071	511.8333

- New intersections - assume one lane on each approach

	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL	Minor Street Traffic Total	Minor Street Traffic Average
5010	Lakeview & Marylicia	0	243	614	78	264	0	0	0	0	509	0	67	1199	509	84.83333
6010	Lakeview & Patricia Ave	0	0	0	274	0	33	27	172	0	0	183	251	506		
5020	34th St & Marylicia	237	857	50	122	939	239	298	536	247	54	499	134	3525	1387	231.1667
5030	26th St & Marylicia	537	997	0	0	970	833	926	0	548	0	0	0	4811	926	154.3333
6030	Patricia Ave & 26th St	294	149	331	1198	120	12	20	1379	247	257	1212	1149	3750	1761	293.5
6040	Patricia Ave & West Access	1577	0	1195	0	0	0	0	1401	1592	1195	1119	0	5765	1577	262.8333
6250	18th St & South Patricia New Access	364	1851	0	0	1962	1023	1031	0	367	0	0	0	6598	1031	171.8333

2022 Background

- Existing intersections - model with existing configurations

	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL	Minor Street Traffic Total	Minor Street Traffic Average
1010	Richmond Ave & Brookwood Dr	4	2	205	115	4	4	4	170	4	166	153	130	961	125	20.83333
2020	34th St & Aberdeen Ave	42	239	21	159	354	497	503	98	54	21	92	201	2281	714	119
6020	34th St & Patricia Ave	21	83	42	145	73	170	108	42	21	31	31	83	850	322	53.66667
3030	26th St & Durum Dr	146	550	80	57	396	62	159	9	194	33	9	66	1761	210	35
4030	Maryland Ave & 26th St	29	267	188	422	161	46	40	95	9	192	172	484	2105	499	83.16667
6035	Patricia & Brentwood Trace	0	0	0	93	0	15	20	250	0	0	157	93	628	93	15.5
6050	18th St & Partrica Ave	82	1058	79	258	1127	164	156	216	74	64	191	193	3662	627	104.5

Brookwood North Units Developed

Location	AM	PM	Daily	Units	AM Rate	PM Rate	Daily
Brookwood at Richmond	80	115	906				
Lakeview at 34th	247	256.5	2337				
TOTAL	327	371.5	3243	417	0.784173	0.890887	7.776978
ITE Reference, Land Use #210					0.7	0.94	9.43
% Difference					12%	-5%	-18%

Trip Generation
- BSD School assumed in Zone B with assumed 250 students
- Need to look at alternate scenario with BSD school in Zone I instead
- Classify land uses as residential, commercial, BSD school, or DSFM school
- Zone G commercial taken from annex lands TIS trip gen data

Zone	Description	LU Type	ITE Code	Independe	Week Rate	Week % In	AM Rate	AM % In	PM Rate	PM % In	AM In	AM Out	PM In	PM Out	Week In	Week Out
A	Brookwood South - 1900 34th St - SFH	Residential	210	152	8.60	50%	0.74	0.26	0.92	0.63	29	83	88	51	654	654
A	Brookwood South - 1900 34th St - TH	Residential	215	96	7.20	50%	0.48	0.31	0.57	0.57	14	32	31	24	346	346
A	Brookwood South - 1900 34th St - Apart.	Residential	221	172	4.54	50%	0.37	0.23	0.39	0.61	15	49	41	26	390	390
B	Brookwood South - 1900 34th St - SFH	Residential	210	106	8.60	50%	0.74	0.26	0.92	0.63	20	58	61	36	456	456
B	Brookwood South - 1900 34th St - TH	Residential	215	67	7.20	50%	0.48	0.31	0.57	0.57	10	22	22	16	241	241
B	Brookwood South - 1900 34th St - Apart.	Residential	221	120	4.54	50%	0.37	0.23	0.39	0.61	10	34	29	18	272	272
B	Brookwood South - 1900 34th St - School	BSD School	520	250	2.27	50%	0.74	0.54	0.16	0.46	100	85	18	22	284	284
C	Brookwood South - 1900 34th St - SFH	Residential	210	87	8.60	50%	0.74	0.26	0.92	0.63	17	48	50	29	374	374
C	Brookwood South - 1900 34th St - TH	Residential	215	55	7.20	50%	0.48	0.31	0.57	0.57	8	18	18	13	198	198
C	Brookwood South - 1900 34th St - Apart.	Residential	221	99	4.54	50%	0.37	0.23	0.39	0.61	8	28	24	15	225	225
D	Bellafield - 1955 34 St - SFH	Residential	210	180	8.60	50%	0.74	0.26	0.92	0.63	35	99	104	61	774	774
D	Bellafield - 1955 34 St - TH	Residential	215	107	7.20	50%	0.48	0.31	0.57	0.57	16	35	35	26	385	385
D	Bellafield - 1955 34 St - Apart.	Residential	221	277	4.54	50%	0.37	0.23	0.39	0.61	24	79	66	42	629	629
E	Bellafield - 1955 34 St - SFH	Residential	210	133	8.60	50%	0.74	0.26	0.92	0.63	26	73	77	45	572	572
E	Bellafield - 1955 34 St - TH	Residential	215	80	7.20	50%	0.48	0.31	0.57	0.57	12	26	26	20	288	288
E	Bellafield - 1955 34 St - Apart.	Residential	221	205	4.54	50%	0.37	0.23	0.39	0.61	17	58	49	31	465	465
F	Bellafield - 1955 34 St - SFH	Residential	210	40	8.60	50%	0.74	0.26	0.92	0.63	8	22	23	14	172	172
F	Bellafield - 1955 34 St - TH	Residential	215	24	7.20	50%	0.48	0.31	0.57	0.57	4	8	8	6	86	86
F	Bellafield - 1955 34 St - Apart.	Residential	221	62	4.54	50%	0.37	0.23	0.39	0.61	5	18	15	9	141	141
G	110052 Patricia Ave - SFH	Residential	210	222	8.60	50%	0.74	0.26	0.92	0.63	43	122	128	75	955	955
G	110052 Patricia Ave - TH	Residential	215	167	7.20	50%	0.48	0.31	0.57	0.57	25	55	54	41	601	601
G	110052 Patricia Ave - Apart.	Residential	221	438	4.54	50%	0.37	0.23	0.39	0.61	37	125	104	67	994	994
H	2210 Maryland Ave - School	DSFM School	520	250	2.27	50%	0.74	0.54	0.16	0.46	100	85	18	22	284	284
H	2210 Maryland Ave - Daycare	DSFM School	565	60	4.09	50%	0.78	0.53	0.79	0.47	25	22	22	25	123	123
H	2210 Maryland Ave - TH	Residential	215	0	7.20	50%	0.48	0.31	0.57	0.57	0	0	0	0	0	0
H	2210 Maryland Ave - Apart.	Residential	221	0	4.54	50%	0.37	0.23	0.39	0.61	0	0	0	0	0	0
H	1905 26th St - SFH	Residential	210	0	8.60	50%	0.74	0.26	0.92	0.63	0	0	0	0	0	0
H	1905 26th St - TH	Residential	215	0	7.20	50%	0.48	0.31	0.57	0.57	0	0	0	0	0	0
H	1905 26th St - Apart.	Residential	221	190	4.54	50%	0.37	0.23	0.39	0.61	16	54	45	29	431	431
I	5 Hummingbird Ln - SFH	Residential	210	50	8.60	50%	0.74	0.26	0.92	0.63	10	27	29	17	215	215
I	5 Hummingbird Ln - TH	Residential	215	0	7.20	50%	0.48	0.31	0.57	0.57	0	0	0	0	0	0
I	5 Hummingbird Ln - Apart.	Residential	221	0	4.54	50%	0.37	0.23	0.39	0.61	0	0	0	0	0	0
J	Morrison - 1700, 1720 30th St - SFH	Residential	210	62	8.60	50%	0.74	0.26	0.92	0.63	12	34	36	21	267	267
J	Morrison - 1700, 1720 30th St - TH	Residential	215	0	7.20	50%	0.48	0.31	0.57	0.57	0	0	0	0	0	0
J	Morrison - 1700, 1720 30th St - Apart.	Residential	221	0	4.54	50%	0.37	0.23	0.39	0.61	0	0	0	0	0	0
K	Brookwood North - SFH	Residential	210	51	8.60	50%	0.74	0.26	0.92	0.63	10	28	29	17	219	219
K	Brookwood North - TH	Residential	215	0	7.20	150%	0.48	0.31	0.57	0.57	0	0	0	0	0	0
K	Brookwood North - Apart.	Residential	221	0	4.54	250%	0.37	0.23	0.39	0.61	0	0	0	0	0	0
E	SW Secondary Plan	Commercial	822	37.7	54.45	50%	2.36	0.60	6.59	0.50	53	36	124	124	1026	1026
G	110052 Patricia Ave	Commercial	820	640	37.01	50%	0.84	0.62	3.40	0.48	333	204	1044	1132	11843	11843

TOTAL	Residential	Units	3242
	Commercial	ksf	677.7
	BSD School	Students	250
	DSFM School	Students	310

Residential	431	1235	1192	749	10350	10350
Commercial	386	240	1168	1256	12869	12869
BSD School	100	85	18	22	284	284
DSFM School	125	107	40	47	407	407
TOTAL	1042	1667	2418	2074	23910	23910

Commercial Pass-By
- Just take out of commercial in Zone G
- Assign to access on PTH 10

ITE Land Use	AM Pass-B'	PM Pass-B\	)aily Pass-By
820 Shopping Center		0.34	0.3

- ITE 820 does not have data for AM pass-by %. Assume 10% as conservative value (higher pass-by = less net trip increase).
- Use ITE rates for PM and Daily.

Applied to Zone G	AM PB Trip	PM PB Trip	)aily PB Trips
	54	355	313

- Need to compare to 18th St through traffic south of Patricia Avenue

Item	AM	PM	Daily
18th Street Existing Through Traffic	423	580	
Zone G Pass-By	54	355	
Pass-By % of 18th Street Traffic	13%	61%	

- Pass-By too high without growth in 18th Street through traffic
- Compare with future growth in 18th Street through traffic
  - Based on assumed 10% of residential traffic going south of Patricia Ave on 18th

Item	AM	PM	Daily
18th Street Projected 2052 Through Traffic	590	699	
Zone G Pass-By	54	355	313
Pass-By % of 18th Street Traffic	9%	51%	

- Still way too high in PM.
- Need to lower pass-by % for PM. 5% gives a reasonable take from the 18th Street through traffic.

Item	AM	PM	Daily
18th Street Projected 2052 Through Traffic	590	699	
Zone G Pass-By	54	52	0
Pass-By % of 18th Street Traffic	9%	7%	

- Use 10% pass-by for AM, 5% for PM.

Calculate remaining primary commercial trips for Zone G

Item	AM	PM	Daily	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
Zone G Commercial Total	537	2176	23686	333	204	1044	1132	11843	11843
Zone G Com. Pass-By	54	52	2368.6	27	27	26	26	1184.3	1184.3
Zone G Com. Primary	483	2124	21317.4	306	177	1018	1106	10658.7	10658.7

Directional Distribution

- Separate for residential, commercial, BSD school, DSFM school

AM PEAK HOUR	Residential		Commercial		BSD School		DSFM School			
Direction	%	Trips	%	Trips	%	Trips	%	Trips	TOTAL	
West on Richmond Ave	2.5%	42	2.50%	14		0	5%	12	68	70.5386
North on 34th St	10%	167	12.50%	72		0	10%	23	262	275.781
North on 26th St	10%	167	12.50%	72		0	10%	23	262	275.781
North on 18th St	15%	250	24.00%	137		0	25%	58	445	472.135
East on Richmond Ave	15%	250	12.50%	72		0	10%	23	345	360.075
East on Patricia Ave	10%	167	12.50%	72	5%	9	10%	23	262	285.114
South on 18th St	10%	167	12.50%	72		0	10%	23	262	275.781
West on Patricia Ave	2.5%	42	2.50%	14		0	5%	12	68	70.5386
				0		0		0	0	
Westview neighbourhood		0		0	5%	9		0	0	
Brentwood village		0		0	5%	9		0	0	
Commercial near Richmond & 18th	10%	167		0		0		0	167	168.588
				0		0		0	0	
Internal (RES-COM)	3%	46	8%	46		0		0	92	
Internal (RES-BSD)	9%	157			85%	157		0	157	
Internal (RES-DSFM)	2%	35					15%	35	70	
				0		0		0	0	
TOTAL	99%	1657	100%	571	100%	184	100%	232	2141	2254.33
										1.05293

Calculated from other land uses

PM PEAK HOUR	Residential		Commercial		BSD School		DSFM School			
Direction	%	Trips	%	Trips	%	Trips	%	Trips	TOTAL	
West on Richmond Av	2.5%	49	2.50%	59		0	5%	4	112	118.364
North on 34th St	10%	194	12.00%	285		0	10%	9	488	517.467
North on 26th St	10%	194	12.00%	285		0	10%	9	488	517.467
North on 18th St	15%	291	24.00%	569		0	25%	22	882	943.052
East on Richmond Ave	15%	291	12.50%	297		0	10%	9	597	626.881
East on Patricia Ave	10%	194	12.00%	285	5%	2	10%	9	488	519.467
South on 18th St	10%	194	12.00%	285		0	10%	9	488	517.467
West on Patricia Ave	2.5%	49	2.50%	59		0	5%	4	112	118.364
				0		0		0	0	
Westview neighbourhood		0		0	5%	2		0	0	
Brentwood village		0		0	5%	2		0	0	
Commercial near Rich	10%	194		0		0		0	194	192.471
				0		0		0	0	
Internal (RES-COM)	13%	261	11%	261		0		0	522	
Internal (RES-BSD)	2%	34			85%	34		0	34	
Internal (RES-DSFM)	1%	13					15%	13	26	
				0		0		0	0	
TOTAL	101%	1958	101%	2385	100%	40	100%	88	3849	4071
										1.05768

Calculated from other land uses

DAILY	Residential		Commercial		BSD School		DSFM School			
Direction	%	Trips	%	Trips	%	Trips	%	Trips	TOTAL	
West on Richmond Av	2.5%	518	2.50%	584		0	5%	41	1143	1265.63
North on 34th St	10%	2070	12.00%	2804		0	10%	81	4955	5543.19
North on 26th St	10%	2070	12.00%	2804		0	10%	81	4955	5543.19
North on 18th St	15%	3105	24.00%	5609		0	25%	204	8918	10082.5
East on Richmond Ave	15%	3105	12.50%	2921		0	10%	81	6107	6728.3
East on Patricia Ave	10%	2070	12.00%	2804	5%	28	10%	81	4955	5571.19
South on 18th St	10%	2070	12.00%	2804		0	10%	81	4955	5543.19
West on Patricia Ave	2.5%	518	2.50%	584		0	5%	41	1143	1265.63
		0		0		0		0	0	
Westview neighbourhood		0		0	5%	28		0	0	
Brentwood village		0		0	5%	28		0	0	
Commercial near Rich	10%	2070		0		0		0	2070	2089.18
				0		0		0	0	
Internal (RES-COM)	11%	2337	10%	2337		0		0	4674	
Internal (RES-BSD)	2%	483			85%	483		0	483	
Internal (RES-DSFM)	1%	122					15%	122	244	
				0		0		0	0	
TOTAL	99%	20538	100%	23251	100%	567	100%	813	39201	43632
										1.11303

Calculated from other land uses

Internal Trips

To/From BSD School in Zone B	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
School	85	72	16	18	242	242
Zone A	24	28	6	5	81	81
Zone D	24	28	6	5	81	81
Zone G	24	28	6	5	81	81

To/From DSFM School in Zone H	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
School	19	16	6	7	61	61
Zone A	5	6	2	2	20	20
Zone D	5	6	2	2	20	20
Zone G	5	6	2	2	20	20

To/From COM in Zone G	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
COM	29	17	125	136	1169	1169
Zone A	4	7	34	31	292	292
Zone D	4	7	34	31	292	292
Zone E	4	7	34	31	292	292
Zone G	4	7	34	31	292	292

Primary External Trips - Residential

Zone	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
A	25	123	118	63	997	997
B	40	114	112	70	969	969
C	33	94	92	57	797	797
D	42	172	163	91	1395	1395
E	51	150	118	65	1033	1033
F	17	48	46	29	399	399
G	72	261	244	145	2157	2157
H	16	54	45	29	431	431
I	10	27	29	17	215	215
J	12	34	36	21	267	267
K	10	28	29	17	219	219

Subtract Internal

Primary External Trips - Commercial

Zone	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
E	53	36	124	124	1026	1026
G	329	197	1010	1101	11551	11551

Subtract Internal and Pass-By

Primary External Trips - BSD School

Zone	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
B	15	13	2	4	42	42

Subtract Internal

Primary External Trips - DSFM School

Zone	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
H	106	91	34	40	346	346

Subtract Internal

Assign External Trips

Zone	A									
Destination	Zone	Route ID	Portion	Mod	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave	A	A01	0.3		0.22059	1.08529	1.04118	0.55588	8.79706	8.79706
West on Richmond Ave	A	A02	0.7		0.51471	2.53235	2.42941	1.29706	20.5265	20.5265
North on 34th St	A	A03	1.0		2.94118	14.4706	13.8824	7.41176	117.294	117.294
North on 26th St	A	A04	0.5		1.47059	7.23529	6.94118	3.70588	58.6471	58.6471
North on 26th St	A	A05	0.5		1.47059	7.23529	6.94118	3.70588	58.6471	58.6471
North on 18th St	A	A06	0.5		2.20588	10.8529	10.4118	5.55882	87.9706	87.9706
North on 18th St	A	A07	0.5		2.20588	10.8529	10.4118	5.55882	87.9706	87.9706
East on Richmond Ave	A	A08	0.5		2.20588	10.8529	10.4118	5.55882	87.9706	87.9706
East on Richmond Ave	A	A09	0.5		2.20588	10.8529	10.4118	5.55882	87.9706	87.9706
West on Patricia Ave	A	A10	1.0		0.73529	3.61765	3.47059	1.85294	29.3235	29.3235
South on 18th St	A	A11	1.0		2.94118	14.4706	13.8824	7.41176	117.294	117.294
East on Patricia Ave	A	A12	1.0		2.94118	14.4706	13.8824	7.41176	117.294	117.294
Commercial near Richmond & 18th	A	A13	0.2		0.58824	2.89412	2.77647	1.48235	23.4588	23.4588
Commercial near Richmond & 18th	A	A14	0.8		2.35294	11.5765	11.1059	5.92941	93.8353	93.8353
Internal (RES-COM)	A	A15	1.0		4	7	34	31	292	292
Internal (RES-BSD)	A	A16	1.0		24	28	6	5	81	81
Internal (RES-DSFM)	A	A17	1.0		5	6	2	2	20	20
						Internal				
	Sum External		9.00		25.00	123.00	118.00	63.00	997.00	997.00
	Target		9.00		25	123	118	63	997	997
	Check		OK		OK	OK	OK	OK	OK	OK

Zone	B	Residential							
Destination	Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave	B	B01	1.0	1.17647	3.35294	3.29412	2.05882	28.5	28.5
North on 34th St	B	B02	1.0	4.70588	13.4118	13.1765	8.23529	114	114
North on 26th St	B	B03	1.0	4.70588	13.4118	13.1765	8.23529	114	114
North on 18th St	B	B04	0.5	3.52941	10.0588	9.88235	6.17647	85.5	85.5
North on 18th St	B	B05	0.5	3.52941	10.0588	9.88235	6.17647	85.5	85.5
East on Richmond Ave	B	B06	1.0	7.05882	20.1176	19.7647	12.3529	171	171
West on Patricia Ave	B	B07	0.5	0.58824	1.67647	1.64706	1.02941	14.25	14.25
West on Patricia Ave	B	B08	0.5	0.58824	1.67647	1.64706	1.02941	14.25	14.25
South on 18th St	B	B09	0.5	2.35294	6.70588	6.58824	4.11765	57	57
South on 18th St	B	B10	0.5	2.35294	6.70588	6.58824	4.11765	57	57
East on Patricia Ave	B	B11	0.5	2.35294	6.70588	6.58824	4.11765	57	57
East on Patricia Ave	B	B12	0.5	2.35294	6.70588	6.58824	4.11765	57	57
Commercial near Richmond & 18th	B	B13	1.0	4.70588	13.4118	13.1765	8.23529	114	114
Internal (RES-BSD)	B	B14	1.0						
Internal (RES-COM)	B	B15	1.0						
Internal (RES-DSFM)	B	B16	1.0						
#N/A			#N/A						
	Sum External		9.00	40.00	114.00	112.00	70.00	969.00	969.00
	Target		9.00	40	114	112	70	969	969
	Check		OK	OK	OK	OK	OK	OK	OK

Zone	B	BSD School							
Destination	Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
Westview neighbourhood	B	B17	1	5	4.33333	0.66667	1.33333	14	14
Brentwood village	B	B18	1	5	4.33333	0.66667	1.33333	14	14
East on Patricia Ave	B	B11	0.5	2.5	2.16667	0.33333	0.66667	7	7
East on Patricia Ave	B	B12	0.5	2.5	2.16667	0.33333	0.66667	7	7
	Sum External		3.00	15.00	13.00	2.00	4.00	42.00	42.00
	Target		3.00	15	13	2	4	42	42
	Check		OK	OK	OK	OK	OK	OK	OK

Zone C

Destination	Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave	C	C01	1.0	0.97059	2.76471	2.70588	1.67647	23.4412	23.4412
North on 34th St	C	C02	1.0	3.88235	11.0588	10.8235	6.70588	93.7647	93.7647
North on 26th St	C	C03	0.5	1.94118	5.52941	5.41176	3.35294	46.8824	46.8824
North on 26th St	C	C04	0.5	1.94118	5.52941	5.41176	3.35294	46.8824	46.8824
North on 18th St	C	C05	1.0	5.82353	16.5882	16.2353	10.0588	140.647	140.647
East on Richmond Ave	C	C06	1.0	5.82353	16.5882	16.2353	10.0588	140.647	140.647
West on Patricia Ave	C	C07	1.0	0.97059	2.76471	2.70588	1.67647	23.4412	23.4412
South on 18th St	C	C08	0.5	1.94118	5.52941	5.41176	3.35294	46.8824	46.8824
South on 18th St	C	C09	0.5	1.94118	5.52941	5.41176	3.35294	46.8824	46.8824
East on Patricia Ave	C	C10	0.5	1.94118	5.52941	5.41176	3.35294	46.8824	46.8824
East on Patricia Ave	C	C11	0.5	1.94118	5.52941	5.41176	3.35294	46.8824	46.8824
Commercial near Richmond & 18th	C	C12	1.0	3.88235	11.0588	10.8235	6.70588	93.7647	93.7647
Internal (RES-COM)	C	C13	1.0						
Internal (RES-BSD)	C	C14	1.0						
Internal (RES-DSFM)	C	C15	1.0						
#N/A			#N/A						
#N/A			#N/A						
	Sum External		9.00	33.00	94.00	92.00	57.00	797.00	797.00
	Target		9.00	33	94	92	57	797	797
	Check		OK	OK	OK	OK	OK	OK	OK

Zone D

Destination	Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave	D	D01	1.0	1.23529	5.05882	4.79412	2.67647	41.0294	41.0294
North on 34th St	D	D02	1.0	4.94118	20.2353	19.1765	10.7059	164.118	164.118
North on 26th St	D	D03	1.0	4.94118	20.2353	19.1765	10.7059	164.118	164.118
East on Richmond Ave	D	D04	0.5	3.70588	15.1765	14.3824	8.02941	123.088	123.088
East on Richmond Ave	D	D05	0.5	3.70588	15.1765	14.3824	8.02941	123.088	123.088
West on Patricia Ave	D	D06	1.0	1.23529	5.05882	4.79412	2.67647	41.0294	41.0294
North on 18th St	D	D07	0.5	3.70588	15.1765	14.3824	8.02941	123.088	123.088
North on 18th St	D	D08	0.5	3.70588	15.1765	14.3824	8.02941	123.088	123.088
East on Patricia Ave	D	D09	0.5	2.47059	10.1176	9.58824	5.35294	82.0588	82.0588
East on Patricia Ave	D	D10	0.5	2.47059	10.1176	9.58824	5.35294	82.0588	82.0588
South on 18th St	D	D11	0.5	2.47059	10.1176	9.58824	5.35294	82.0588	82.0588
South on 18th St	D	D12	0.5	2.47059	10.1176	9.58824	5.35294	82.0588	82.0588
Commercial near Richmond & 18th	D	D13	1.0	4.94118	20.2353	19.1765	10.7059	164.118	164.118
Internal (RES-COM)	D	D14	1.0	4	7	34	31	292	292
Internal (RES-BSD)	D	D15	1.0	24	28	6	5	81	81
Internal (RES-DSFM)	D	D16	1.0	5	6	2	2	20	20
#N/A			#N/A		Internal				
	Sum External		9.00	42.00	172.00	163.00	91.00	1395.00	1395.00
	Target		9.00	42	172	163	91	1395	1395
	Check		OK	OK	OK	OK	OK	OK	OK

	Zone	E	Residential							
Destination		Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave		E	E01	1.0	1.5	4.41176	3.47059	1.91176	30.3824	30.3824
North on 34th St		E	E02	1.0	6	17.6471	13.8824	7.64706	121.529	121.529
North on 26th St		E	E03	0.8	4.8	14.1176	11.1059	6.11765	97.2235	97.2235
North on 26th St		E	E04	0.2	1.2	3.52941	2.77647	1.52941	24.3059	24.3059
North on 18th St		E	E05	0.5	4.5	13.2353	10.4118	5.73529	91.1471	91.1471
North on 18th St		E	E06	0.5	4.5	13.2353	10.4118	5.73529	91.1471	91.1471
East on Richmond Ave		E	E07	0.5	4.5	13.2353	10.4118	5.73529	91.1471	91.1471
East on Richmond Ave		E	E08	0.5	4.5	13.2353	10.4118	5.73529	91.1471	91.1471
West on Patricia Ave		E	E09	0.8	1.2	3.52941	2.77647	1.52941	24.3059	24.3059
West on Patricia Ave		E	E10	0.2	0.3	0.88235	0.69412	0.38235	6.07647	6.07647
East on Patricia Ave		E	E11	1.0	6	17.6471	13.8824	7.64706	121.529	121.529
South on 18th St		E	E12	1.0	6	17.6471	13.8824	7.64706	121.529	121.529
Commercial near Richmond & 18th		E	E13	1.0	6	17.6471	13.8824	7.64706	121.529	121.529
Internal (RES-COM)		E	E14	1.0	4	7	34	31	292	292
Internal (RES-BSD)		E	E15	1.0						
Internal (RES-DSFM)		E	E16	1.0						
#N/A				#N/A		Internal				
		Sum External		9.00	51.00	150.00	118.00	65.00	1033.00	1033.00
		Target		9.00	51	150	118	65	1033	1033
		Check		OK	OK	OK	OK	OK	OK	OK

	Zone	E	Commercial							
Destination		Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave		E	E01	1.0	1.44809	0.98361	3.46369	3.46369	28.6592	28.6592
North on 34th St		E	E02	1.0	7.24044	4.91803	16.6257	16.6257	137.564	137.564
North on 26th St		E	E03	0.8	5.79235	3.93443	13.3006	13.3006	110.051	110.051
North on 26th St		E	E04	0.2	1.44809	0.98361	3.32514	3.32514	27.5128	27.5128
North on 18th St		E	E05	0.5	6.95082	4.72131	16.6257	16.6257	137.564	137.564
North on 18th St		E	E06	0.5	6.95082	4.72131	16.6257	16.6257	137.564	137.564
East on Richmond Ave		E	E07	0.5	3.62022	2.45902	8.65922	8.65922	71.648	71.648
East on Richmond Ave		E	E08	0.5	3.62022	2.45902	8.65922	8.65922	71.648	71.648
West on Patricia Ave		E	E09	0.8	1.15847	0.78689	2.77095	2.77095	22.9274	22.9274
West on Patricia Ave		E	E10	0.2	0.28962	0.19672	0.69274	0.69274	5.73184	5.73184
East on Patricia Ave		E	E11	1.0	7.24044	4.91803	16.6257	16.6257	137.564	137.564
South on 18th St		E	E12	1.0	7.24044	4.91803	16.6257	16.6257	137.564	137.564
Commercial near Richmond & 18th		E	E13	1.0	0	0	0	0	0	0
Internal (RES-COM)		E	E14	1.0						
Internal (RES-BSD)		E	E15	1.0						
Internal (RES-DSFM)		E	E16	1.0						
#N/A				#N/A						
		Sum External		9.00	53.00	36.00	124.00	124.00	1026.00	1026.00
		Target		9.00	53	36	124	124	1026	1026
		Check		OK	OK	OK	OK	OK	OK	OK

	Zone	F								
Destination		Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave		F	F01	0.5	0.25	0.70588	0.67647	0.42647	5.86765	5.86765
West on Richmond Ave		F	F02	0.5	0.25	0.70588	0.67647	0.42647	5.86765	5.86765
North on 34th St		F	F03	0.5	1	2.82353	2.70588	1.70588	23.4706	23.4706
North on 34th St		F	F04	0.5	1	2.82353	2.70588	1.70588	23.4706	23.4706
North on 26th St		F	F05	1.0	2	5.64706	5.41176	3.41176	46.9412	46.9412
North on 18th St		F	F06	1.0	3	8.47059	8.11765	5.11765	70.4118	70.4118
East on Richmond Ave		F	F07	1.0	3	8.47059	8.11765	5.11765	70.4118	70.4118
West on Patricia Ave		F	F08	1.0	0.5	1.41176	1.35294	0.85294	11.7353	11.7353
East on Patricia Ave		F	F09	1.0	2	5.64706	5.41176	3.41176	46.9412	46.9412
South on 18th St		F	F10	1.0	2	5.64706	5.41176	3.41176	46.9412	46.9412
Commercial near Richmond & 18th		F	F11	1.0	2	5.64706	5.41176	3.41176	46.9412	46.9412
Internal (RES-COM)		F	F12	1.0	0.55522	1.56768	7.21384	4.54786	53.4139	53.4139
Internal (RES-BSD)		F	F13	1.0	1.89499	5.35056	0.93973	0.59244	11.0393	11.0393
Internal (RES-DSFM)		F	F14	1.0						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
		Sum External		9.00	17.00	48.00	46.00	29.00	399.00	399.00
		Target		9.00	17	48	46	29	399	399
		Check		OK	OK	OK	OK	OK	OK	OK

	Zone	G	Residential							
Destination		Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave		G	G01	1.0	2.11765	7.67647	7.17647	4.26471	63.4412	63.4412
North on 34th St		G	G02	1.0	8.47059	30.7059	28.7059	17.0588	253.765	253.765
North on 26th St		G	G03	1.0	8.47059	30.7059	28.7059	17.0588	253.765	253.765
North on 18th St		G	G04	1.0	12.7059	46.0588	43.0588	25.5882	380.647	380.647
South on 18th St		G	G05	0.5	4.23529	15.3529	14.3529	8.52941	126.882	126.882
South on 18th St		G	G06	0.5	4.23529	15.3529	14.3529	8.52941	126.882	126.882
West on Patricia Ave		G	G07	1.0	2.11765	7.67647	7.17647	4.26471	63.4412	63.4412
East on Patricia Ave		G	G08	0.5	4.23529	15.3529	14.3529	8.52941	126.882	126.882
East on Patricia Ave		G	G09	0.5	4.23529	15.3529	14.3529	8.52941	126.882	126.882
Commercial near Richmond & 18th		G	G10	1.0	8.47059	30.7059	28.7059	17.0588	253.765	253.765
Internal (RES-BSD)		G	G11	1.0	24	28	6	5	81	81
Internal (RES-DSFM)		G	G12	1.0	5	6	2	2	20	20
East on Richmond Ave		G	G13	0.5	6.35294	23.0294	21.5294	12.7941	190.324	190.324
East on Richmond Ave		G	G14	0.5	6.35294	23.0294	21.5294	12.7941	190.324	190.324
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A		Internal				
		Sum External		9.00	72.00	261.00	244.00	145.00	2157.00	2157.00
		Target		9.00	72	261	244	145	2157	2157
		Check		OK	OK	OK	OK	OK	OK	OK

Destination	Zone	G	Commercial		AM In	AM Out	PM In	PM Out	ADT In	ADT Out
		Zone	Route ID	Portion						
West on Richmond Ave		G	G15	1.0	8.98907	5.38251	28.2123	30.7542	322.654	322.654
North on 34th St		G	G16	1.0	44.9454	26.9126	135.419	147.62	1548.74	1548.74
North on 26th St		G	G17	1.0	44.9454	26.9126	135.419	147.62	1548.74	1548.74
North on 18th St		G	G18	0.5	43.1475	25.8361	135.419	147.62	1548.74	1548.74
North on 18th St		G	G19	0.5	43.1475	25.8361	135.419	147.62	1548.74	1548.74
South on 18th St		G	G20	0.4	17.9781	10.765	54.1676	59.048	619.495	619.495
South on 18th St		G	G21	0.4	17.9781	10.765	54.1676	59.048	619.495	619.495
West on Patricia Ave		G	G22	1.0	8.98907	5.38251	28.2123	30.7542	322.654	322.654
East on Patricia Ave		G	G23	0.5	22.4727	13.4563	67.7095	73.8101	774.369	774.369
East on Patricia Ave		G	G24	0.5	22.4727	13.4563	67.7095	73.8101	774.369	774.369
South on 18th St		G	G25	0.2	8.98907	5.38251	27.0838	29.524	309.747	309.747
East on Richmond Ave		G	G26	0.5	22.4727	13.4563	70.5307	76.8855	806.634	806.634
East on Richmond Ave		G	G27	0.5	22.4727	13.4563	70.5307	76.8855	806.634	806.634
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
		Sum External		8.00	329.00	197.00	1010.00	1101.00	11551.00	11551.00
		Target		8.00	329	197	1010	1101	11551	11551
		Check		OK	OK	OK	OK	OK	OK	OK

Destination	Zone	H	Residential		AM In	AM Out	PM In	PM Out	ADT In	ADT Out
		Zone	Route ID	Portion						
West on Richmond Ave		H	H01	1.0	0.47059	1.58824	1.32353	0.85294	12.6765	12.6765
North on 34th St		H	H02	1.0	1.88235	6.35294	5.29412	3.41176	50.7059	50.7059
North on 26th St		H	H03	1.0	1.88235	6.35294	5.29412	3.41176	50.7059	50.7059
North on 18th St		H	H04	1.0	2.82353	9.52941	7.94118	5.11765	76.0588	76.0588
West on Patricia Ave		H	H05	1.0	0.47059	1.58824	1.32353	0.85294	12.6765	12.6765
East on Patricia Ave		H	H06	1.0	1.88235	6.35294	5.29412	3.41176	50.7059	50.7059
South on 18th St		H	H07	1.0	1.88235	6.35294	5.29412	3.41176	50.7059	50.7059
Commercial near Richmond & 18th		H	H08	1.0	1.88235	6.35294	5.29412	3.41176	50.7059	50.7059
Internal (RES-COM)		H	H09	1.0	0.52256	1.76364	7.05702	4.54786	57.6978	57.6978
Internal (RES-BSD)		H	H10	1.0	1.78352	6.01938	0.91931	0.59244	11.9247	11.9247
East on Richmond Ave		H	H11	0.5	1.41176	4.76471	3.97059	2.55882	38.0294	38.0294
East on Richmond Ave		H	H12	0.5	1.41176	4.76471	3.97059	2.55882	38.0294	38.0294
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
		Sum External		#N/A	16.00	54.00	45.00	29.00	431.00	431.00
		Target		9.00	16	54	45	29	431	431
		Check		#N/A	OK	OK	OK	OK	OK	OK

Destination		Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
	Zone	H	DSFM School							
West on Richmond Ave		H	H01	1.0	6.23529	5.35294	2	2.35294	20.3529	20.3529
North on 34th St		H	H02	1.0	12.4706	10.7059	4	4.70588	40.7059	40.7059
North on 26th St		H	H03	1.0	12.4706	10.7059	4	4.70588	40.7059	40.7059
North on 18th St		H	H04	1.0	31.1765	26.7647	10	11.7647	101.765	101.765
West on Patricia Ave		H	H05	1.0	6.23529	5.35294	2	2.35294	20.3529	20.3529
East on Patricia Ave		H	H06	1.0	12.4706	10.7059	4	4.70588	40.7059	40.7059
South on 18th St		H	H07	1.0	12.4706	10.7059	4	4.70588	40.7059	40.7059
Commercial near Richmond & 18th		H	H08	1.0	0	0	0	0	0	0
Internal (RES-COM)		H	H09	1.0	0	0	0	0	0	0
Internal (RES-BSD)		H	H10	1.0	0	0	0	0	0	0
East on Richmond Ave		H	H11	0.5	6.23529	5.35294	2	2.35294	20.3529	20.3529
East on Richmond Ave		H	H12	0.5	6.23529	5.35294	2	2.35294	20.3529	20.3529
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
		Sum External		#N/A	106.00	91.00	34.00	40.00	346.00	346.00
		Target		9.00	106	91	34	40	346	346
		Check		#N/A	OK	OK	OK	OK	OK	OK

Destination		Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
	Zone	I								
West on Richmond Ave		I	I01	1.0	0.29412	0.79412	0.85294	0.5	6.32353	6.32353
North on 34th St		I	I02	1.0	1.17647	3.17647	3.41176	2	25.2941	25.2941
North on 26th St		I	I03	1.0	1.17647	3.17647	3.41176	2	25.2941	25.2941
West on Patricia Ave		I	I04	1.0	0.29412	0.79412	0.85294	0.5	6.32353	6.32353
North on 18th St		I	I05	1.0	1.76471	4.76471	5.11765	3	37.9412	37.9412
East on Patricia Ave		I	I06	1.0	1.17647	3.17647	3.41176	2	25.2941	25.2941
South on 18th St		I	I07	1.0	1.17647	3.17647	3.41176	2	25.2941	25.2941
East on Richmond Ave		I	I08	1.0	1.76471	4.76471	5.11765	3	37.9412	37.9412
Commercial near Richmond & 18th		I	I09	1.0	1.17647	3.17647	3.41176	2	25.2941	25.2941
Internal (RES-COM)		I	I10	1.0	0.3266	0.88182	4.54786	2.66599	28.7819	28.7819
Internal (RES-BSD)		I	I11	1.0	1.1147	3.00969	0.59244	0.34729	5.94851	5.94851
Internal (RES-DSFM)		I	I12	1.0	0.2485	0.67095	0.22652	0.13279	1.50252	1.50252
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
#N/A				#N/A						
		Sum External		9.00	10.00	27.00	29.00	17.00	215.00	215.00
		Target		9.00	10	27	29	17	215	215
		Check		OK	OK	OK	OK	OK	OK	OK

Zone J

Destination	Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave	J	J01	1.0	0.35294	1	1.05882	0.61765	7.85294	7.85294
North on 34th St	J	J02	1.0	1.41176	4	4.23529	2.47059	31.4118	31.4118
North on 26th St	J	J03	1.0	1.41176	4	4.23529	2.47059	31.4118	31.4118
West on Patricia Ave	J	J04	0.4	0.14118	0.4	0.42353	0.24706	3.14118	3.14118
West on Patricia Ave	J	J05	0.6	0.21176	0.6	0.63529	0.37059	4.71176	4.71176
North on 18th St	J	J06	1.0	2.11765	6	6.35294	3.70588	47.1176	47.1176
East on Richmond Ave	J	J07	1.0	2.11765	6	6.35294	3.70588	47.1176	47.1176
East on Patricia Ave	J	J08	1.0	1.41176	4	4.23529	2.47059	31.4118	31.4118
South on 18th St	J	J09	1.0	1.41176	4	4.23529	2.47059	31.4118	31.4118
Commercial near Richmond & 18th	J	J10	1.0	1.41176	4	4.23529	2.47059	31.4118	31.4118
Internal (RES-COM)	J	J11	1.0	0.39192	1.11044	5.64562	3.29328	35.7432	35.7432
Internal (RES-BSD)	J	J12	1.0	1.33764	3.78998	0.73544	0.42901	7.38722	7.38722
Internal (RES-DSFM)	J	J13	1.0	0.2982	0.8449	0.2812	0.16403	1.86592	1.86592
#N/A			#N/A						
#N/A			#N/A						
#N/A			#N/A						
#N/A			#N/A						
	Sum External		9.00	12.00	34.00	36.00	21.00	267.00	267.00
	Target		9.00	12	34	36	21	267	267
	Check		OK	OK	OK	OK	OK	OK	OK

Zone K

Destination	Zone	Route ID	Portion	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
West on Richmond Ave	K	K01	1.0	0.29412	0.82353	0.85294	0.5	6.44118	6.44118
North on 34th St	K	K02	1.0	1.17647	3.29412	3.41176	2	25.7647	25.7647
North on 26th St	K	K03	1.0	1.17647	3.29412	3.41176	2	25.7647	25.7647
West on Patricia Ave	K	K04	1.0	0.29412	0.82353	0.85294	0.5	6.44118	6.44118
North on 18th St	K	K05	1.0	1.76471	4.94118	5.11765	3	38.6471	38.6471
East on Patricia Ave	K	K06	1.0	1.17647	3.29412	3.41176	2	25.7647	25.7647
East on Richmond Ave	K	K07	1.0	1.76471	4.94118	5.11765	3	38.6471	38.6471
South on 18th St	K	K08	1.0	1.17647	3.29412	3.41176	2	25.7647	25.7647
Commercial near Richmond & 18th	K	K09	1.0	1.17647	3.29412	3.41176	2	25.7647	25.7647
Internal (RES-COM)	K	K10	1.0	0.3266	0.91448	4.54786	2.66599	29.3174	29.3174
Internal (RES-BSD)	K	K11	1.0	1.1147	3.12116	0.59244	0.34729	6.05918	6.05918
Internal (RES-DSFM)	K	K12	1.0	0.2485	0.6958	0.22652	0.13279	1.53048	1.53048
#N/A			#N/A						
#N/A			#N/A						
#N/A			#N/A						
#N/A			#N/A						
#N/A			#N/A						
	Sum External		9.00	10.00	28.00	29.00	17.00	219.00	219.00
	Target		9.00	10	28	29	17	219	219
	Check		OK	OK	OK	OK	OK	OK	OK

Assign Internal Trips
- Note "In" and "Out" referenced to Origin

Origin	Destination	Route	AM In	AM Out	PM In	PM Out	ADT In	ADT Out
Zone A	BSD School	A16	24	28	6	5	81	81
Zone D		D15	24	28	6	5	81	81
Zone G		G11	24	28	6	5	81	81
Zone A	DSFM School	A17	5	6	2	2	20	20
Zone D		D16	5	6	2	2	20	20
Zone G		G12	5	6	2	2	20	20
Zone A	COM	A15	4	7	34	31	292	292
Zone D		D14	4	7	34	31	292	292
Zone E		E14	4	7	34	31	292	292
Zone G			4	7	34	31	292	292

Assign Pass-By Trips

ID	Intersection	Period	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
6250	18th St & South Patric	AM		16	-16				-11	11		16		11					27
		PM		11	-11				-15	15		11		15					26
		ADT		592	-592				-592	592		592		592					1184

TOTAL Assignment AM PEAK HOUR

ID	Intersection	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Broo		10.028	4.11548	10.9945		0	4.74863	0		0	21.9796	3.01678		2.23465	31.968	0	89.0856
1020	Richmond Ave & 34th St		31.2976	161.181	82.6374		0.94973	97.1044	0		0	11.2319	21.7421		24.637	2.90505	2.68158	436.368
1510	Brookwood Drive at Plateau Drive		0	25.138	0		0	10.0001	0		0	0	0		0	0	0	35.138
2010	Lakeview Drive at Brookwood Drive		6.7412	17.6146	13.0168		0.27933	4.9721	4.74863		0	1.05866	0		5.25143	2.96425	0.78213	57.4292
2015	Lakeview Drive at Plateau Drive		4.52851	0	26.5574		0	0	0		0	12.7375	1.61732		9.48479	4.4693	0	59.3948
2020	34th St & Aberdeen Ave		2.54483	188.272	0.13408		28.9387	103.372	11.1733		31.5086	0.66082	7.12553		0.37989	0.23601	55.3355	429.681
2025	Durum Drive at Aberdeen Avenue		31.9289	0	0		0	0	0		0	0	23.8677		0	0	0	55.7966
3030	26th St & Durum Dr		23.0294	288.923	0.31018		1.11733	145.734	0		0	1.39666	24.7364		3.69587	3.77097	0	492.713
4030	Maryland Ave & 26th St		0.57334	209.791	147.751		34.2923	118.703	17.0951		63.2406	41.0261	1.62445		83.2418	11.3447	39.2307	767.914
5010	Lakeview & Marylicia		0	19.8018	200.543		23.4951	47.8541	0		0	0	0		95.9503	0	13.7775	401.422
5020	34th St & Marylicia		66.5088	69.493	10.0612		17.4303	67.9158	25.5309		91.2408	173.85	84.6281		16.2502	118.151	30.2169	771.276
5030	26th St & Marylicia		72.4285	139.123	0		0	127.65	164.286		262.717	0	93.737		0	0	0	859.941
6010	Lakeview & Patricia Ave		0	0	0		52.3374	0	10.028		3.01678	21.9796	0		0	31.968	20.9219	140.252
6020	34th St & Patricia Ave		0	0	0		152.164	0	16.6301		10.1953	64.1217	0		0	36.2598	135.868	415.239
6030	Patricia Ave & 26th St		89.6374	40.5589	87.4866		163.628	17.542	2.93545		2.29057	159.407	55.6428		24.1342	79.5546	80.2989	803.117
6035	Patricia & Brentwood Trace		0	0	0		0	0	0		0	410.522	0		0	183.988	0	594.509
6040	Patricia Ave & West Access		92.6367	0	101.885		0	0	0		0	263.85	147.727		119.332	91.3511	0	816.781
6050	18th St & Partrica Ave		60.868	75.2781	27.3609		23.0169	91.3717	88.4667		132.094	117.6	116.041		25.3653	61.348	16.0895	834.9
6250	18th St & South Patricia New Access		45.6338	60.9575	0	0	0	128.058	104.72	0	102.55	0	40.9168	0	0	0	0	482.835

Includes pass-by trips

Balance to Patricia at 26th

Zone Access Checks

ID		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
5025			4.6429	0	115.464		52.4706	0	3.78998		3.69611	207.389	10.9145		64.4636	164.899	9.88235
5031			0.58962	122.912	5.05522		7.14499	179.609	46.3519		79.6635	0	1.07907		14.2736	0	20.1741

TOTAL Assignment PM PEAK HOUR

ID	Intersection	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Broo		5.75623	1.26062	5.60607		0	0.63031	0		0	50.7767	9.76057		10.5003	45.6163	0	129.907
1020	Richmond Ave & 34th St		45.2131	225.309	47.0621		2.55833	259.768	0		0	6.24565	50.1371		80.8208	10.9035	1.61286	729.631
1510	Brookwood Drive at Plateau Drive		0	12.6229	0		0	20.8911	0		0	0	0		0	0	0	33.5141
2010	Lakeview Drive at Brookwood Drive		2.84567	9.30452	8.59264		0.80643	19.4544	0.63031		0	0.56013	0		12.9307	0.32835	0.47273	55.9258
2015	Lakeview Drive at Plateau Drive		1.27382	0	17.7736		0	0	0		0	7.78621	2.17299		30.3197	12.4579	0	71.7843
2020	34th St & Aberdeen Ave		10.7513	269.811	0.40043		43.6306	315.283	31.8122		19.1318	0.12555	6.30248		0.23359	0.21417	28.6421	726.338
2025	Durum Drive at Aberdeen Avenue		16.4373	0	0		0	0	0		0	0	21.4931		0	0	0	37.9304
3030	26th St & Durum Dr		10.9202	315.662	4.29985		3.22571	395.879	0		0	4.03214	14.5062		2.84896	2.36367	0	753.738
4030	Maryland Ave & 26th St		5.9384	277.639	96.1604		20.8424	328.596	61.3442		34.6486	22.3458	3.46407		129.097	39.475	18.5952	1038.15
5010	Lakeview & Marylicia		0	96.3608	91.8327		13.6391	78.2254	0		0	0	0		147.337	0	18.4777	445.873
5020	34th St & Marylicia		45.5864	195.66	13.7263		41.119	192.649	88.0509		50.9552	81.8577	33.1099		10.1002	119.611	34.3474	906.773
5030	26th St & Marylicia		170.719	311.703	0		0	310.585	213.381		155.902	0	154.126		0	0	0	1316.42
6010	Lakeview & Patricia Ave		0	0	0		80.3833	0	5.75623		9.76057	50.7767	0		0	45.6163	100.424	292.717
6020	34th St & Patricia Ave		0	0	0		225.526	0	10.3338		14.1267	117.033	0		0	135.706	240.846	743.571
6030	Patricia Ave & 26th St		29.6154	19.9104	48.3857		324.687	30.9224	2.17327		6.30473	294.097	45.2712		81.4215	344.763	388.795	1616.35
6035	Patricia & Brentwood Trace		0	0	0		0	0	0		0	667.169	0		0	814.98	0	1482.15
6040	Patricia Ave & West Access		550.66	0	385.951		0	0	0		0	168.29	501.993		369.482	264.32	0	2240.7
6050	18th St & Partrica Ave		181.525	240.377	77.8493		11.9018	226.976	282.925		264.681	138.432	151.128		77.5874	169.352	16.0173	1838.75
6250	18th St & South Patricia New Access		101.391	186.542	0	0	0	148.03	307.662	0	313.209	0	106.806	0	0	0	0	1163.64

Includes pass-by trips

Balance to Patricia at 26th

Zone Access Checks

4911	99.2353	7.06989	15.1569	13.1765	8.55514	13.5353	7.22647	0	78.6765	9.93137	0	8.23529
5011	0	105.716	10.8235	64.9412	84.402	89.2294	53.0971	0	0	6.70588	0	40.2353

TOTAL Assignment ADT

ID	Intersection	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	Total
1010	Richmond Ave & Broo		78.799	12.5782	84.306	0	0	12.5782	0	0	0	489.749	78.799	0	84.306	489.749	0	1330.86
1020	Richmond Ave & 34th St		484.477	2469.04	642.431	0	21.0871	2469.04	0	0	0	89.5777	484.477	0	642.431	89.5777	21.0871	7413.23
1510	Brookwood Drive at Plateau Drive		0	175.683	0	0	0	175.683	0	0	0	0	0	0	0	0	0	351.366
2010	Lakeview Drive at Brookwood Drive		33.6389	136.257	108.21	0	5.78705	157.318	12.5782	0	0	5.44385	0	0	108.21	5.44385	5.78705	578.674
2015	Lakeview Drive at Plateau Drive		17.018	0	212.901	0	0	0	0	0	0	102.423	17.018	0	212.901	102.423	0	664.683
2020	34th St & Aberdeen Ave		72.6365	2994.84	2.82218	0	359.801	2994.84	241.312	0	241.312	1.37505	72.6365	0	2.82218	1.37505	359.801	7345.57
2025	Durum Drive at Aberdeen Avenue		179.685	0	0	0	0	0	0	0	0	0	179.685	0	0	0	0	359.37
3030	26th St & Durum Dr		113.179	3571.82	25.859	0	22.7254	3571.82	0	0	0	28.4068	141.249	0	31.2034	28.4068	0	7534.68
4030	Maryland Ave & 26th St		36.3466	3034.04	1101.72	0	195.307	3039.39	481.514	0	481.514	307.518	36.3466	0	1096.38	307.518	195.307	10312.9
5010	Lakeview & Marylicia		0	791.626	1268.79	0	170.071	791.626	0	0	0	0	0	0	1268.79	0	170.071	4460.98
5020	34th St & Marylicia		443.885	2015.45	114.656	0	338.526	2015.45	716.315	0	716.315	1075.92	443.885	0	114.656	1075.92	338.526	9409.52
5030	26th St & Marylicia		1459.81	3012.06	0	0	0	3012.06	1874.3	0	1874.3	0	1459.81	0	0	0	0	12692.3
6010	Lakeview & Patricia Ave		0	0	0	0	823.029	0	78.799	0	78.799	489.749	0	0	0	489.749	823.029	2783.16
6020	34th St & Patricia Ave		0	0	0	0	2456.52	0	117.478	0	117.478	1195.3	0	0	0	1195.3	2456.52	7538.59
6030	Patricia Ave & 26th St		430.541	263.932	683.982	0	3359.5	263.932	25.3859	0	57.4992	3195.89	430.541	0	683.982	3195.89	3391.62	15982.7
6035	Patricia & Brentwood Trace		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6040	Patricia Ave & West Access		5099.73	0	3931.77	0	0	0	0	0	0	2171.77	5099.73	0	3931.77	2171.77	0	22406.5
6050	18th St & Partrica Ave		1686.47	2420.25	809.726	0	133.076	2420.25	2857.15	0	2857.15	1559.91	1686.47	0	809.726	1559.91	133.076	18933.2
6250	18th St & South Patricia New Access		1540.87	1227.55	0	0	0	1227.55	3688.9	0	3688.9	0	1540.87	0	0	0	0	12914.6

Includes pass-by trips

Zone Access Checks

5025	4.6429	0	115.464	52.4706	0	3.78998	3.69611	207.389	10.9145	64.4636	164.899	9.88235
5031	0.58962	122.912	5.05522	7.14499	179.609	46.3519	79.6635	0	1.07907	14.2736	0	20.1741

APPENDIX C: Synchro Traffic Analysis Reports

Appendix

C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	46	1	15	18	14	1	1	75	28	1	1
Future Volume (Veh/h)	1	46	1	15	18	14	1	1	75	28	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	1	62	1	20	24	19	1	1	101	38	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	43			63			140	148	62	240	138	34
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	43			63			140	148	62	240	138	34
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	90	94	100	100
cM capacity (veh/h)	1566			1540			820	734	1002	635	742	1040

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	64	63	103	40
Volume Left	1	20	1	38
Volume Right	1	19	101	1
cSH	1566	1540	997	644
Volume to Capacity	0.00	0.01	0.10	0.06
Queue Length 95th (m)	0.0	0.3	2.6	1.5
Control Delay (s)	0.1	2.4	9.0	11.0
Lane LOS	A	A	A	B
Approach Delay (s)	0.1	2.4	9.0	11.0
Approach LOS			A	B

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	61	61	28	79	22	109	5	150	102	212	84	20
Future Volume (veh/h)	61	61	28	79	22	109	5	150	102	212	84	20
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	82	82	38	107	30	147	7	203	138	286	114	27
Approach Volume (veh/h)		202			284			348			427	
Crossing Volume (veh/h)		507			292			450			144	
High Capacity (veh/h)		928			1101			971			1237	
High v/c (veh/h)		0.22			0.26			0.36			0.35	
Low Capacity (veh/h)		750			904			788			1027	
Low v/c (veh/h)		0.27			0.31			0.44			0.42	

Intersection Summary			
Maximum v/c High	0.36		
Maximum v/c Low	0.44		
Intersection Capacity Utilization	57.1%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	10.2
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	202	284	348	427
Demand Flow Rate, veh/h	209	291	361	440
Vehicles Circulating, veh/h	521	304	462	147
Vehicles Exiting, veh/h	66	519	268	447
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.6	8.5	13.1	9.1
Approach LOS	A	A	B	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	209	291	361	440
Cap Entry Lane, veh/h	671	834	712	975
Entry HV Adj Factor	0.966	0.978	0.964	0.971
Flow Entry, veh/h	202	284	348	427
Cap Entry, veh/h	648	815	686	947
V/C Ratio	0.311	0.349	0.507	0.451
Control Delay, s/veh	9.6	8.5	13.1	9.1
LOS	A	A	B	A
95th %tile Queue, veh	1	2	3	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	149	27	12	4	18	58	6	50	4	31	78	82
Future Volume (Veh/h)	149	27	12	4	18	58	6	50	4	31	78	82
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	201	36	16	5	24	78	8	68	5	42	105	111
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	421	334	160	365	386	70	216			73		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	421	334	160	365	386	70	216			73		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	57	94	98	99	95	92	99			97		
cM capacity (veh/h)	471	567	885	538	530	992	1354			1527		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	253	107	81	258
Volume Left	201	5	8	42
Volume Right	16	78	5	111
cSH	497	803	1354	1527
Volume to Capacity	0.51	0.13	0.01	0.03
Queue Length 95th (m)	21.6	3.5	0.1	0.6
Control Delay (s)	19.5	10.2	0.8	1.4
Lane LOS	C	B	A	A
Approach Delay (s)	19.5	10.2	0.8	1.4
Approach LOS	C	B		

Intersection Summary			
Average Delay	9.2		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	36	2	38	5	2	15	28	120	18	13	77	14
Future Volume (Veh/h)	36	2	38	5	2	15	28	120	18	13	77	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Hourly flow rate (vph)	55	3	58	8	3	23	43	185	28	20	118	22
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	478	468	129	514	465	199	140			213		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	478	468	129	514	465	199	140			213		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	88	99	94	98	99	97	97			99		
cM capacity (veh/h)	465	471	921	425	473	842	1443			1357		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	116	34	256	160
Volume Left	55	8	43	20
Volume Right	58	23	28	22
cSH	618	648	1443	1357
Volume to Capacity	0.19	0.05	0.03	0.01
Queue Length 95th (m)	5.2	1.3	0.7	0.3
Control Delay (s)	12.2	10.9	1.5	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	12.2	10.9	1.5	1.1
Approach LOS	B	B		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	28.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	35	4	81	42	9	102
Future Volume (Veh/h)	35	4	81	42	9	102
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.65	0.65	0.65	0.65	0.65	0.65
Hourly flow rate (vph)	54	6	125	65	14	157
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			60		372	57
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			60		372	57
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		98	84
cM capacity (veh/h)			1544		578	1009

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	60	190	171
Volume Left	0	125	14
Volume Right	6	0	157
cSH	1700	1544	951
Volume to Capacity	0.04	0.08	0.18
Queue Length 95th (m)	0.0	2.0	5.0
Control Delay (s)	0.0	5.2	9.6
Lane LOS		A	A
Approach Delay (s)	0.0	5.2	9.6
Approach LOS			A

Intersection Summary			
Average Delay	6.2		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	70	67	82	96	79	41
Future Volume (vph)	70	67	82	96	79	41
Peak Hour Factor	0.65	0.65	0.65	0.65	0.65	0.65
Hourly flow rate (vph)	108	103	126	148	122	63

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	211	274	185
Volume Left (vph)	108	0	122
Volume Right (vph)	0	148	63
Hadj (s)	0.14	-0.29	-0.04
Departure Headway (s)	4.8	4.4	5.0
Degree Utilization, x	0.28	0.33	0.26
Capacity (veh/h)	703	783	670
Control Delay (s)	9.8	9.5	9.7
Approach Delay (s)	9.8	9.5	9.7
Approach LOS	A	A	A

Intersection Summary			
Delay	9.6		
Level of Service	A		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	15	10	5	5	5	20	5	15	10	30	20	42
Future Volume (Veh/h)	15	10	5	5	5	20	5	15	10	30	20	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	19	13	6	6	6	26	6	19	13	38	26	54
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	32			19			152	98	16	108	88	19
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	32			19			152	98	16	108	88	19
tC, single (s)	4.1			4.2			7.2	6.6	6.3	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.4	3.5	4.1	3.3
p0 queue free %	99			100			99	98	99	95	97	95
cM capacity (veh/h)	1580			1547			728	765	1040	834	775	1059

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	38	38	38	118
Volume Left	19	6	6	38
Volume Right	6	26	13	54
cSH	1580	1547	834	907
Volume to Capacity	0.01	0.00	0.05	0.13
Queue Length 95th (m)	0.3	0.1	1.1	3.4
Control Delay (s)	3.7	1.2	9.5	9.6
Lane LOS	A	A	A	A
Approach Delay (s)	3.7	1.2	9.5	9.6
Approach LOS			A	A

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	20.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	47	27	3	20	3
Future Volume (Veh/h)	3	47	27	3	20	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	4	60	35	4	26	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	39				105	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	39				105	37
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1571				891	1035

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	64	39	30
Volume Left	4	0	26
Volume Right	0	4	4
cSH	1571	1700	907
Volume to Capacity	0.00	0.02	0.03
Queue Length 95th (m)	0.1	0.0	0.8
Control Delay (s)	0.5	0.0	9.1
Lane LOS	A		A
Approach Delay (s)	0.5	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	14.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	49	12	8	27	40	7	229	20	44	147	11
Future Volume (Veh/h)	32	49	12	8	27	40	7	229	20	44	147	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	40	61	15	10	34	50	9	286	25	55	184	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	672	630	191	656	624	298	198			311		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	672	630	191	656	624	298	198			311		
tC, single (s)	7.1	6.6	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	84	98	97	91	93	99			96		
cM capacity (veh/h)	309	374	851	313	381	741	1357			1249		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	116	94	9	311	55	198
Volume Left	40	10	9	0	55	0
Volume Right	15	50	0	25	0	14
cSH	374	498	1357	1700	1249	1700
Volume to Capacity	0.31	0.19	0.01	0.18	0.04	0.12
Queue Length 95th (m)	9.9	5.2	0.2	0.0	1.0	0.0
Control Delay (s)	18.9	13.9	7.7	0.0	8.0	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	18.9	13.9	0.2		1.7	
Approach LOS	C	B				

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	35	1	64	55	48	1	0	23	27	1	1
Future Volume (Veh/h)	1	35	1	64	55	48	1	0	23	27	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	38	1	70	60	52	1	0	25	29	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	112			39			268	292	38	292	267	86
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	112			39			268	292	38	292	267	86
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	98	95	100	100
cM capacity (veh/h)	1478			1571			659	590	1033	622	610	973

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	40	182	26	31
Volume Left	1	70	1	29
Volume Right	1	52	25	1
cSH	1478	1571	1011	629
Volume to Capacity	0.00	0.04	0.03	0.05
Queue Length 95th (m)	0.0	1.1	0.6	1.2
Control Delay (s)	0.2	3.1	8.7	11.0
Lane LOS	A	A	A	B
Approach Delay (s)	0.2	3.1	8.7	11.0
Approach LOS			A	B

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	35	35	14	199	78	147	12	88	93	128	78	78
Future Volume (veh/h)	35	35	14	199	78	147	12	88	93	128	78	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
Hourly flow rate (vph)	38	38	15	216	85	160	13	96	101	139	85	85
Approach Volume (veh/h)		91			461			210			309	
Crossing Volume (veh/h)		440			147			215			314	
High Capacity (veh/h)		979			1234			1170			1082	
High v/c (veh/h)		0.09			0.37			0.18			0.29	
Low Capacity (veh/h)		795			1025			967			887	
Low v/c (veh/h)		0.11			0.45			0.22			0.35	

Intersection Summary			
Maximum v/c High	0.37		
Maximum v/c Low	0.45		
Intersection Capacity Utilization	67.7%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	91	461	210	309
Demand Flow Rate, veh/h	94	472	217	318
Vehicles Circulating, veh/h	451	153	221	322
Vehicles Exiting, veh/h	189	285	324	303
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.6	9.8	6.6	9.3
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	94	472	217	318
Cap Entry Lane, veh/h	720	970	906	819
Entry HV Adj Factor	0.969	0.976	0.969	0.971
Flow Entry, veh/h	91	461	210	309
Cap Entry, veh/h	698	947	877	795
V/C Ratio	0.131	0.487	0.240	0.388
Control Delay, s/veh	6.6	9.8	6.6	9.3
LOS	A	A	A	A
95th %tile Queue, veh	0	3	1	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	20	14	6	26	38	14	64	6	45	91	155
Future Volume (Veh/h)	91	20	14	6	26	38	14	64	6	45	91	155
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	101	22	16	7	29	42	16	71	7	50	101	172
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	450	397	187	420	480	74	273			78		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	450	397	187	420	480	74	273			78		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	78	96	98	99	94	96	99			97		
cM capacity (veh/h)	457	516	855	498	464	987	1290			1520		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	139	78	94	323
Volume Left	101	7	16	50
Volume Right	16	42	7	172
cSH	493	655	1290	1520
Volume to Capacity	0.28	0.12	0.01	0.03
Queue Length 95th (m)	8.7	3.1	0.3	0.8
Control Delay (s)	15.2	11.2	1.4	1.4
Lane LOS	C	B	A	A
Approach Delay (s)	15.2	11.2	1.4	1.4
Approach LOS	C	B		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	2	50	10	2	15	38	129	18	13	100	14
Future Volume (Veh/h)	36	2	50	10	2	15	38	129	18	13	100	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	49	3	68	14	3	21	52	177	25	18	137	19
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	498	488	146	546	486	190	156			202		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	498	488	146	546	486	190	156			202		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	99	92	96	99	98	96			99		
cM capacity (veh/h)	451	456	901	397	458	852	1424			1370		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	120	38	254	174
Volume Left	49	14	52	18
Volume Right	68	21	25	19
cSH	629	572	1424	1370
Volume to Capacity	0.19	0.07	0.04	0.01
Queue Length 95th (m)	5.3	1.6	0.9	0.3
Control Delay (s)	12.1	11.7	1.8	0.9
Lane LOS	B	B	A	A
Approach Delay (s)	12.1	11.7	1.8	0.9
Approach LOS	B	B		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	25	0	75	55	4	100
Future Volume (Veh/h)	25	0	75	55	4	100
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	34	0	103	75	5	137
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			34		315	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			34		315	34
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		99	87
cM capacity (veh/h)			1578		634	1039

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	34	178	142
Volume Left	0	103	5
Volume Right	0	0	137
cSH	1700	1578	1016
Volume to Capacity	0.02	0.07	0.14
Queue Length 95th (m)	0.0	1.6	3.7
Control Delay (s)	0.0	4.5	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	4.5	9.1
Approach LOS			A

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	67	58	79	118	109	51
Future Volume (vph)	67	58	79	118	109	51
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	92	79	108	162	149	70

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	171	270	219
Volume Left (vph)	92	0	149
Volume Right (vph)	0	162	70
Hadj (s)	0.14	-0.33	-0.02
Departure Headway (s)	4.9	4.4	4.9
Degree Utilization, x	0.23	0.33	0.30
Capacity (veh/h)	685	779	686
Control Delay (s)	9.4	9.5	10.0
Approach Delay (s)	9.4	9.5	10.0
Approach LOS	A	A	A

Intersection Summary			
Delay	9.6		
Level of Service	A		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	37	10	5	10	10	20	5	25	10	40	15	40
Future Volume (Veh/h)	37	10	5	10	10	20	5	25	10	40	15	40
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	46	12	6	12	12	25	6	31	12	49	19	49
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	37			18			214	168	15	183	158	24
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	37			18			214	168	15	183	158	24
tC, single (s)	4.1			4.2			7.2	6.6	6.3	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.4	3.5	4.1	3.3
p0 queue free %	97			99			99	95	99	93	97	95
cM capacity (veh/h)	1574			1548			659	684	1042	722	693	1052

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	64	49	49	117
Volume Left	46	12	6	49
Volume Right	6	25	12	49
cSH	1574	1548	743	825
Volume to Capacity	0.03	0.01	0.07	0.14
Queue Length 95th (m)	0.7	0.2	1.6	3.7
Control Delay (s)	5.3	1.8	10.2	10.1
Lane LOS	A	A	B	B
Approach Delay (s)	5.3	1.8	10.2	10.1
Approach LOS			B	B

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	55	37	35	18	3
Future Volume (Veh/h)	5	55	37	35	18	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	7	75	51	48	25	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	99				164	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	99				164	75
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1494				823	986

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	82	99	29
Volume Left	7	0	25
Volume Right	0	48	4
cSH	1494	1700	842
Volume to Capacity	0.00	0.06	0.03
Queue Length 95th (m)	0.1	0.0	0.8
Control Delay (s)	0.7	0.0	9.4
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	9.4
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	17.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	38	18	18	50	38	26	198	12	60	308	55
Future Volume (Veh/h)	31	38	18	18	50	38	26	198	12	60	308	55
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	36	45	21	21	59	45	31	233	14	71	362	65
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	906	846	394	850	871	240	427			247		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	906	846	394	850	871	240	427			247		
tC, single (s)	7.1	6.6	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	81	83	97	91	78	94	97			95		
cM capacity (veh/h)	189	271	655	223	266	799	1116			1319		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	102	125	31	247	71	427
Volume Left	36	21	31	0	71	0
Volume Right	21	45	0	14	0	65
cSH	263	336	1116	1700	1319	1700
Volume to Capacity	0.39	0.37	0.03	0.15	0.05	0.25
Queue Length 95th (m)	13.3	12.7	0.7	0.0	1.3	0.0
Control Delay (s)	27.1	21.9	8.3	0.0	7.9	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	27.1	21.9	0.9		1.1	
Approach LOS	D	C				

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	68	4	17	50	14	11	5	86	28	6	1
Future Volume (Veh/h)	1	68	4	17	50	14	11	5	86	28	6	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	74	4	18	54	15	12	5	93	30	7	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	69			78			180	183	76	271	178	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	69			78			180	183	76	271	178	62
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			98	99	91	95	99	100
cM capacity (veh/h)	1532			1520			768	702	985	608	707	1004

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	79	87	110	38
Volume Left	1	18	12	30
Volume Right	4	15	93	1
cSH	1532	1520	939	631
Volume to Capacity	0.00	0.01	0.12	0.06
Queue Length 95th (m)	0.0	0.3	3.0	1.5
Control Delay (s)	0.1	1.6	9.3	11.1
Lane LOS	A	A	A	B
Approach Delay (s)	0.1	1.6	9.3	11.1
Approach LOS			A	B

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	61	72	50	104	25	112	36	311	185	213	181	20
Future Volume (veh/h)	61	72	50	104	25	112	36	311	185	213	181	20
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
Hourly flow rate (vph)	66	78	54	113	27	122	39	338	201	232	197	22
Approach Volume (veh/h)		198			262			578			451	
Crossing Volume (veh/h)		542			443			376			179	
High Capacity (veh/h)		903			977			1030			1204	
High v/c (veh/h)		0.22			0.27			0.56			0.37	
Low Capacity (veh/h)		727			793			841			997	
Low v/c (veh/h)		0.27			0.33			0.69			0.45	

Intersection Summary			
Maximum v/c High	0.56		
Maximum v/c Low	0.69		
Intersection Capacity Utilization	82.5%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	15.5
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	198	262	578	451
Demand Flow Rate, veh/h	204	267	600	466
Vehicles Circulating, veh/h	559	462	386	183
Vehicles Exiting, veh/h	90	524	377	546
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.9	10.1	23.8	10.2
Approach LOS	A	B	C	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	204	267	600	466
Cap Entry Lane, veh/h	646	712	768	941
Entry HV Adj Factor	0.971	0.980	0.963	0.968
Flow Entry, veh/h	198	262	578	451
Cap Entry, veh/h	627	698	740	911
V/C Ratio	0.316	0.375	0.781	0.495
Control Delay, s/veh	9.9	10.1	23.8	10.2
LOS	A	B	C	B
95th %tile Queue, veh	1	2	8	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	181	28	19	4	18	113	9	238	4	60	181	93
Future Volume (Veh/h)	181	28	19	4	18	113	9	238	4	60	181	93
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	197	30	21	4	20	123	10	259	4	65	197	101
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	792	660	248	684	709	261	298			263		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	792	660	248	684	709	261	298			263		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	17	92	97	99	94	84	99			95		
cM capacity (veh/h)	236	361	791	316	338	778	1263			1301		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	248	147	273	363
Volume Left	197	4	10	65
Volume Right	21	123	4	101
cSH	265	639	1263	1301
Volume to Capacity	0.94	0.23	0.01	0.05
Queue Length 95th (m)	65.7	6.7	0.2	1.2
Control Delay (s)	81.2	12.3	0.4	1.8
Lane LOS	F	B	A	A
Approach Delay (s)	81.2	12.3	0.4	1.8
Approach LOS	F	B		

Intersection Summary				
Average Delay		22.0		
Intersection Capacity Utilization		64.7%	ICU Level of Service	C
Analysis Period (min)		15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	3	63	9	6	15	51	409	18	14	225	14
Future Volume (Veh/h)	36	3	63	9	6	15	51	409	18	14	225	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	39	3	68	10	7	16	55	445	20	15	245	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	867	858	252	917	855	455	260			465		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	867	858	252	917	855	455	260			465		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	84	99	91	95	97	97	96			99		
cM capacity (veh/h)	250	278	786	219	279	605	1304			1096		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	110	33	520	275
Volume Left	39	10	55	15
Volume Right	68	16	20	15
cSH	434	340	1304	1096
Volume to Capacity	0.25	0.10	0.04	0.01
Queue Length 95th (m)	7.6	2.4	1.0	0.3
Control Delay (s)	16.1	16.7	1.2	0.6
Lane LOS	C	C	A	A
Approach Delay (s)	16.1	16.7	1.2	0.6
Approach LOS	C	C		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	72	68	6	131	47	137	10	272	190	114	154	24
Future Volume (vph)	72	68	6	131	47	137	10	272	190	114	154	24
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
Hourly flow rate (vph)	78	74	7	142	51	149	11	296	207	124	167	26

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	159	342	514	317
Volume Left (vph)	78	142	11	124
Volume Right (vph)	7	149	207	26
Hadj (s)	0.11	-0.14	-0.20	0.06
Departure Headway (s)	8.0	7.1	6.5	7.2
Degree Utilization, x	0.35	0.67	0.92	0.63
Capacity (veh/h)	399	486	547	475
Control Delay (s)	15.3	23.4	46.4	21.6
Approach Delay (s)	15.3	23.4	46.4	21.6
Approach LOS	C	C	E	C

Intersection Summary			
Delay	30.9		
Level of Service	D		
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	96	14	20	201	23	48
Future Volume (vph)	96	14	20	201	23	48
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	15	22	218	25	52

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	119	240	77
Volume Left (vph)	104	0	25
Volume Right (vph)	15	218	0
Hadj (s)	0.13	-0.51	0.10
Departure Headway (s)	4.7	3.8	4.5
Degree Utilization, x	0.15	0.25	0.10
Capacity (veh/h)	715	921	755
Control Delay (s)	8.5	8.0	8.0
Approach Delay (s)	8.5	8.0	8.0
Approach LOS	A	A	A

Intersection Summary			
Delay	8.2		
Level of Service	A		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	174	85	16	118	30	67	129	10	17	160	26
Future Volume (Veh/h)	91	174	85	16	118	30	67	129	10	17	160	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	99	189	92	17	128	33	73	140	11	18	174	28
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	612	521	188	702	530	146	202			151		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	612	521	188	702	530	146	202			151		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	56	89	91	70	96	95			99		
cM capacity (veh/h)	285	430	854	197	425	902	1370			1430		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	380	178	224	220
Volume Left	99	17	73	18
Volume Right	92	33	11	28
cSH	425	420	1370	1430
Volume to Capacity	0.89	0.42	0.05	0.01
Queue Length 95th (m)	71.9	15.7	1.3	0.3
Control Delay (s)	52.8	19.7	2.8	0.7
Lane LOS	F	C	A	A
Approach Delay (s)	52.8	19.7	2.8	0.7
Approach LOS	F	C		

Intersection Summary			
Average Delay	24.3		
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	263	94	72	139	128	164
Future Volume (vph)	263	94	72	139	128	164
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	286	102	78	151	139	178

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	388	229	317
Volume Left (vph)	286	78	0
Volume Right (vph)	102	0	178
Hadj (s)	0.02	0.10	-0.30
Departure Headway (s)	5.4	5.6	5.1
Degree Utilization, x	0.58	0.36	0.45
Capacity (veh/h)	640	590	663
Control Delay (s)	15.4	11.7	12.2
Approach Delay (s)	15.4	11.7	12.2
Approach LOS	C	B	B

Intersection Summary			
Delay	13.4		
Level of Service	B		
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	27	37	21	52	10
Future Volume (Veh/h)	3	27	37	21	52	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	29	40	23	57	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	63				86	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	63				86	52
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	99
cM capacity (veh/h)	1540				913	1016

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	32	63	68
Volume Left	3	0	57
Volume Right	0	23	11
cSH	1540	1700	928
Volume to Capacity	0.00	0.04	0.07
Queue Length 95th (m)	0.0	0.0	1.8
Control Delay (s)	0.7	0.0	9.2
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	9.2
Approach LOS			A

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	25	74	5	5	41	156	5	15	10	182	20	59
Future Volume (Veh/h)	25	74	5	5	41	156	5	15	10	182	20	59
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	27	80	5	5	45	170	5	16	11	198	22	64
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	215			85			352	362	82	296	279	130
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	215			85			352	362	82	296	279	130
tC, single (s)	4.1			4.2			7.2	6.6	6.3	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.4	3.5	4.1	3.3
p0 queue free %	98			100			99	97	99	68	96	93
cM capacity (veh/h)	1355			1462			523	540	955	623	601	920

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	112	220	32	284
Volume Left	27	5	5	198
Volume Right	5	170	11	64
cSH	1355	1462	631	670
Volume to Capacity	0.02	0.00	0.05	0.42
Queue Length 95th (m)	0.5	0.1	1.2	16.1
Control Delay (s)	2.0	0.2	11.0	14.3
Lane LOS	A	A	B	B
Approach Delay (s)	2.0	0.2	11.0	14.3
Approach LOS			B	B

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	209	56	24	110	80	90	41	87	164	18	3
Future Volume (Veh/h)	2	209	56	24	110	80	90	41	87	164	18	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	227	61	26	120	87	98	45	95	178	20	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	207			288			490	520	258	594	508	164
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	207			288			490	520	258	594	508	164
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			79	90	88	46	96	100
cM capacity (veh/h)	1364			1274			463	450	781	332	458	881

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	290	233	238	201
Volume Left	2	26	98	178
Volume Right	61	87	95	3
cSH	1364	1274	549	345
Volume to Capacity	0.00	0.02	0.43	0.58
Queue Length 95th (m)	0.0	0.5	16.5	26.7
Control Delay (s)	0.1	1.0	16.5	29.0
Lane LOS	A	A	C	D
Approach Delay (s)	0.1	1.0	16.5	29.0
Approach LOS			C	D

Intersection Summary			
Average Delay	10.4		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	458	211	3	20	3
Future Volume (Veh/h)	3	458	211	3	20	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	498	229	3	22	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	232				734	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	232				734	230
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	100
cM capacity (veh/h)	1336				386	809

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	501	232	25
Volume Left	3	0	22
Volume Right	0	3	3
cSH	1336	1700	412
Volume to Capacity	0.00	0.14	0.06
Queue Length 95th (m)	0.1	0.0	1.5
Control Delay (s)	0.1	0.0	14.3
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	14.3
Approach LOS			B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	331	148	119	121	93	102
Future Volume (Veh/h)	331	148	119	121	93	102
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	360	161	129	132	101	111
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			521		830	440
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			521		830	440
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		66	82
cM capacity (veh/h)			1045		298	617

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	521	261	212
Volume Left	0	129	101
Volume Right	161	0	111
cSH	1700	1045	408
Volume to Capacity	0.31	0.12	0.52
Queue Length 95th (m)	0.0	3.2	22.0
Control Delay (s)	0.0	5.0	22.9
Lane LOS		A	C
Approach Delay (s)	0.0	5.0	22.9
Approach LOS			C

Intersection Summary			
Average Delay	6.2		
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	164	167	128	33	88	56	71	304	47	67	240	129
Future Volume (Veh/h)	164	167	128	33	88	56	71	304	47	67	240	129
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	178	182	139	36	96	61	77	330	51	73	261	140
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1070	1012	331	1146	1056	356	401			381		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1070	1012	331	1146	1056	356	401			381		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	12	80	0	51	91	93			94		
cM capacity (veh/h)	101	207	711	33	195	688	1158			1177		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	499	193	77	381	73	401
Volume Left	178	36	77	0	73	0
Volume Right	139	61	0	51	0	140
cSH	176	114	1158	1700	1177	1700
Volume to Capacity	2.83	1.69	0.07	0.22	0.06	0.24
Queue Length 95th (m)	338.5	112.1	1.6	0.0	1.5	0.0
Control Delay (s)	880.0	410.4	8.3	0.0	8.3	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	880.0	410.4	1.4		1.3	
Approach LOS	F	F				

Intersection Summary			
Average Delay	319.9		
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	103	41	46	320	297	105
Future Volume (Veh/h)	103	41	46	320	297	105
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	112	45	50	348	323	114
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	828	380	437			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	828	380	437			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	66	93	96			
cM capacity (veh/h)	326	667	1123			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	157	398	437
Volume Left	112	50	0
Volume Right	45	0	114
cSH	382	1123	1700
Volume to Capacity	0.41	0.04	0.26
Queue Length 95th (m)	14.9	1.1	0.0
Control Delay (s)	20.9	1.5	0.0
Lane LOS	C	A	
Approach Delay (s)	20.9	1.5	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	68	4	17	50	14	11	5	86	28	6	1
Future Volume (Veh/h)	1	68	4	17	50	14	11	5	86	28	6	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	74	4	18	54	15	12	5	93	30	7	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	69			78			180	183	76	271	178	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	69			78			180	183	76	271	178	62
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			98	99	91	95	99	100
cM capacity (veh/h)	1532			1520			768	702	985	608	707	1004

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	79	87	110	38
Volume Left	1	18	12	30
Volume Right	4	15	93	1
cSH	1532	1520	939	631
Volume to Capacity	0.00	0.01	0.12	0.06
Queue Length 95th (m)	0.0	0.3	3.0	1.5
Control Delay (s)	0.1	1.6	9.3	11.1
Lane LOS	A	A	A	B
Approach Delay (s)	0.1	1.6	9.3	11.1
Approach LOS			A	B

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	61	72	50	104	25	112	36	311	185	213	181	20
Future Volume (veh/h)	61	72	50	104	25	112	36	311	185	213	181	20
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
Hourly flow rate (vph)	66	78	54	113	27	122	39	338	201	232	197	22
Approach Volume (veh/h)		198			262			578			451	
Crossing Volume (veh/h)		542			443			376			179	
High Capacity (veh/h)		903			977			1030			1204	
High v/c (veh/h)		0.22			0.27			0.56			0.37	
Low Capacity (veh/h)		727			793			841			997	
Low v/c (veh/h)		0.27			0.33			0.69			0.45	

Intersection Summary			
Maximum v/c High	0.56		
Maximum v/c Low	0.69		
Intersection Capacity Utilization	82.5%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	15.5
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	198	262	578	451
Demand Flow Rate, veh/h	204	267	600	466
Vehicles Circulating, veh/h	559	462	386	183
Vehicles Exiting, veh/h	90	524	377	546
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.9	10.1	23.8	10.2
Approach LOS	A	B	C	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	204	267	600	466
Cap Entry Lane, veh/h	646	712	768	941
Entry HV Adj Factor	0.971	0.980	0.963	0.968
Flow Entry, veh/h	198	262	578	451
Cap Entry, veh/h	627	698	740	911
V/C Ratio	0.316	0.375	0.781	0.495
Control Delay, s/veh	9.9	10.1	23.8	10.2
LOS	A	B	C	B
95th %tile Queue, veh	1	2	8	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	181	28	19	4	18	113	9	238	4	60	181	93
Future Volume (veh/h)	181	28	19	4	18	113	9	238	4	60	181	93
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
Hourly flow rate (vph)	197	30	21	4	20	123	10	259	4	65	197	101
Approach Volume (veh/h)		248			147			273			363	
Crossing Volume (veh/h)		266			466			292			34	
High Capacity (veh/h)		1124			959			1101			1348	
High v/c (veh/h)		0.22			0.15			0.25			0.27	
Low Capacity (veh/h)		925			777			904			1128	
Low v/c (veh/h)		0.27			0.19			0.30			0.32	

Intersection Summary			
Maximum v/c High	0.27		
Maximum v/c Low	0.32		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	248	147	273	363
Demand Flow Rate, veh/h	253	149	286	376
Vehicles Circulating, veh/h	277	483	298	34
Vehicles Exiting, veh/h	133	101	232	598
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.5	7.7	8.5	6.9
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	253	149	286	376
Cap Entry Lane, veh/h	857	697	839	1092
Entry HV Adj Factor	0.982	0.984	0.955	0.966
Flow Entry, veh/h	248	147	273	363
Cap Entry, veh/h	841	686	801	1055
V/C Ratio	0.295	0.214	0.341	0.344
Control Delay, s/veh	7.5	7.7	8.5	6.9
LOS	A	A	A	A
95th %tile Queue, veh	1	1	2	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	36	3	63	9	6	15	51	409	18	14	225	14
Future Volume (Veh/h)	36	3	63	9	6	15	51	409	18	14	225	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	39	3	68	10	7	16	55	445	20	15	245	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	867	858	252	917	855	455	260			465		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	867	858	252	917	855	455	260			465		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	84	99	91	95	97	97	96			99		
cM capacity (veh/h)	250	278	786	219	279	605	1304			1096		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	110	33	520	275
Volume Left	39	10	55	15
Volume Right	68	16	20	15
cSH	434	340	1304	1096
Volume to Capacity	0.25	0.10	0.04	0.01
Queue Length 95th (m)	7.6	2.4	1.0	0.3
Control Delay (s)	16.1	16.7	1.2	0.6
Lane LOS	C	C	A	A
Approach Delay (s)	16.1	16.7	1.2	0.6
Approach LOS	C	C		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	72	68	6	131	47	137	10	272	190	114	154	24
Future Volume (veh/h)	72	68	6	131	47	137	10	272	190	114	154	24
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
Hourly flow rate (vph)	78	74	7	142	51	149	11	296	207	124	167	26
Approach Volume (veh/h)		159			342			514			317	
Crossing Volume (veh/h)		433			385			276			204	
High Capacity (veh/h)		985			1023			1115			1180	
High v/c (veh/h)		0.16			0.33			0.46			0.27	
Low Capacity (veh/h)		800			834			917			976	
Low v/c (veh/h)		0.20			0.41			0.56			0.32	

Intersection Summary			
Maximum v/c High	0.46		
Maximum v/c Low	0.56		
Intersection Capacity Utilization	73.8%	ICU Level of Service	D

Intersection	
Intersection Delay, s/veh	11.0
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	159	342	514	317
Demand Flow Rate, veh/h	162	349	524	323
Vehicles Circulating, veh/h	441	393	281	208
Vehicles Exiting, veh/h	90	412	322	534
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.6	11.1	14.0	7.9
Approach LOS	A	B	B	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	162	349	524	323
Cap Entry Lane, veh/h	727	763	853	918
Entry HV Adj Factor	0.979	0.980	0.981	0.980
Flow Entry, veh/h	159	342	514	317
Cap Entry, veh/h	711	747	837	900
V/C Ratio	0.223	0.458	0.614	0.352
Control Delay, s/veh	7.6	11.1	14.0	7.9
LOS	A	B	B	A
95th %tile Queue, veh	1	2	4	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Right Turn Channelized						
Traffic Volume (veh/h)	96	14	20	201	23	48
Future Volume (veh/h)	96	14	20	201	23	48
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	15	22	218	25	52
Approach Volume (veh/h)	119		240			77
Crossing Volume (veh/h)	22		25			104
High Capacity (veh/h)	1361		1358			1277
High v/c (veh/h)	0.09		0.18			0.06
Low Capacity (veh/h)	1140		1137			1063
Low v/c (veh/h)	0.10		0.21			0.07

Intersection Summary			
Maximum v/c High	0.18		
Maximum v/c Low	0.21		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	4.9
Intersection LOS	A

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	119	240	77
Demand Flow Rate, veh/h	121	244	79
Vehicles Circulating, veh/h	22	25	106
Vehicles Exiting, veh/h	247	159	37
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.3	5.4	4.3
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	121	244	79
Cap Entry Lane, veh/h	1105	1102	1016
Entry HV Adj Factor	0.983	0.982	0.974
Flow Entry, veh/h	119	240	77
Cap Entry, veh/h	1087	1082	990
V/C Ratio	0.109	0.221	0.078
Control Delay, s/veh	4.3	5.4	4.3
LOS	A	A	A
95th %tile Queue, veh	0	1	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	91	174	85	16	118	30	67	129	10	17	160	26
Future Volume (veh/h)	91	174	85	16	118	30	67	129	10	17	160	26
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
Hourly flow rate (vph)	99	189	92	17	128	33	73	140	11	18	174	28
Approach Volume (veh/h)		380			178			224			220	
Crossing Volume (veh/h)		209			312			306			218	
High Capacity (veh/h)		1176			1084			1089			1167	
High v/c (veh/h)		0.32			0.16			0.21			0.19	
Low Capacity (veh/h)		972			889			893			964	
Low v/c (veh/h)		0.39			0.20			0.25			0.23	

Intersection Summary			
Maximum v/c High	0.32		
Maximum v/c Low	0.39		
Intersection Capacity Utilization	63.7%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	380	178	224	220
Demand Flow Rate, veh/h	388	182	232	230
Vehicles Circulating, veh/h	218	322	312	222
Vehicles Exiting, veh/h	234	222	294	282
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.2	6.9	7.7	6.8
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	388	182	232	230
Cap Entry Lane, veh/h	909	819	827	905
Entry HV Adj Factor	0.980	0.980	0.966	0.958
Flow Entry, veh/h	380	178	224	220
Cap Entry, veh/h	890	803	799	867
V/C Ratio	0.427	0.222	0.280	0.254
Control Delay, s/veh	9.2	6.9	7.7	6.8
LOS	A	A	A	A
95th %tile Queue, veh	2	1	1	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	263	94	72	139	128	164
Future Volume (veh/h)	263	94	72	139	128	164
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	286	102	78	151	139	178
Approach Volume (veh/h)	388			229	317	
Crossing Volume (veh/h)	139			286	78	
High Capacity (veh/h)	1242			1106	1303	
High v/c (veh/h)	0.31			0.21	0.24	
Low Capacity (veh/h)	1032			909	1087	
Low v/c (veh/h)	0.38			0.25	0.29	

Intersection Summary			
Maximum v/c High	0.31		
Maximum v/c Low	0.38		
Intersection Capacity Utilization	58.4%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	388	229	317
Demand Flow Rate, veh/h	396	234	324
Vehicles Circulating, veh/h	142	292	80
Vehicles Exiting, veh/h	262	246	446
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.3	7.4	6.7
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	396	234	324
Cap Entry Lane, veh/h	980	844	1043
Entry HV Adj Factor	0.980	0.979	0.979
Flow Entry, veh/h	388	229	317
Cap Entry, veh/h	961	826	1021
V/C Ratio	0.404	0.277	0.311
Control Delay, s/veh	8.3	7.4	6.7
LOS	A	A	A
95th %tile Queue, veh	2	1	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	27	37	21	52	10
Future Volume (Veh/h)	3	27	37	21	52	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	29	40	23	57	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	63				86	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	63				86	52
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	99
cM capacity (veh/h)	1540				913	1016

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	32	63	68
Volume Left	3	0	57
Volume Right	0	23	11
cSH	1540	1700	928
Volume to Capacity	0.00	0.04	0.07
Queue Length 95th (m)	0.0	0.0	1.8
Control Delay (s)	0.7	0.0	9.2
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	9.2
Approach LOS			A

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	25	74	5	5	41	156	5	15	10	182	20	59
Future Volume (veh/h)	25	74	5	5	41	156	5	15	10	182	20	59
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
Hourly flow rate (vph)	27	80	5	5	45	170	5	16	11	198	22	64
Approach Volume (veh/h)		112			220			32			284	
Crossing Volume (veh/h)		225			48			305			55	
High Capacity (veh/h)		1161			1334			1090			1327	
High v/c (veh/h)		0.10			0.16			0.03			0.21	
Low Capacity (veh/h)		958			1115			894			1108	
Low v/c (veh/h)		0.12			0.20			0.04			0.26	

Intersection Summary			
Maximum v/c High	0.21		
Maximum v/c Low	0.26		
Intersection Capacity Utilization	46.0%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	5.7
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	112	220	32	284
Demand Flow Rate, veh/h	118	226	36	291
Vehicles Circulating, veh/h	231	51	314	57
Vehicles Exiting, veh/h	117	298	34	219
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.5	5.4	5.3	6.1
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	118	226	36	291
Cap Entry Lane, veh/h	897	1074	825	1067
Entry HV Adj Factor	0.949	0.972	0.899	0.975
Flow Entry, veh/h	112	220	32	284
Cap Entry, veh/h	851	1044	742	1041
V/C Ratio	0.132	0.210	0.044	0.273
Control Delay, s/veh	5.5	5.4	5.3	6.1
LOS	A	A	A	A
95th %tile Queue, veh	0	1	0	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	2	209	56	24	110	80	90	41	87	164	18	3
Future Volume (veh/h)	2	209	56	24	110	80	90	41	87	164	18	3
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
Hourly flow rate (vph)	2	227	61	26	120	87	98	45	95	178	20	3
Approach Volume (veh/h)		290			233			238			201	
Crossing Volume (veh/h)		224			145			407			244	
High Capacity (veh/h)		1162			1236			1005			1144	
High v/c (veh/h)		0.25			0.19			0.24			0.18	
Low Capacity (veh/h)		959			1026			818			943	
Low v/c (veh/h)		0.30			0.23			0.29			0.21	

Intersection Summary			
Maximum v/c High	0.25		
Maximum v/c Low	0.30		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	290	233	238	201
Demand Flow Rate, veh/h	302	242	243	205
Vehicles Circulating, veh/h	229	148	422	253
Vehicles Exiting, veh/h	229	517	109	137
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.0	6.3	9.0	6.6
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	302	242	243	205
Cap Entry Lane, veh/h	899	974	741	877
Entry HV Adj Factor	0.959	0.963	0.980	0.979
Flow Entry, veh/h	290	233	238	201
Cap Entry, veh/h	862	938	726	859
V/C Ratio	0.336	0.248	0.328	0.234
Control Delay, s/veh	8.0	6.3	9.0	6.6
LOS	A	A	A	A
95th %tile Queue, veh	1	1	1	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	458	211	3	20	3
Future Volume (Veh/h)	3	458	211	3	20	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	498	229	3	22	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	232				734	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	232				734	230
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	100
cM capacity (veh/h)	1336				386	809

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	501	232	25
Volume Left	3	0	22
Volume Right	0	3	3
cSH	1336	1700	412
Volume to Capacity	0.00	0.14	0.06
Queue Length 95th (m)	0.1	0.0	1.5
Control Delay (s)	0.1	0.0	14.3
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	14.3
Approach LOS			B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Right Turn Channelized						
Traffic Volume (veh/h)	331	148	119	121	93	102
Future Volume (veh/h)	331	148	119	121	93	102
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	360	161	129	132	101	111
Approach Volume (veh/h)	521			261	212	
Crossing Volume (veh/h)	129			101	360	
High Capacity (veh/h)	1252			1280	1044	
High v/c (veh/h)	0.42			0.20	0.20	
Low Capacity (veh/h)	1041			1066	853	
Low v/c (veh/h)	0.50			0.24	0.25	

Intersection Summary			
Maximum v/c High	0.42		
Maximum v/c Low	0.50		
Intersection Capacity Utilization	39.2%	ICU Level of Service	A

Intersection						
Intersection Delay, s/veh	6.4					
Intersection LOS	A					

Approach		EB		WB		NB
Entry Lanes		2		2		2
Conflicting Circle Lanes		1		1		1
Adj Approach Flow, veh/h		521		261		212
Demand Flow Rate, veh/h		542		271		216
Vehicles Circulating, veh/h		132		103		378
Vehicles Exiting, veh/h		242		491		296
Follow-Up Headway, s		3.186		3.186		3.186
Ped Vol Crossing Leg, #/h		0		0		0
Ped Cap Adj		1.000		1.000		1.000
Approach Delay, s/veh		7.2		4.9		6.2
Approach LOS		A		A		A

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	L	TR	L	TR
Assumed Moves	LT	R	L	TR	L	TR
RT Channelized						
Lane Util	0.697	0.303	0.487	0.513	0.477	0.523
Critical Headway, s	5.193	5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	378	164	132	139	103	113
Cap Entry Lane, veh/h	990	990	1019	1019	774	774
Entry HV Adj Factor	0.952	0.982	0.977	0.952	0.981	0.982
Flow Entry, veh/h	360	161	129	132	101	111
Cap Entry, veh/h	943	972	996	971	759	761
V/C Ratio	0.382	0.166	0.129	0.136	0.133	0.146
Control Delay, s/veh	8.1	5.3	4.8	5.0	6.1	6.3
LOS	A	A	A	A	A	A
95th %tile Queue, veh	2	1	0	0	0	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	164	167	128	33	88	56	71	304	47	67	240	129
Future Volume (veh/h)	164	167	128	33	88	56	71	304	47	67	240	129
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
Hourly flow rate (vph)	178	182	139	36	96	61	77	330	51	73	261	140
Approach Volume (veh/h)		499			193			458			474	
Crossing Volume (veh/h)		370			585			433			209	
High Capacity (veh/h)		1035			872			985			1176	
High v/c (veh/h)		0.48			0.22			0.47			0.40	
Low Capacity (veh/h)		845			700			800			972	
Low v/c (veh/h)		0.59			0.28			0.57			0.49	

Intersection Summary			
Maximum v/c High	0.48		
Maximum v/c Low	0.59		
Intersection Capacity Utilization	57.9%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	499	193	458	474
Demand Flow Rate, veh/h	515	200	477	491
Vehicles Circulating, veh/h	385	607	447	217
Vehicles Exiting, veh/h	323	317	453	590
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.9	6.9	7.9	6.5
Approach LOS	A	A	A	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	LT	R	LT	TR	LT	TR
Assumed Moves	LT	R	LT	R	LT	TR	LT	TR
RT Channelized								
Lane Util	0.724	0.276	0.690	0.310	0.470	0.530	0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	373	142	138	62	224	253	231	260
Cap Entry Lane, veh/h	847	863	717	739	808	826	960	971
Entry HV Adj Factor	0.965	0.979	0.958	0.984	0.960	0.958	0.964	0.966
Flow Entry, veh/h	360	139	132	61	215	242	223	251
Cap Entry, veh/h	817	845	687	727	776	792	926	938
V/C Ratio	0.441	0.165	0.193	0.084	0.277	0.306	0.241	0.268
Control Delay, s/veh	10.0	5.9	7.5	5.8	7.8	8.1	6.3	6.6
LOS	B	A	A	A	A	A	A	A
95th %tile Queue, veh	2	1	1	0	1	1	1	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	103	41	46	320	297	105
Future Volume (veh/h)	103	41	46	320	297	105
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	112	45	50	348	323	114
Approach Volume (veh/h)	157			398	437	
Crossing Volume (veh/h)	323			112	50	
High Capacity (veh/h)	1075			1269	1332	
High v/c (veh/h)	0.15			0.31	0.33	
Low Capacity (veh/h)	880			1056	1113	
Low v/c (veh/h)	0.18			0.38	0.39	

Intersection Summary			
Maximum v/c High	0.33		
Maximum v/c Low	0.39		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	5.4
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	2	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	157	398	437
Demand Flow Rate, veh/h	160	416	455
Vehicles Circulating, veh/h	339	114	51
Vehicles Exiting, veh/h	167	385	479
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.2	5.5	5.4
Approach LOS	A	A	A

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	L	TR	LT	TR	LT	TR
Assumed Moves	L	TR	LT	TR	LT	TR
RT Channelized						
Lane Util	0.712	0.287	0.471	0.529	0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	114	46	196	220	214	241
Cap Entry Lane, veh/h	876	891	1037	1043	1088	1090
Entry HV Adj Factor	0.982	0.978	0.953	0.958	0.959	0.961
Flow Entry, veh/h	112	45	187	211	205	232
Cap Entry, veh/h	861	872	989	999	1043	1047
V/C Ratio	0.130	0.052	0.189	0.211	0.197	0.221
Control Delay, s/veh	5.5	4.6	5.4	5.6	5.3	5.5
LOS	A	A	A	A	A	A
95th %tile Queue, veh	0	0	1	1	1	1

Lane Group	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	227	21	147	273	363
v/c Ratio	0.59	0.04	0.25	0.39	0.57
Control Delay	19.5	1.2	5.0	12.0	13.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	1.2	5.0	12.0	13.7
Queue Length 50th (m)	11.2	0.0	1.0	12.2	15.4
Queue Length 95th (m)	35.3	1.1	10.7	34.0	45.1
Internal Link Dist (m)	223.6		126.7	770.1	323.4
Turn Bay Length (m)		10.0			
Base Capacity (vph)	676	903	961	1229	1096
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.34	0.02	0.15	0.22	0.33

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	181	28	19	4	18	113	9	238	4	60	181	93
Future Volume (vph)	181	28	19	4	18	113	9	238	4	60	181	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.89			1.00			0.96	
Flt Protected		0.96	1.00		1.00			1.00			0.99	
Satd. Flow (prot)		1805	1601		1668			1825			1768	
Flt Permitted		0.65	1.00		0.99			0.98			0.89	
Satd. Flow (perm)		1233	1601		1651			1792			1581	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	197	30	21	4	20	123	10	259	4	65	197	101
RTOR Reduction (vph)	0	0	14	0	84	0	0	1	0	0	25	0
Lane Group Flow (vph)	0	227	7	0	63	0	0	272	0	0	338	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		13.0	13.0		13.0			16.3			16.3	
Effective Green, g (s)		13.0	13.0		13.0			16.3			16.3	
Actuated g/C Ratio		0.31	0.31		0.31			0.39			0.39	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		388	503		519			707			623	
v/s Ratio Prot												
v/s Ratio Perm		c0.18	0.00		0.04			0.15			c0.21	
v/c Ratio		0.59	0.01		0.12			0.38			0.54	
Uniform Delay, d1		11.9	9.7		10.1			8.9			9.6	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		2.2	0.0		0.1			0.3			1.0	
Delay (s)		14.1	9.7		10.2			9.3			10.6	
Level of Service		B	A		B			A			B	
Approach Delay (s)		13.8			10.2			9.3			10.6	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	41.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	360	161	129	132	101	111
v/c Ratio	0.36	0.10	0.46	0.11	0.25	0.25
Control Delay	17.2	0.1	43.7	11.5	40.2	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	0.1	43.7	11.5	40.2	8.4
Queue Length 50th (m)	46.3	0.0	16.1	14.3	19.7	0.0
Queue Length 95th (m)	70.4	0.0	19.8	26.7	35.2	14.3
Internal Link Dist (m)	190.0			351.8	113.5	
Turn Bay Length (m)		40.0	50.0			
Base Capacity (vph)	994	1601	462	1235	402	446
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.10	0.28	0.11	0.25	0.25

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	331	148	119	121	93	102
Future Volume (vph)	331	148	119	121	93	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1830	1601	3471	1830	1789	1601
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1830	1601	3471	1830	1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	360	161	129	132	101	111
RTOR Reduction (vph)	0	0	0	0	0	86
Lane Group Flow (vph)	360	161	129	132	101	25
Heavy Vehicles (%)	5%	2%	2%	5%	2%	2%
Turn Type	NA	Free	Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	65.2	120.0	9.8	81.0	27.0	27.0
Effective Green, g (s)	65.2	120.0	9.8	81.0	27.0	27.0
Actuated g/C Ratio	0.54	1.00	0.08	0.68	0.22	0.22
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	994	1601	283	1235	402	360
v/s Ratio Prot	c0.20		c0.04	0.07	c0.06	
v/s Ratio Perm		0.10				0.02
v/c Ratio	0.36	0.10	0.46	0.11	0.25	0.07
Uniform Delay, d1	15.6	0.0	52.6	6.8	38.2	36.6
Progression Factor	1.00	1.00	0.74	1.64	1.00	1.00
Incremental Delay, d2	1.0	0.1	1.2	0.2	1.5	0.4
Delay (s)	16.6	0.1	40.0	11.4	39.7	37.0
Level of Service	B	A	D	B	D	D
Approach Delay (s)	11.5			25.5	38.3	
Approach LOS	B			C	D	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	178	182	139	36	96	61	77	330	51	73	261	140
v/c Ratio	0.72	0.53	0.34	0.20	0.28	0.17	0.49	0.16	0.05	0.48	0.13	0.09
Control Delay	49.9	37.0	3.6	40.6	41.5	4.7	68.9	10.8	1.1	62.0	13.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.9	37.0	3.6	40.6	41.5	4.7	68.9	10.8	1.1	62.0	13.4	0.1
Queue Length 50th (m)	38.6	30.0	0.1	7.2	19.5	0.0	18.8	15.1	0.0	16.7	14.2	0.0
Queue Length 95th (m)	59.3	44.3	2.5	15.3	31.5	6.4	27.2	29.8	2.2	30.8	26.8	0.0
Internal Link Dist (m)		351.8			274.1			180.0			292.9	
Turn Bay Length (m)	75.0			75.0		60.0	90.0		75.0	90.0		75.0
Base Capacity (vph)	512	716	711	370	716	676	313	2073	988	298	2066	1601
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.25	0.20	0.10	0.13	0.09	0.25	0.16	0.05	0.24	0.13	0.09

Intersection Summary

HCM Signalized Intersection Capacity Analysis
6050: PTH 10/18th St & Patricia Ave

10-12-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	164	167	128	33	88	56	71	304	47	67	240	129
Future Volume (vph)	164	167	128	33	88	56	71	304	47	67	240	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1830	1601	1789	1830	1601	1789	3476	1601	1789	3476	1601
Flt Permitted	0.69	1.00	1.00	0.50	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1309	1830	1601	945	1830	1601	1789	3476	1601	1789	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	178	182	139	36	96	61	77	330	51	73	261	140
RTOR Reduction (vph)	0	0	113	0	0	50	0	0	21	0	0	0
Lane Group Flow (vph)	178	182	26	36	96	11	77	330	30	73	261	140
Heavy Vehicles (%)	2%	5%	2%	2%	5%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			Free
Actuated Green, G (s)	22.6	22.6	22.6	22.6	22.6	22.6	9.2	70.4	70.4	9.0	70.2	120.0
Effective Green, g (s)	22.6	22.6	22.6	22.6	22.6	22.6	9.2	70.4	70.4	9.0	70.2	120.0
Actuated g/C Ratio	0.19	0.19	0.19	0.19	0.19	0.19	0.08	0.59	0.59	0.08	0.59	1.00
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	246	344	301	177	344	301	137	2039	939	134	2033	1601
v/s Ratio Prot		0.10			0.05		c0.04	c0.09		0.04	0.08	
v/s Ratio Perm	c0.14		0.02	0.04		0.01			0.02			c0.09
v/c Ratio	0.72	0.53	0.09	0.20	0.28	0.04	0.56	0.16	0.03	0.54	0.13	0.09
Uniform Delay, d1	45.8	43.9	40.2	41.1	41.7	39.8	53.5	11.3	10.4	53.5	11.2	0.0
Progression Factor	0.76	0.74	0.26	1.00	1.00	1.00	1.13	0.80	0.74	1.00	1.00	1.00
Incremental Delay, d2	9.7	1.4	0.1	0.6	0.4	0.1	5.2	0.2	0.1	4.5	0.1	0.1
Delay (s)	44.4	34.1	10.7	41.7	42.2	39.9	65.7	9.2	7.8	58.0	11.3	0.1
Level of Service	D	C	B	D	D	D	E	A	A	E	B	A
Approach Delay (s)		31.2			41.3			18.6			15.2	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	112	45	50	348	323	114
v/c Ratio	0.58	0.21	0.38	0.13	0.13	0.10
Control Delay	62.5	15.4	60.8	3.3	4.1	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.5	15.4	60.8	3.3	4.1	0.7
Queue Length 50th (m)	25.5	0.0	11.5	8.1	4.4	0.0
Queue Length 95th (m)	42.1	10.5	23.5	14.2	7.5	0.0
Internal Link Dist (m)	91.8			168.8	180.0	
Turn Bay Length (m)		60.0	75.0			75.0
Base Capacity (vph)	551	524	327	2753	2393	1138
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.09	0.15	0.13	0.13	0.10

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	103	41	46	320	297	105
Future Volume (vph)	103	41	46	320	297	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1789	1601	1789	3476	3476	1601
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1789	1601	1789	3476	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	112	45	50	348	323	114
RTOR Reduction (vph)	0	40	0	0	0	37
Lane Group Flow (vph)	112	5	50	348	323	77
Heavy Vehicles (%)	2%	2%	2%	5%	5%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	12.9	12.9	7.6	95.1	81.5	81.5
Effective Green, g (s)	12.9	12.9	7.6	95.1	81.5	81.5
Actuated g/C Ratio	0.11	0.11	0.06	0.79	0.68	0.68
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	192	172	113	2754	2360	1087
v/s Ratio Prot	c0.06		c0.03	0.10	c0.09	
v/s Ratio Perm		0.00				0.05
v/c Ratio	0.58	0.03	0.44	0.13	0.14	0.07
Uniform Delay, d1	51.0	47.9	54.2	2.9	6.8	6.5
Progression Factor	1.00	1.00	1.00	1.00	0.51	0.30
Incremental Delay, d2	4.5	0.1	2.8	0.1	0.1	0.1
Delay (s)	55.5	48.0	56.9	3.0	3.6	2.1
Level of Service	E	D	E	A	A	A
Approach Delay (s)	53.3			9.7	3.2	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	33.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	86	11	75	101	48	7	1	29	27	2	1
Future Volume (Veh/h)	1	86	11	75	101	48	7	1	29	27	2	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	93	12	82	110	52	8	1	32	29	2	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	162			105			403	427	99	434	407	136
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162			105			403	427	99	434	407	136
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			94			98	100	97	94	100	100
cM capacity (veh/h)	1417			1486			532	491	957	492	504	913

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	106	244	41	32
Volume Left	1	82	8	29
Volume Right	12	52	32	1
cSH	1417	1486	812	500
Volume to Capacity	0.00	0.06	0.05	0.06
Queue Length 95th (m)	0.0	1.3	1.2	1.6
Control Delay (s)	0.1	2.8	9.7	12.7
Lane LOS	A	A	A	B
Approach Delay (s)	0.1	2.8	9.7	12.7
Approach LOS			A	B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	35	41	64	280	89	149	57	313	140	131	338	78
Future Volume (veh/h)	35	41	64	280	89	149	57	313	140	131	338	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
Hourly flow rate (vph)	38	45	70	304	97	162	62	340	152	142	367	85
Approach Volume (veh/h)		153			563			554			594	
Crossing Volume (veh/h)		813			440			225			463	
High Capacity (veh/h)		725			979			1161			961	
High v/c (veh/h)		0.21			0.57			0.48			0.62	
Low Capacity (veh/h)		571			795			958			779	
Low v/c (veh/h)		0.27			0.71			0.58			0.76	

Intersection Summary			
Maximum v/c High	0.62		
Maximum v/c Low	0.76		
Intersection Capacity Utilization	96.7%	ICU Level of Service	F

Intersection	
Intersection Delay, s/veh	25.0
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	153	563	554	594
Demand Flow Rate, veh/h	157	577	575	617
Vehicles Circulating, veh/h	840	459	231	475
Vehicles Exiting, veh/h	252	347	766	561
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.8	27.2	14.5	35.7
Approach LOS	B	D	B	E

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	157	577	575	617
Cap Entry Lane, veh/h	488	714	897	703
Entry HV Adj Factor	0.973	0.976	0.963	0.962
Flow Entry, veh/h	153	563	554	594
Cap Entry, veh/h	475	697	864	676
V/C Ratio	0.322	0.808	0.641	0.878
Control Delay, s/veh	12.8	27.2	14.5	35.7
LOS	B	D	B	E
95th %tile Queue, veh	1	8	5	11

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	20	20	6	26	67	25	334	6	89	406	187
Future Volume (Veh/h)	110	20	20	6	26	67	25	334	6	89	406	187
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	120	22	22	7	28	73	27	363	7	97	441	203
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1244	1160	542	1179	1258	366	644			370		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1244	1160	542	1179	1258	366	644			370		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	87	96	95	82	89	97			92		
cM capacity (veh/h)	106	174	540	133	152	679	941			1189		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	164	108	397	741
Volume Left	120	7	27	97
Volume Right	22	73	7	203
cSH	128	314	941	1189
Volume to Capacity	1.29	0.34	0.03	0.08
Queue Length 95th (m)	79.4	11.3	0.7	2.0
Control Delay (s)	240.5	22.4	0.9	2.0
Lane LOS	F	C	A	A
Approach Delay (s)	240.5	22.4	0.9	2.0
Approach LOS	F	C		

Intersection Summary			
Average Delay	31.0		
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	36	6	65	13	4	15	49	445	22	16	496	14
Future Volume (Veh/h)	36	6	65	13	4	15	49	445	22	16	496	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	39	7	71	14	4	16	53	484	24	17	539	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1200	1194	546	1257	1190	496	554			508		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1200	1194	546	1257	1190	496	554			508		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	73	96	87	88	98	97	95			98		
cM capacity (veh/h)	147	174	537	118	175	574	1016			1057		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	117	34	561	571
Volume Left	39	14	53	17
Volume Right	71	16	24	15
cSH	267	201	1016	1057
Volume to Capacity	0.44	0.17	0.05	0.02
Queue Length 95th (m)	16.0	4.5	1.3	0.4
Control Delay (s)	28.6	26.5	1.4	0.4
Lane LOS	D	D	A	A
Approach Delay (s)	28.6	26.5	1.4	0.4
Approach LOS	D	D		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	44	38	3	168	81	140	10	337	139	132	367	75
Future Volume (vph)	44	38	3	168	81	140	10	337	139	132	367	75
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
Hourly flow rate (vph)	48	41	3	183	88	152	11	366	151	143	399	82

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	92	423	528	624
Volume Left (vph)	48	183	11	143
Volume Right (vph)	3	152	151	82
Hadj (s)	0.12	-0.10	-0.13	0.00
Departure Headway (s)	9.4	7.5	7.2	7.3
Degree Utilization, x	0.24	0.88	1.06	1.27
Capacity (veh/h)	368	474	507	499
Control Delay (s)	15.3	44.6	82.9	160.8
Approach Delay (s)	15.3	44.6	82.9	160.8
Approach LOS	C	E	F	F

Intersection Summary			
Delay	98.6		
Level of Service	F		
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	147	18	96	92	14	78
Future Volume (vph)	147	18	96	92	14	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	160	20	104	100	15	85

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	180	204	100
Volume Left (vph)	160	0	15
Volume Right (vph)	20	100	0
Hadj (s)	0.15	-0.26	0.06
Departure Headway (s)	4.7	4.2	4.6
Degree Utilization, x	0.24	0.24	0.13
Capacity (veh/h)	714	815	730
Control Delay (s)	9.2	8.5	8.3
Approach Delay (s)	9.2	8.5	8.3
Approach LOS	A	A	A

Intersection Summary			
Delay	8.7		
Level of Service	A		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	51	82	33	10	120	34	46	280	14	41	288	88
Future Volume (Veh/h)	51	82	33	10	120	34	46	280	14	41	288	88
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	55	89	36	11	130	37	50	304	15	45	313	96
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	964	870	361	943	910	312	409			319		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	964	870	361	943	910	312	409			319		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	56	67	95	93	49	95	96			96		
cM capacity (veh/h)	125	267	684	161	253	729	1150			1241		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	180	178	369	454
Volume Left	55	11	50	45
Volume Right	36	37	15	96
cSH	218	281	1150	1241
Volume to Capacity	0.82	0.63	0.04	0.04
Queue Length 95th (m)	46.9	30.1	1.0	0.9
Control Delay (s)	69.7	37.6	1.5	1.1
Lane LOS	F	E	A	A
Approach Delay (s)	69.7	37.6	1.5	1.1
Approach LOS	F	E		

Intersection Summary			
Average Delay	17.2		
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	156	154	171	312	311	213
Future Volume (vph)	156	154	171	312	311	213
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	170	167	186	339	338	232

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	337	525	570
Volume Left (vph)	170	186	0
Volume Right (vph)	167	0	232
Hadj (s)	-0.16	0.10	-0.21
Departure Headway (s)	6.7	6.3	5.9
Degree Utilization, x	0.63	0.91	0.94
Capacity (veh/h)	516	562	602
Control Delay (s)	20.5	44.3	46.7
Approach Delay (s)	20.5	44.3	46.7
Approach LOS	C	E	E

Intersection Summary			
Delay	39.7		
Level of Service	E		
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	56	51	100	80	6
Future Volume (Veh/h)	10	56	51	100	80	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	61	55	109	87	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	164				192	110
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	164				192	110
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				89	99
cM capacity (veh/h)	1414				790	944

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	72	164	94
Volume Left	11	0	87
Volume Right	0	109	7
cSH	1414	1700	800
Volume to Capacity	0.01	0.10	0.12
Queue Length 95th (m)	0.2	0.0	3.0
Control Delay (s)	1.2	0.0	10.1
Lane LOS	A		B
Approach Delay (s)	1.2	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	51	127	5	10	146	261	5	25	10	266	15	50
Future Volume (Veh/h)	51	127	5	10	146	261	5	25	10	266	15	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	55	138	5	11	159	284	5	27	11	289	16	54
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	443			143			636	716	140	598	576	301
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	443			143			636	716	140	598	576	301
tC, single (s)	4.1			4.2			7.2	6.6	6.3	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.4	3.5	4.1	3.3
p0 queue free %	95			99			98	92	99	21	96	93
cM capacity (veh/h)	1117			1392			326	327	887	367	394	739

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	198	454	43	359
Volume Left	55	11	5	289
Volume Right	5	284	11	54
cSH	1117	1392	390	398
Volume to Capacity	0.05	0.01	0.11	0.90
Queue Length 95th (m)	1.2	0.2	2.8	71.6
Control Delay (s)	2.7	0.3	15.4	56.4
Lane LOS	A	A	C	F
Approach Delay (s)	2.7	0.3	15.4	56.4
Approach LOS			C	F

Intersection Summary			
Average Delay	20.5		
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	354	45	81	385	389	30	20	48	325	31	2
Future Volume (Veh/h)	6	354	45	81	385	389	30	20	48	325	31	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	7	385	49	88	418	423	33	22	52	353	34	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	841			434			1248	1440	410	1292	1254	630
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	841			434			1248	1440	410	1292	1254	630
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			92			72	82	92	0	78	100
cM capacity (veh/h)	794			1126			117	121	642	104	157	482

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	441	929	107	389
Volume Left	7	88	33	353
Volume Right	49	423	52	2
cSH	794	1126	196	107
Volume to Capacity	0.01	0.08	0.55	3.63
Queue Length 95th (m)	0.2	1.9	21.8	Err
Control Delay (s)	0.3	2.0	43.4	Err
Lane LOS	A	A	E	F
Approach Delay (s)	0.3	2.0	43.4	Err
Approach LOS			E	F

Intersection Summary			
Average Delay	2088.0		
Intersection Capacity Utilization	106.6%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	722	852	35	18	3
Future Volume (Veh/h)	5	722	852	35	18	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	785	926	38	20	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	964				1740	945
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	964				1740	945
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				79	99
cM capacity (veh/h)	714				95	318

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	790	964	23
Volume Left	5	0	20
Volume Right	0	38	3
cSH	714	1700	104
Volume to Capacity	0.01	0.57	0.22
Queue Length 95th (m)	0.2	0.0	6.0
Control Delay (s)	0.2	0.0	48.9
Lane LOS	A		E
Approach Delay (s)	0.2	0.0	48.9
Approach LOS			E

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	241	502	369	336	551	386
Future Volume (Veh/h)	241	502	369	336	551	386
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	262	546	401	365	599	420
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			808		1702	535
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			808		1702	535
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			51		0	23
cM capacity (veh/h)			817		51	545

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	808	766	1019
Volume Left	0	401	599
Volume Right	546	0	420
cSH	1700	817	82
Volume to Capacity	0.48	0.49	12.42
Queue Length 95th (m)	0.0	20.9	Err
Control Delay (s)	0.0	11.1	Err
Lane LOS		B	F
Approach Delay (s)	0.0	11.1	Err
Approach LOS			F

Intersection Summary			
Average Delay	3932.7		
Intersection Capacity Utilization	145.8%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	296	176	169	96	219	54	212	438	90	72	538	383
Future Volume (Veh/h)	296	176	169	96	219	54	212	438	90	72	538	383
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	322	191	184	104	238	59	230	476	98	78	585	416
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2063	1983	793	2006	2142	525	1001			574		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2063	1983	793	2006	2142	525	1001			574		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	53	0	0	89	67			92		
cM capacity (veh/h)	0	37	389	0	29	552	692			999		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	697	401	230	574	78	1001
Volume Left	322	104	230	0	78	0
Volume Right	184	59	0	98	0	416
cSH	0	0	692	1700	999	1700
Volume to Capacity	Err	Err	0.33	0.34	0.08	0.59
Queue Length 95th (m)	Err	Err	11.1	0.0	1.9	0.0
Control Delay (s)	Err	Err	12.8	0.0	8.9	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	Err	Err	3.7		0.6	
Approach LOS	F	F				

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	132.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	313	107	101	427	495	308
Future Volume (Veh/h)	313	107	101	427	495	308
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	340	116	110	464	538	335
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1390	706	873			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1390	706	873			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	73	86			
cM capacity (veh/h)	135	436	773			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	456	574	873
Volume Left	340	110	0
Volume Right	116	0	335
cSH	163	773	1700
Volume to Capacity	2.79	0.14	0.51
Queue Length 95th (m)	309.9	3.8	0.0
Control Delay (s)	866.2	3.6	0.0
Lane LOS	F	A	
Approach Delay (s)	866.2	3.6	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	208.7		
Intersection Capacity Utilization	106.8%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	86	11	75	101	48	7	1	29	27	2	1
Future Volume (Veh/h)	1	86	11	75	101	48	7	1	29	27	2	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	93	12	82	110	52	8	1	32	29	2	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	162			105			403	427	99	434	407	136
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162			105			403	427	99	434	407	136
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			94			98	100	97	94	100	100
cM capacity (veh/h)	1417			1486			532	491	957	492	504	913

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	106	244	41	32
Volume Left	1	82	8	29
Volume Right	12	52	32	1
cSH	1417	1486	812	500
Volume to Capacity	0.00	0.06	0.05	0.06
Queue Length 95th (m)	0.0	1.3	1.2	1.6
Control Delay (s)	0.1	2.8	9.7	12.7
Lane LOS	A	A	A	B
Approach Delay (s)	0.1	2.8	9.7	12.7
Approach LOS			A	B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	35	41	64	280	89	149	57	313	140	131	338	78
Future Volume (veh/h)	35	41	64	280	89	149	57	313	140	131	338	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
Hourly flow rate (vph)	38	45	70	304	97	162	62	340	152	142	367	85
Approach Volume (veh/h)		153			563			554			594	
Crossing Volume (veh/h)		813			440			225			463	
High Capacity (veh/h)		725			979			1161			961	
High v/c (veh/h)		0.21			0.57			0.48			0.62	
Low Capacity (veh/h)		571			795			958			779	
Low v/c (veh/h)		0.27			0.71			0.58			0.76	

Intersection Summary			
Maximum v/c High	0.62		
Maximum v/c Low	0.76		
Intersection Capacity Utilization	96.7%	ICU Level of Service	F

Intersection	
Intersection Delay, s/veh	25.0
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	153	563	554	594
Demand Flow Rate, veh/h	157	577	575	617
Vehicles Circulating, veh/h	840	459	231	475
Vehicles Exiting, veh/h	252	347	766	561
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.8	27.2	14.5	35.7
Approach LOS	B	D	B	E

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	157	577	575	617
Cap Entry Lane, veh/h	488	714	897	703
Entry HV Adj Factor	0.973	0.976	0.963	0.962
Flow Entry, veh/h	153	563	554	594
Cap Entry, veh/h	475	697	864	676
V/C Ratio	0.322	0.808	0.641	0.878
Control Delay, s/veh	12.8	27.2	14.5	35.7
LOS	B	D	B	E
95th %tile Queue, veh	1	8	5	11

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	110	20	20	6	26	67	25	334	6	89	406	187
Future Volume (veh/h)	110	20	20	6	26	67	25	334	6	89	406	187
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
Hourly flow rate (vph)	120	22	22	7	28	73	27	363	7	97	441	203
Approach Volume (veh/h)		164			108			397			741	
Crossing Volume (veh/h)		545			510			239			62	
High Capacity (veh/h)		900			926			1148			1319	
High v/c (veh/h)		0.18			0.12			0.35			0.56	
Low Capacity (veh/h)		725			748			947			1102	
Low v/c (veh/h)		0.23			0.14			0.42			0.67	

Intersection Summary			
Maximum v/c High	0.56		
Maximum v/c Low	0.67		
Intersection Capacity Utilization	82.0%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	12.9
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	164	108	397	741
Demand Flow Rate, veh/h	166	110	416	769
Vehicles Circulating, veh/h	569	531	243	64
Vehicles Exiting, veh/h	264	128	492	577
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.0	7.4	10.3	15.9
Approach LOS	A	A	B	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	166	110	416	769
Cap Entry Lane, veh/h	640	664	886	1060
Entry HV Adj Factor	0.985	0.986	0.954	0.964
Flow Entry, veh/h	164	108	397	741
Cap Entry, veh/h	630	655	845	1021
V/C Ratio	0.260	0.166	0.469	0.726
Control Delay, s/veh	9.0	7.4	10.3	15.9
LOS	A	A	B	C
95th %tile Queue, veh	1	1	3	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	36	6	65	13	4	15	49	445	22	16	496	14
Future Volume (Veh/h)	36	6	65	13	4	15	49	445	22	16	496	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	39	7	71	14	4	16	53	484	24	17	539	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1200	1194	546	1257	1190	496	554			508		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1200	1194	546	1257	1190	496	554			508		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	73	96	87	88	98	97	95			98		
cM capacity (veh/h)	147	174	537	118	175	574	1016			1057		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	117	34	561	571
Volume Left	39	14	53	17
Volume Right	71	16	24	15
cSH	267	201	1016	1057
Volume to Capacity	0.44	0.17	0.05	0.02
Queue Length 95th (m)	16.0	4.5	1.3	0.4
Control Delay (s)	28.6	26.5	1.4	0.4
Lane LOS	D	D	A	A
Approach Delay (s)	28.6	26.5	1.4	0.4
Approach LOS	D	D		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	44	38	3	168	81	140	10	337	139	132	367	75
Future Volume (veh/h)	44	38	3	168	81	140	10	337	139	132	367	75
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
Hourly flow rate (vph)	48	41	3	183	88	152	11	366	151	143	399	82
Approach Volume (veh/h)		92			423			528			624	
Crossing Volume (veh/h)		725			425			232			282	
High Capacity (veh/h)		779			991			1155			1110	
High v/c (veh/h)		0.12			0.43			0.46			0.56	
Low Capacity (veh/h)		618			806			952			912	
Low v/c (veh/h)		0.15			0.53			0.55			0.68	

Intersection Summary			
Maximum v/c High	0.56		
Maximum v/c Low	0.68		
Intersection Capacity Utilization	93.8%	ICU Level of Service	F

Intersection	
Intersection Delay, s/veh	15.9
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	92	423	528	624
Demand Flow Rate, veh/h	94	432	538	637
Vehicles Circulating, veh/h	740	433	237	288
Vehicles Exiting, veh/h	185	342	597	577
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.1	14.9	13.2	20.0
Approach LOS	A	B	B	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	94	432	538	637
Cap Entry Lane, veh/h	539	733	892	847
Entry HV Adj Factor	0.981	0.980	0.981	0.980
Flow Entry, veh/h	92	423	528	624
Cap Entry, veh/h	529	718	874	830
V/C Ratio	0.174	0.589	0.603	0.752
Control Delay, s/veh	9.1	14.9	13.2	20.0
LOS	A	B	B	C
95th %tile Queue, veh	1	4	4	7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Right Turn Channelized						
Traffic Volume (veh/h)	147	18	96	92	14	78
Future Volume (veh/h)	147	18	96	92	14	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	160	20	104	100	15	85
Approach Volume (veh/h)	180		204			100
Crossing Volume (veh/h)	104		15			160
High Capacity (veh/h)	1277		1369			1222
High v/c (veh/h)	0.14		0.15			0.08
Low Capacity (veh/h)	1063		1147			1013
Low v/c (veh/h)	0.17		0.18			0.10

Intersection Summary			
Maximum v/c High	0.15		
Maximum v/c Low	0.18		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	5.1
Intersection LOS	A

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	180	204	100
Demand Flow Rate, veh/h	183	208	102
Vehicles Circulating, veh/h	106	15	163
Vehicles Exiting, veh/h	117	250	126
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.3	5.0	4.8
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	183	208	102
Cap Entry Lane, veh/h	1016	1113	960
Entry HV Adj Factor	0.984	0.980	0.983
Flow Entry, veh/h	180	204	100
Cap Entry, veh/h	1000	1091	944
V/C Ratio	0.180	0.187	0.106
Control Delay, s/veh	5.3	5.0	4.8
LOS	A	A	A
95th %tile Queue, veh	1	1	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	51	82	33	10	120	34	46	280	14	41	288	88
Future Volume (veh/h)	51	82	33	10	120	34	46	280	14	41	288	88
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
Hourly flow rate (vph)	55	89	36	11	130	37	50	304	15	45	313	96
Approach Volume (veh/h)		180			178			369			454	
Crossing Volume (veh/h)		369			409			189			191	
High Capacity (veh/h)		1036			1004			1194			1193	
High v/c (veh/h)		0.17			0.18			0.31			0.38	
Low Capacity (veh/h)		846			817			988			987	
Low v/c (veh/h)		0.21			0.22			0.37			0.46	

Intersection Summary			
Maximum v/c High	0.38		
Maximum v/c Low	0.46		
Intersection Capacity Utilization	56.1%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	180	178	369	454
Demand Flow Rate, veh/h	184	182	385	473
Vehicles Circulating, veh/h	386	426	193	195
Vehicles Exiting, veh/h	282	152	377	413
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.5	7.8	8.9	10.7
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	184	182	385	473
Cap Entry Lane, veh/h	768	738	932	930
Entry HV Adj Factor	0.979	0.980	0.958	0.961
Flow Entry, veh/h	180	178	369	454
Cap Entry, veh/h	752	723	892	893
V/C Ratio	0.240	0.247	0.413	0.509
Control Delay, s/veh	7.5	7.8	8.9	10.7
LOS	A	A	A	B
95th %tile Queue, veh	1	1	2	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	156	154	171	312	311	213
Future Volume (veh/h)	156	154	171	312	311	213
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	170	167	186	339	338	232
Approach Volume (veh/h)	337			525	570	
Crossing Volume (veh/h)	338			170	186	
High Capacity (veh/h)	1062			1212	1197	
High v/c (veh/h)	0.32			0.43	0.48	
Low Capacity (veh/h)	869			1005	991	
Low v/c (veh/h)	0.39			0.52	0.58	

Intersection Summary			
Maximum v/c High	0.48		
Maximum v/c Low	0.58		
Intersection Capacity Utilization	83.3%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	337	525	570
Demand Flow Rate, veh/h	343	536	582
Vehicles Circulating, veh/h	345	173	190
Vehicles Exiting, veh/h	427	515	519
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.1	11.6	13.3
Approach LOS	B	B	B

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	343	536	582
Cap Entry Lane, veh/h	800	950	934
Entry HV Adj Factor	0.983	0.980	0.980
Flow Entry, veh/h	337	525	570
Cap Entry, veh/h	786	931	916
V/C Ratio	0.429	0.564	0.623
Control Delay, s/veh	10.1	11.6	13.3
LOS	B	B	B
95th %tile Queue, veh	2	4	4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	56	51	100	80	6
Future Volume (Veh/h)	10	56	51	100	80	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	61	55	109	87	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	164				192	110
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	164				192	110
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				89	99
cM capacity (veh/h)	1414				790	944

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	72	164	94
Volume Left	11	0	87
Volume Right	0	109	7
cSH	1414	1700	800
Volume to Capacity	0.01	0.10	0.12
Queue Length 95th (m)	0.2	0.0	3.0
Control Delay (s)	1.2	0.0	10.1
Lane LOS	A		B
Approach Delay (s)	1.2	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	51	127	5	10	146	261	5	25	10	266	15	50
Future Volume (veh/h)	51	127	5	10	146	261	5	25	10	266	15	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
Hourly flow rate (vph)	55	138	5	11	159	284	5	27	11	289	16	54
Approach Volume (veh/h)		198			454			43			359	
Crossing Volume (veh/h)		316			87			482			175	
High Capacity (veh/h)		1081			1294			947			1208	
High v/c (veh/h)		0.18			0.35			0.05			0.30	
Low Capacity (veh/h)		886			1079			766			1000	
Low v/c (veh/h)		0.22			0.42			0.06			0.36	

Intersection Summary			
Maximum v/c High	0.35		
Maximum v/c Low	0.42		
Intersection Capacity Utilization	67.7%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	8.3
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	198	454	43	359
Demand Flow Rate, veh/h	207	469	48	368
Vehicles Circulating, veh/h	325	91	496	184
Vehicles Exiting, veh/h	227	452	35	376
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.4	8.8	6.6	8.4
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	207	469	48	368
Cap Entry Lane, veh/h	816	1032	688	940
Entry HV Adj Factor	0.957	0.968	0.902	0.977
Flow Entry, veh/h	198	454	43	359
Cap Entry, veh/h	781	999	620	918
V/C Ratio	0.254	0.455	0.070	0.391
Control Delay, s/veh	7.4	8.8	6.6	8.4
LOS	A	A	A	A
95th %tile Queue, veh	1	2	0	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	6	354	45	81	385	389	30	20	48	325	31	2
Future Volume (veh/h)	6	354	45	81	385	389	30	20	48	325	31	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
Hourly flow rate (vph)	7	385	49	88	418	423	33	22	52	353	34	2
Approach Volume (veh/h)		441			929			107			389	
Crossing Volume (veh/h)		475			62			745			539	
High Capacity (veh/h)		952			1319			766			905	
High v/c (veh/h)		0.46			0.70			0.14			0.43	
Low Capacity (veh/h)		771			1102			607			729	
Low v/c (veh/h)		0.57			0.84			0.18			0.53	

Intersection Summary			
Maximum v/c High	0.70		
Maximum v/c Low	0.84		
Intersection Capacity Utilization	106.6%	ICU Level of Service	G

Intersection	
Intersection Delay, s/veh	23.6
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	441	929	107	389
Demand Flow Rate, veh/h	461	960	109	397
Vehicles Circulating, veh/h	485	63	771	563
Vehicles Exiting, veh/h	475	817	175	460
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	18.7	30.0	9.9	17.5
Approach LOS	C	D	A	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	461	960	109	397
Cap Entry Lane, veh/h	696	1061	523	644
Entry HV Adj Factor	0.956	0.968	0.978	0.981
Flow Entry, veh/h	441	929	107	389
Cap Entry, veh/h	665	1027	511	631
V/C Ratio	0.663	0.905	0.209	0.617
Control Delay, s/veh	18.7	30.0	9.9	17.5
LOS	C	D	A	C
95th %tile Queue, veh	5	14	1	4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	722	852	35	18	3
Future Volume (Veh/h)	5	722	852	35	18	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	785	926	38	20	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	964				1740	945
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	964				1740	945
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				79	99
cM capacity (veh/h)	714				95	318

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	790	964	23
Volume Left	5	0	20
Volume Right	0	38	3
cSH	714	1700	104
Volume to Capacity	0.01	0.57	0.22
Queue Length 95th (m)	0.2	0.0	6.0
Control Delay (s)	0.2	0.0	48.9
Lane LOS	A		E
Approach Delay (s)	0.2	0.0	48.9
Approach LOS			E

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Right Turn Channelized						
Traffic Volume (veh/h)	241	502	369	336	551	386
Future Volume (veh/h)	241	502	369	336	551	386
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	262	546	401	365	599	420
Approach Volume (veh/h)	808			766	1019	
Crossing Volume (veh/h)	401			599	262	
High Capacity (veh/h)	1010			862	1128	
High v/c (veh/h)	0.80			0.89	0.90	
Low Capacity (veh/h)	823			691	928	
Low v/c (veh/h)	0.98			1.11	1.10	

Intersection Summary			
Maximum v/c High	0.90		
Maximum v/c Low	1.11		
Intersection Capacity Utilization	73.7%	ICU Level of Service	D

Intersection						
Intersection Delay, s/veh	17.2					
Intersection LOS	C					

Approach		EB		WB		NB
Entry Lanes		2		2		2
Conflicting Circle Lanes		0		0		0
Adj Approach Flow, veh/h		808		766		1019
Demand Flow Rate, veh/h		832		792		1039
Vehicles Circulating, veh/h		409		611		275
Vehicles Exiting, veh/h		994		703		966
Follow-Up Headway, s		3.186		3.186		3.186
Ped Vol Crossing Leg, #/h		0		0		0
Ped Cap Adj		1.000		1.000		1.000
Approach Delay, s/veh		17.5		19.8		14.9
Approach LOS		C		C		B

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	L	TR	L	TR
Assumed Moves	LT	R	L	TR	L	TR
RT Channelized						
Lane Util	0.331	0.669	0.516	0.484	0.588	0.412
Critical Headway, s	5.193	5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	275	557	409	383	611	428
Cap Entry Lane, veh/h	751	751	613	613	858	858
Entry HV Adj Factor	0.952	0.980	0.980	0.952	0.980	0.981
Flow Entry, veh/h	262	546	401	365	599	420
Cap Entry, veh/h	715	736	601	584	841	842
V/C Ratio	0.366	0.742	0.667	0.624	0.712	0.499
Control Delay, s/veh	9.7	21.3	20.5	19.0	17.7	10.9
LOS	A	C	C	C	C	B
95th %tile Queue, veh	2	7	5	4	6	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	296	176	169	96	219	54	212	438	90	72	538	383
Future Volume (veh/h)	296	176	169	96	219	54	212	438	90	72	538	383
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
Hourly flow rate (vph)	322	191	184	104	238	59	230	476	98	78	585	416
Approach Volume (veh/h)		697			401			804			1079	
Crossing Volume (veh/h)		767			1028			591			572	
High Capacity (veh/h)		753			608			868			881	
High v/c (veh/h)		0.93			0.66			0.93			1.22	
Low Capacity (veh/h)		595			471			696			708	
Low v/c (veh/h)		1.17			0.85			1.15			1.52	

Intersection Summary			
Maximum v/c High	1.22		
Maximum v/c Low	1.52		
Intersection Capacity Utilization	99.4%	ICU Level of Service	F

Intersection	
Intersection Delay, s/veh	31.2
Intersection LOS	D

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	1	1
Adj Approach Flow, veh/h	697	401	804	1079
Demand Flow Rate, veh/h	717	416	835	1118
Vehicles Circulating, veh/h	800	1063	609	591
Vehicles Exiting, veh/h	909	381	908	888
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	28.6	23.6	21.7	42.7
Approach LOS	D	C	C	E

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	LT	R	LT	TR	LT	TR
Assumed Moves	LT	R	LT	R	LT	TR	LT	TR
RT Channelized								
Lane Util	0.738	0.262	0.856	0.144	0.469	0.531	0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	5.193	5.193	5.193	5.193
Entry Flow, veh/h	529	188	356	60	392	443	525	593
Cap Entry Lane, veh/h	620	645	509	537	615	615	626	626
Entry HV Adj Factor	0.971	0.979	0.961	0.983	0.964	0.962	0.966	0.964
Flow Entry, veh/h	513	184	342	59	378	426	507	572
Cap Entry, veh/h	602	632	489	528	593	591	604	603
V/C Ratio	0.853	0.291	0.699	0.112	0.638	0.721	0.839	0.948
Control Delay, s/veh	35.4	9.5	26.2	8.2	19.3	23.8	33.6	50.7
LOS	E	A	D	A	C	C	D	F
95th %tile Queue, veh	9	1	5	0	5	6	9	13

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	313	107	101	427	495	308
Future Volume (veh/h)	313	107	101	427	495	308
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	340	116	110	464	538	335
Approach Volume (veh/h)	456			574	873	
Crossing Volume (veh/h)	538			340	110	
High Capacity (veh/h)	905			1060	1271	
High v/c (veh/h)	0.50			0.54	0.69	
Low Capacity (veh/h)	730			868	1058	
Low v/c (veh/h)	0.62			0.66	0.83	

Intersection Summary			
Maximum v/c High	0.69		
Maximum v/c Low	0.83		
Intersection Capacity Utilization	65.6%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	2	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	456	574	873
Demand Flow Rate, veh/h	465	599	907
Vehicles Circulating, veh/h	565	347	112
Vehicles Exiting, veh/h	454	683	834
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.3	8.2	8.5
Approach LOS	B	A	A

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	L	TR	LT	TR	LT	TR
Assumed Moves	L	TR	LT	TR	LT	TR
RT Channelized						
Lane Util	0.746	0.254	0.471	0.529	0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	347	118	282	317	426	481
Cap Entry Lane, veh/h	740	761	871	886	1039	1045
Entry HV Adj Factor	0.980	0.983	0.956	0.959	0.963	0.962
Flow Entry, veh/h	340	116	270	304	410	463
Cap Entry, veh/h	725	748	833	850	1001	1005
V/C Ratio	0.469	0.155	0.324	0.358	0.410	0.460
Control Delay, s/veh	11.6	6.5	8.0	8.4	8.1	8.9
LOS	B	A	A	A	A	A
95th %tile Queue, veh	3	1	1	2	2	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	6	354	45	81	385	389	30	20	48	325	31	2
Future Volume (veh/h)	6	354	45	81	385	389	30	20	48	325	31	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
Hourly flow rate (vph)	7	385	49	88	418	423	33	22	52	353	34	2
Approach Volume (veh/h)		441			929			107			389	
Crossing Volume (veh/h)		475			62			745			539	
High Capacity (veh/h)		952			1319			766			905	
High v/c (veh/h)		0.46			0.70			0.14			0.43	
Low Capacity (veh/h)		771			1102			607			729	
Low v/c (veh/h)		0.57			0.84			0.18			0.53	

Intersection Summary			
Maximum v/c High	0.70		
Maximum v/c Low	0.84		
Intersection Capacity Utilization	82.9%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	13.0
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	2	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	441	929	107	389
Demand Flow Rate, veh/h	461	960	109	397
Vehicles Circulating, veh/h	485	63	771	563
Vehicles Exiting, veh/h	475	817	175	460
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	18.7	8.7	9.9	17.5
Approach LOS	C	A	A	C

Lane	Left	Left	Right	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT	R	LTR	LTR
RT Channelized					
Lane Util	1.000	0.551	0.449	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	461	529	431	109	397
Cap Entry Lane, veh/h	696	1061	1061	523	644
Entry HV Adj Factor	0.956	0.957	0.981	0.978	0.981
Flow Entry, veh/h	441	506	423	107	389
Cap Entry, veh/h	665	1015	1041	511	631
V/C Ratio	0.663	0.499	0.406	0.209	0.617
Control Delay, s/veh	18.7	9.5	7.8	9.9	17.5
LOS	C	A	A	A	C
95th %tile Queue, veh	5	3	2	1	4

Lane Group	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	142	22	108	397	741
v/c Ratio	0.50	0.06	0.26	0.36	0.72
Control Delay	24.7	1.9	9.4	8.4	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	1.9	9.4	8.4	15.9
Queue Length 50th (m)	12.1	0.0	2.7	18.3	45.5
Queue Length 95th (m)	25.5	1.5	12.1	43.0	#129.0
Internal Link Dist (m)	223.6		126.7	770.1	323.4
Turn Bay Length (m)		10.0			
Base Capacity (vph)	484	635	668	1069	1014
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.29	0.03	0.16	0.37	0.73

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	20	20	6	26	67	25	334	6	89	406	187
Future Volume (vph)	110	20	20	6	26	67	25	334	6	89	406	187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.91			1.00			0.96	
Flt Protected		0.96	1.00		1.00			1.00			0.99	
Satd. Flow (prot)		1807	1601		1706			1824			1771	
Flt Permitted		0.69	1.00		0.97			0.93			0.90	
Satd. Flow (perm)		1291	1601		1658			1709			1595	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	22	22	7	28	73	27	363	7	97	441	203
RTOR Reduction (vph)	0	0	18	0	60	0	0	1	0	0	19	0
Lane Group Flow (vph)	0	142	4	0	48	0	0	396	0	0	722	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.1	9.1		9.1			30.0			30.0	
Effective Green, g (s)		9.1	9.1		9.1			30.0			30.0	
Actuated g/C Ratio		0.18	0.18		0.18			0.59			0.59	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		229	285		295			1003			936	
v/s Ratio Prot												
v/s Ratio Perm		c0.11	0.00		0.03			0.23			c0.45	
v/c Ratio		0.62	0.01		0.16			0.39			0.77	
Uniform Delay, d1		19.4	17.3		17.8			5.7			8.0	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		5.1	0.0		0.3			0.3			4.0	
Delay (s)		24.5	17.3		18.0			5.9			12.0	
Level of Service		C	B		B			A			B	
Approach Delay (s)		23.6			18.0			5.9			12.0	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	51.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	262	546	401	365	599	420
v/c Ratio	0.45	0.62	0.77	0.38	0.88	0.49
Control Delay	37.6	7.0	47.1	22.9	50.2	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.6	7.0	47.1	22.9	50.2	4.8
Queue Length 50th (m)	50.6	2.0	36.0	58.2	126.6	2.6
Queue Length 95th (m)	79.5	32.6	58.2	96.2	167.1	21.1
Internal Link Dist (m)	190.0			351.8	113.5	
Turn Bay Length (m)		40.0	50.0			
Base Capacity (vph)	592	879	560	954	760	911
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.62	0.72	0.38	0.79	0.46

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	241	502	369	336	551	386
Future Volume (vph)	241	502	369	336	551	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1830	1601	3471	1830	1789	1601
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1830	1601	3471	1830	1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	262	546	401	365	599	420
RTOR Reduction (vph)	0	362	0	0	0	250
Lane Group Flow (vph)	262	184	401	365	599	170
Heavy Vehicles (%)	5%	2%	2%	5%	2%	2%
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	38.6	38.6	18.0	62.6	45.4	45.4
Effective Green, g (s)	38.6	38.6	18.0	62.6	45.4	45.4
Actuated g/C Ratio	0.32	0.32	0.15	0.52	0.38	0.38
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	588	514	520	954	676	605
v/s Ratio Prot	c0.14		c0.12	0.20	c0.33	
v/s Ratio Perm		0.11				0.11
v/c Ratio	0.45	0.36	0.77	0.38	0.89	0.28
Uniform Delay, d1	32.2	31.2	49.0	17.2	34.9	25.9
Progression Factor	1.00	1.00	0.76	1.17	1.00	1.00
Incremental Delay, d2	2.4	1.9	6.6	1.1	13.3	0.3
Delay (s)	34.7	33.1	43.9	21.1	48.2	26.2
Level of Service	C	C	D	C	D	C
Approach Delay (s)	33.6			33.1	39.1	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	322	191	184	104	238	59	230	476	98	78	585	416
v/c Ratio	0.91	0.29	0.27	0.26	0.37	0.09	0.79	0.32	0.13	0.53	0.51	0.26
Control Delay	56.1	20.6	2.7	27.2	29.0	0.3	66.8	18.3	3.1	66.0	36.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.1	20.6	2.7	27.2	29.0	0.3	66.8	18.3	3.1	66.0	36.9	0.4
Queue Length 50th (m)	71.1	19.1	0.0	16.8	40.0	0.0	47.0	40.2	4.3	17.8	60.4	0.0
Queue Length 95th (m)	#112.2	31.7	3.6	27.8	55.4	0.0	72.7	52.1	7.2	33.5	87.2	0.0
Internal Link Dist (m)		351.8			274.1			180.0			292.9	
Turn Bay Length (m)	75.0			75.0		60.0	90.0		75.0	90.0		75.0
Base Capacity (vph)	422	777	786	472	777	758	343	1509	750	166	1151	1601
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.25	0.23	0.22	0.31	0.08	0.67	0.32	0.13	0.47	0.51	0.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	296	176	169	96	219	54	212	438	90	72	538	383
Future Volume (vph)	296	176	169	96	219	54	212	438	90	72	538	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1830	1601	1789	1830	1601	1789	3476	1601	1789	3476	1601
Flt Permitted	0.53	1.00	1.00	0.59	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	994	1830	1601	1111	1830	1601	1789	3476	1601	1789	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	322	191	184	104	238	59	230	476	98	78	585	416
RTOR Reduction (vph)	0	0	119	0	0	38	0	0	56	0	0	0
Lane Group Flow (vph)	322	191	65	104	238	21	230	476	42	78	585	416
Heavy Vehicles (%)	2%	5%	2%	2%	5%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			Free
Actuated Green, G (s)	42.6	42.6	42.6	42.6	42.6	42.6	19.7	50.9	50.9	8.5	39.7	120.0
Effective Green, g (s)	42.6	42.6	42.6	42.6	42.6	42.6	19.7	50.9	50.9	8.5	39.7	120.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.36	0.16	0.42	0.42	0.07	0.33	1.00
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	352	649	568	394	649	568	293	1474	679	126	1149	1601
v/s Ratio Prot		0.10			0.13		c0.13	0.14		0.04	c0.17	
v/s Ratio Perm	c0.32		0.04	0.09		0.01			0.03			0.26
v/c Ratio	0.91	0.29	0.12	0.26	0.37	0.04	0.78	0.32	0.06	0.62	0.51	0.26
Uniform Delay, d1	37.0	27.9	26.0	27.5	28.7	25.3	48.1	23.1	20.4	54.2	32.3	0.0
Progression Factor	0.76	0.74	0.61	1.00	1.00	1.00	1.02	0.70	0.49	1.00	1.00	1.00
Incremental Delay, d2	25.7	0.2	0.1	0.4	0.4	0.0	12.4	0.6	0.2	8.7	1.6	0.4
Delay (s)	53.6	20.9	15.9	27.9	29.1	25.3	61.3	16.6	10.1	62.9	33.9	0.4
Level of Service	D	C	B	C	C	C	E	B	B	E	C	A
Approach Delay (s)		34.7			28.2			28.6			23.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	340	116	110	464	538	335
v/c Ratio	0.80	0.25	0.59	0.20	0.31	0.34
Control Delay	56.9	7.0	63.0	8.9	8.2	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	7.0	63.0	8.9	8.2	2.0
Queue Length 50th (m)	75.7	0.0	25.1	20.5	9.8	0.0
Queue Length 95th (m)	99.1	13.0	41.8	34.1	42.5	6.1
Internal Link Dist (m)	129.4			191.2	180.0	
Turn Bay Length (m)		60.0	75.0			75.0
Base Capacity (vph)	655	660	283	2302	1761	976
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.18	0.39	0.20	0.31	0.34

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	313	107	101	427	495	308
Future Volume (vph)	313	107	101	427	495	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1789	1601	1789	3476	3476	1601
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1789	1601	1789	3476	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	340	116	110	464	538	335
RTOR Reduction (vph)	0	88	0	0	0	165
Lane Group Flow (vph)	340	28	110	464	538	170
Heavy Vehicles (%)	2%	2%	2%	5%	5%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	28.5	28.5	12.7	79.5	60.8	60.8
Effective Green, g (s)	28.5	28.5	12.7	79.5	60.8	60.8
Actuated g/C Ratio	0.24	0.24	0.11	0.66	0.51	0.51
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	424	380	189	2302	1761	811
v/s Ratio Prot	c0.19		c0.06	0.13	c0.15	
v/s Ratio Perm		0.02				0.11
v/c Ratio	0.80	0.07	0.58	0.20	0.31	0.21
Uniform Delay, d1	43.1	35.5	51.1	7.9	17.3	16.3
Progression Factor	1.00	1.00	1.00	1.00	0.41	0.46
Incremental Delay, d2	10.5	0.1	4.5	0.2	0.4	0.5
Delay (s)	53.5	35.6	55.6	8.1	7.5	8.0
Level of Service	D	D	E	A	A	A
Approach Delay (s)	49.0			17.2	7.7	
Approach LOS	D			B	A	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	142	22	108	27	370	97	644
v/c Ratio	0.45	0.05	0.24	0.07	0.34	0.16	0.60
Control Delay	21.1	1.8	8.6	7.9	8.7	8.2	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	1.8	8.6	7.9	8.7	8.2	11.5
Queue Length 50th (m)	9.1	0.0	2.0	1.0	15.9	3.7	30.9
Queue Length 95th (m)	25.4	1.5	11.9	4.9	40.2	12.6	80.5
Internal Link Dist (m)	223.6		126.7		770.1		323.4
Turn Bay Length (m)		10.0		30.0		30.0	
Base Capacity (vph)	557	722	757	432	1298	724	1267
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.03	0.14	0.06	0.29	0.13	0.51

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	20	20	6	26	67	25	334	6	89	406	187
Future Volume (vph)	110	20	20	6	26	67	25	334	6	89	406	187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	1.00		1.00	0.95	
Flt Protected		0.96	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1807	1601		1706		1789	1825		1789	1759	
Flt Permitted		0.69	1.00		0.97		0.32	1.00		0.54	1.00	
Satd. Flow (perm)		1291	1601		1658		608	1825		1019	1759	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	22	22	7	28	73	27	363	7	97	441	203
RTOR Reduction (vph)	0	0	18	0	59	0	0	1	0	0	25	0
Lane Group Flow (vph)	0	142	4	0	49	0	27	369	0	97	619	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.0	9.0		9.0		24.6	24.6		24.6	24.6	
Effective Green, g (s)		9.0	9.0		9.0		24.6	24.6		24.6	24.6	
Actuated g/C Ratio		0.20	0.20		0.20		0.54	0.54		0.54	0.54	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		254	315		327		328	984		549	948	
v/s Ratio Prot								0.20			c0.35	
v/s Ratio Perm		c0.11	0.00		0.03		0.04			0.10		
v/c Ratio		0.56	0.01		0.15		0.08	0.38		0.18	0.65	
Uniform Delay, d1		16.5	14.7		15.1		5.1	6.1		5.3	7.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.7	0.0		0.2		0.1	0.2		0.2	1.6	
Delay (s)		19.2	14.7		15.4		5.2	6.3		5.5	9.1	
Level of Service		B	B		B		A	A		A	A	
Approach Delay (s)		18.6			15.4			6.2			8.6	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	45.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX D: Traffic Signal Warrant Analysis Spreadsheets

Appendix

D

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	**Richmond Ave**	**Direction (EW or NS)**	**EW**	**Road Authority:**	**Manitoba Infrastructure**
Side Street (name)	**Brookwood Dr**	**Direction (EW or NS)**	**NS**	**City:**	**Steinbach**
Quadrant / Int #	**:hmond Ave & Brookwood**	**Comments**	2052 D	**Analysis Date:**	**2021 Sep 22, Wed**
	CHECK SHEET			**Count Date:**	
				Date Entry Format:	(yyyy-mm-dd)

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Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Richmond Ave	WB	0	0	0	1	0	0	0	1400	1			
Richmond Ave	EB	0	0	0	1	0	0	0	2000	1			
Brookwood Dr	NB	0	0	0	1	0	0	0	2000	1			
Brookwood Dr	SB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Brookwood Dr NB right turns significantly impeded by through movements? (y/n)	n
Are the Brookwood Dr SB right turns significantly impeded by through movements? (y/n)	n
Are the Richmond Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Richmond Ave EB right turns significantly impeded by through movements? (y/n)	n

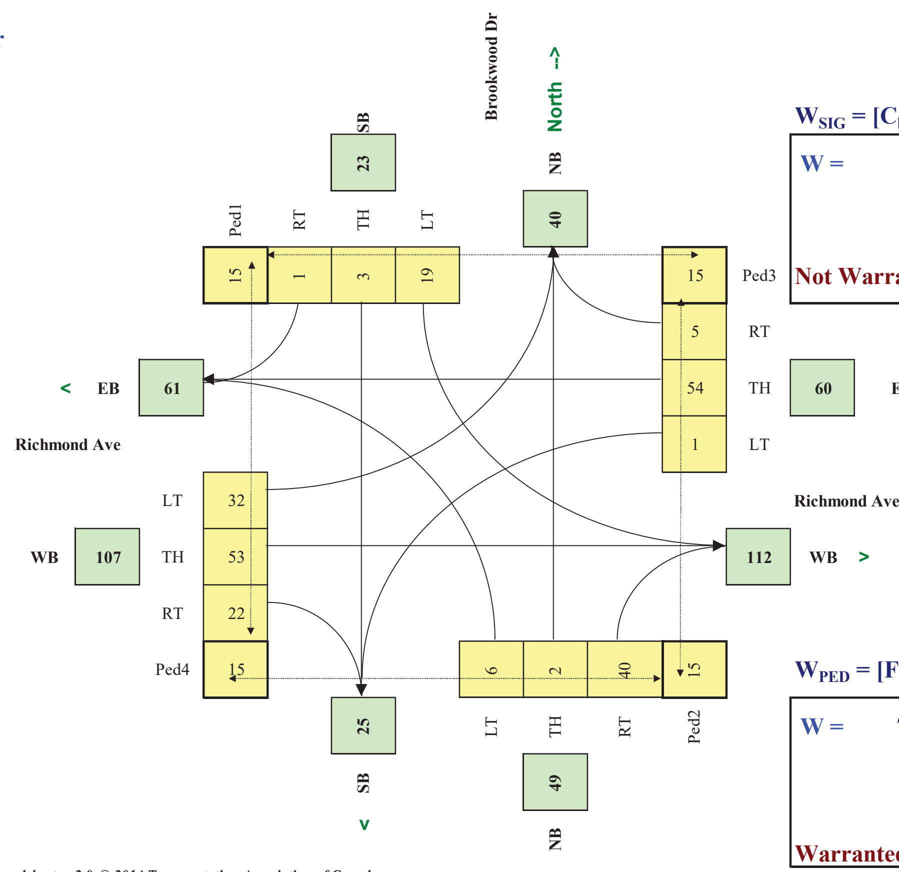
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Richmond Ave	EW	50	0.0%	n	0.0
Brookwood Dr	NS	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	38	13	241	115	17	4	4	323	31	193	316	130	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**38**	**13**	**241**	**115**	**17**	**4**	**4**	**323**	**31**	**193**	**316**	**130**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**6**	**2**	**40**	**19**	**3**	**1**	**1**	**54**	**5**	**32**	**53**	**22**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$

W =	11	5	6
		Veh	*Ped*

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 7

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	34th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Aberdeen Ave	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	34th St & Aberdeen Ave	Comments	2022 O	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

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Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
34th St	NB	0	0	0	1	0	0	0	2000	1			
34th St	SB	0	0	0	1	0	0	0	2000	1			
Aberdeen Ave	WB	0	0	0	1	0	0	0	2000	1			
Aberdeen Ave	EB	0	1	0	0	0	1	0	2000	1			

Are the Aberdeen Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Aberdeen Ave EB right turns significantly impeded by through movements? (y/n)	n
Are the 34th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 34th St SB right turns significantly impeded by through movements? (y/n)	n

Saturation Flow Rates (if not default) (vphpl)		Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

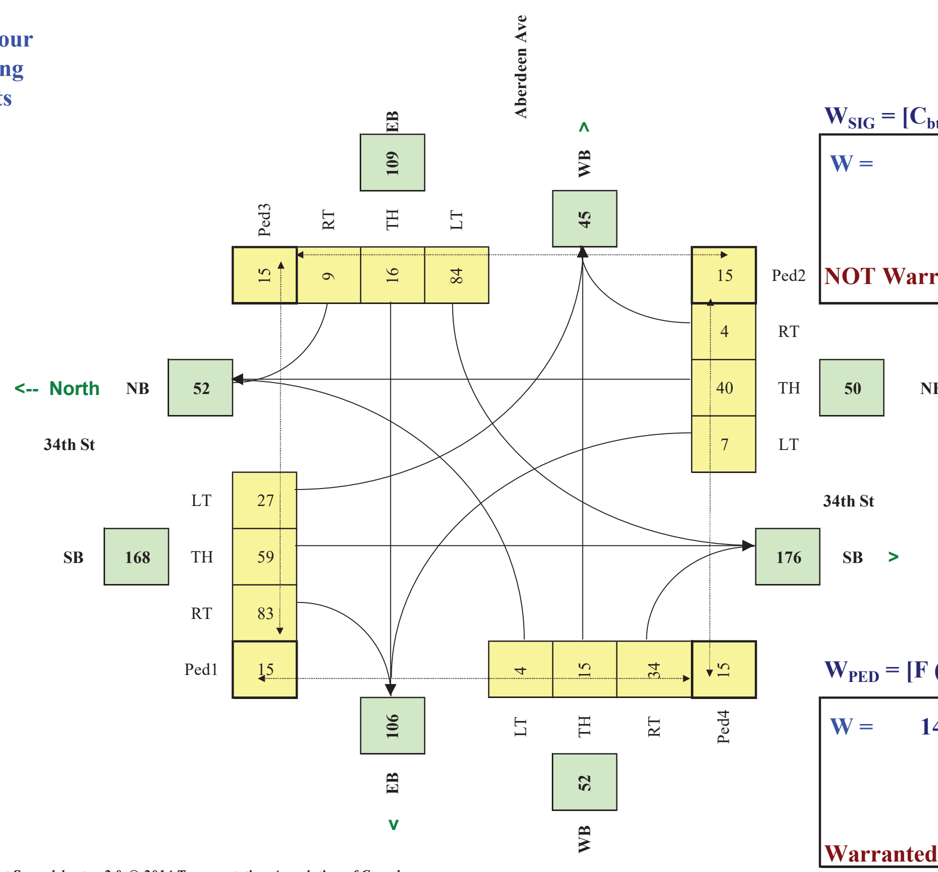
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	52,421
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
34th St	NS	50	0.0%	n	0.0
Aberdeen Ave	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	42	239	21	159	354	497	503	98	54	21	92	201	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**42**	**239**	**21**	**159**	**354**	**497**	**503**	**98**	**54**	**21**	**92**	**201**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**7**	**40**	**4**	**27**	**59**	**83**	**84**	**16**	**9**	**4**	**15**	**34**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F (X_{v-p}) L) / K_2] \times C_i$

W =	23	16	7
		Veh	*Ped*

NOT Warranted

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 14

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	34th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Aberdeen Ave	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	34th St & Aberdeen Ave	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
34th St	NB	0	0	0	1	0	0	0	2000	1			
34th St	SB	0	0	0	1	0	0	0	2000	1			
Aberdeen Ave	WB	0	0	0	1	0	0	0	2000	1			
Aberdeen Ave	EB	0	1	0	0	0	1	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Aberdeen Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Aberdeen Ave EB right turns significantly impeded by through movements? (y/n)	n
Are the 34th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 34th St SB right turns significantly impeded by through movements? (y/n)	n

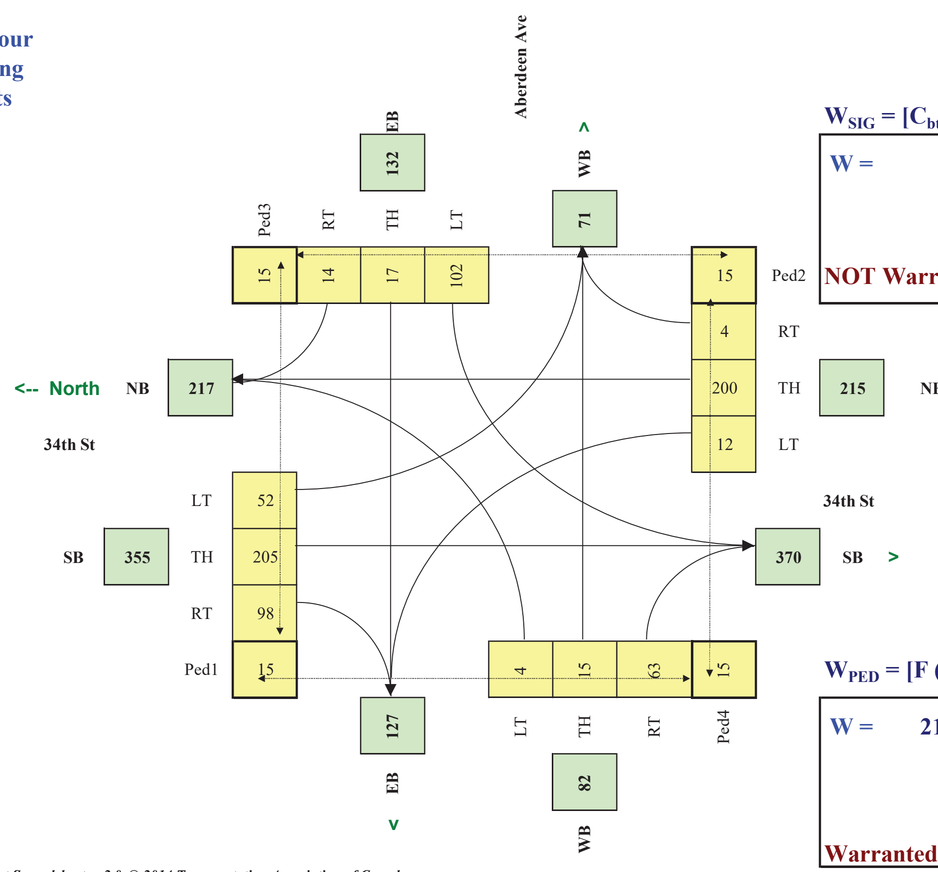
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
34th St	NS	50	0.0%	n	0.0
Aberdeen Ave	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	71	1198	21	312	1230	587	610	101	82	21	92	377	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	71	1,198	21	312	1,230	587	610	101	82	21	92	377	90	90	90	90	
Average (6-hour peak)	12	200	4	52	205	98	102	17	14	4	15	63	15	15	15	15	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$

W =	80	60	20
		Veh	*Ped*

NOT Warranted

RESET SHEET

$W_{PED} = [F\,((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 21

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	34th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Marylicia	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	34th St & Marylicia	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
34th St	NB	0	0	0	1	0	0	0	2000	1			
34th St	SB	0	0	0	1	0	0	0	2000	1			
Marylicia	WB	0	0	0	1	0	0	0	2000	1			
Marylicia	EB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Marylicia WB right turns significantly impeded by through movements? (y/n)	n
Are the Marylicia EB right turns significantly impeded by through movements? (y/n)	n
Are the 34th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 34th St SB right turns significantly impeded by through movements? (y/n)	n

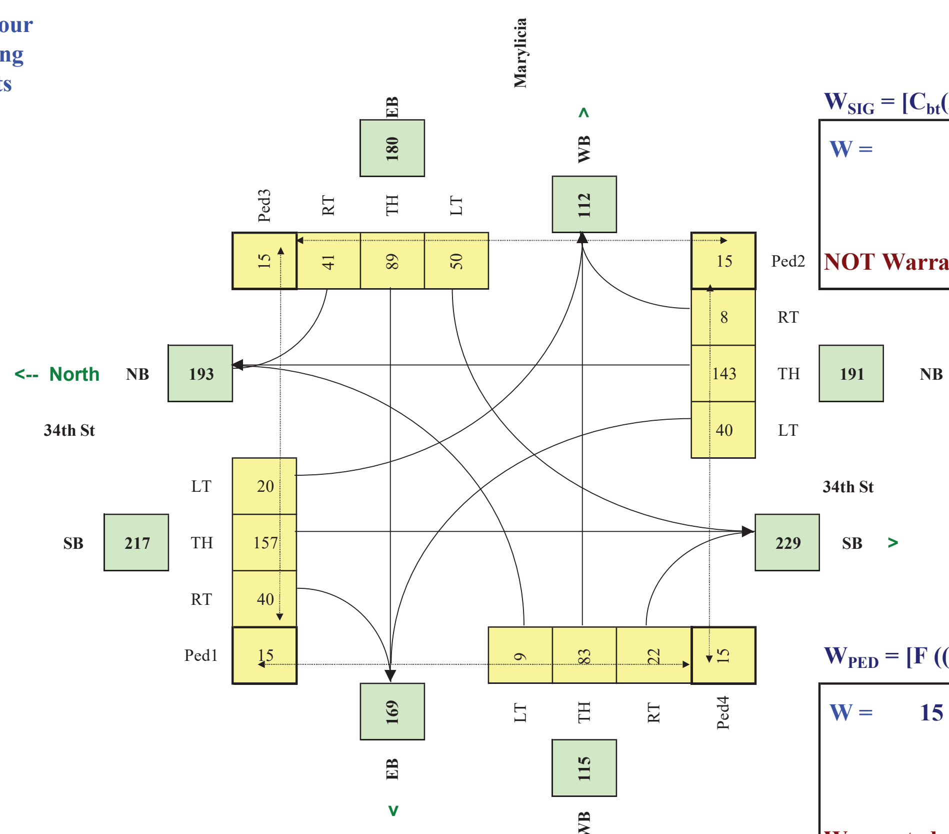
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
34th St	NS	50	0.0%	n	0.0
Marylicia	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	237	857	50	122	939	239	298	536	247	54	499	134	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**237**	**857**	**50**	**122**	**939**	**239**	**298**	**536**	**247**	**54**	**499**	**134**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**40**	**143**	**8**	**20**	**157**	**40**	**50**	**89**	**41**	**9**	**83**	**22**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$

W =	84	70	14
		Veh	*Ped*

NOT Warranted

RESET SHEET

$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 15

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Patricia Ave	Direction (EW or NS)	EW	Road Authority:	Manitoba Infrastructure
Side Street (name)	34th St	Direction (EW or NS)	NS	City:	Steinbach
Quadrant / Int #	34th St & Patricia Ave	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Patricia Ave	WB	0	0	0	1	0	0	0	2000	1			
Patricia Ave	EB	0	0	0	1	0	0	0	2000	1			
34th St	NB	0	0	0	1	0	0	0	2000	1			
34th St	SB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the 34th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 34th St SB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave EB right turns significantly impeded by through movements? (y/n)	n

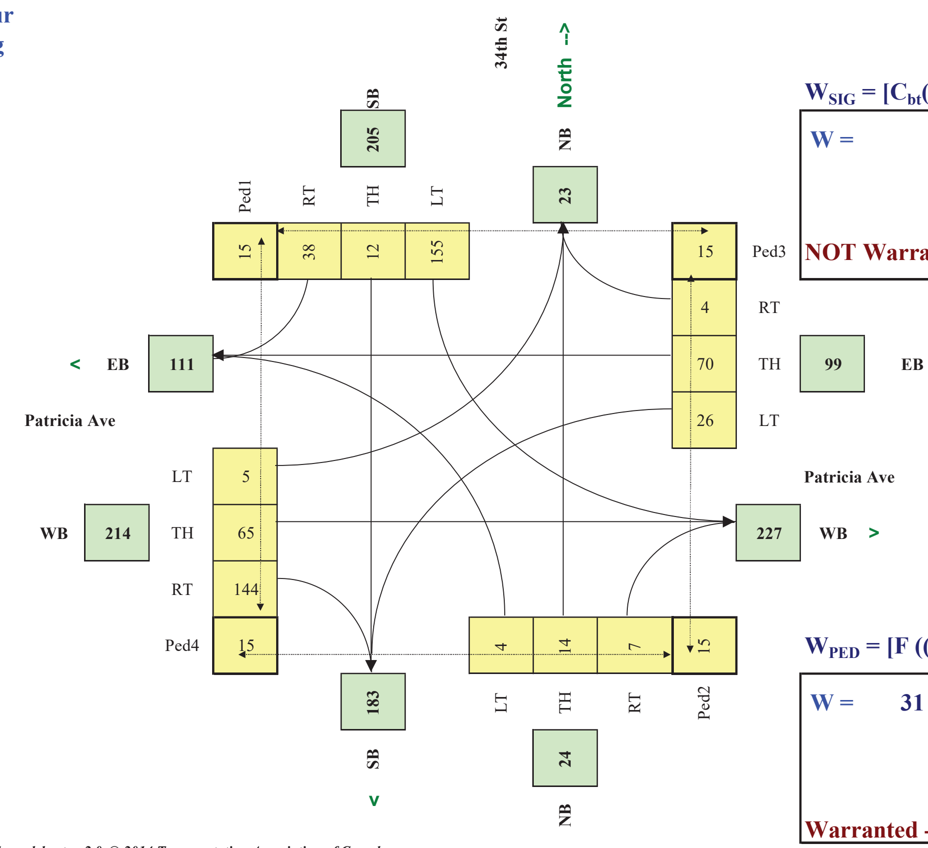
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Patricia Ave	EW	90	0.0%	n	0.0
34th St	NS	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	21	83	42	930	73	226	158	417	21	31	388	865	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	21	83	42	930	73	226	158	417	21	31	388	865	90	90	90	90	
Average (6-hour peak)	4	14	7	155	12	38	26	70	4	5	65	144	15	15	15	15	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F (X_{v-p}) L) / K_2] \times C_i$

W =	42	30	12
		Veh	*Ped*

NOT Warranted

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 31

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Lakeview	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Marylicia	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	Lakeview & Marylicia	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Lakeview	NB	0	0	0	1	0	0	0	2000	1			
Lakeview	SB	0	0	0	1	0	0	0	2000	1			
Marylicia	WB	0	0	0	1	0	0	0	2000	1			
Marylicia	EB	0	0	0	0	0	0	0	2000	0			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Marylicia WB right turns significantly impeded by through movements? (y/n)	n
Are the Marylicia EB right turns significantly impeded by through movements? (y/n)	n
Are the Lakeview NB right turns significantly impeded by through movements? (y/n)	n
Are the Lakeview SB right turns significantly impeded by through movements? (y/n)	n

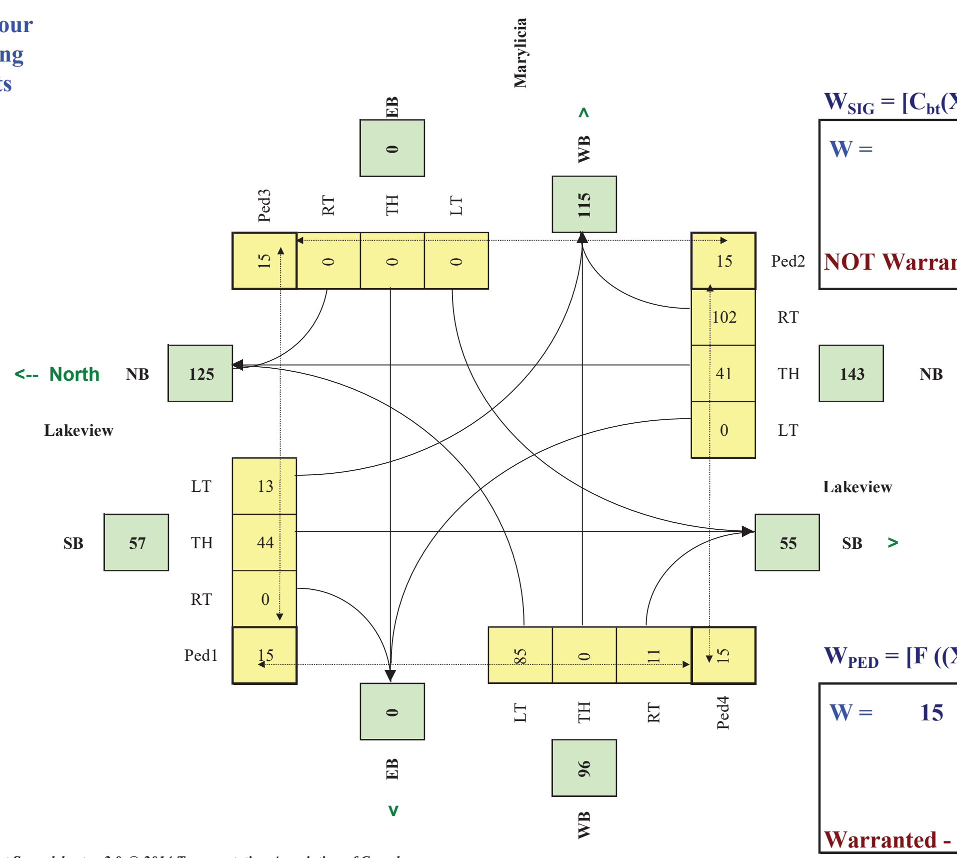
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Lakeview	NS	50	0.0%	n	0.0
Marylicia	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	0	243	614	78	264	0	0	0	0	509	0	67	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**0**	**243**	**614**	**78**	**264**	**0**	**0**	**0**	**0**	**509**	**0**	**67**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**0**	**41**	**102**	**13**	**44**	**0**	**0**	**0**	**0**	**85**	**0**	**11**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$$

W =	13	7	6
		Veh	*Ped*

NOT Warranted

RESET SHEET

$$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$$

W = 15

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Patricia Ave	Direction (EW or NS)	EW	Road Authority:	Manitoba Infrastructure
Side Street (name)	Lakeview	Direction (EW or NS)	NS	City:	Steinbach
Quadrant / Int #	Lakeview & Patricia Ave	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Patricia Ave	WB	0	0	0	1	0	0	0	2000	1			
Patricia Ave	EB	0	0	0	1	0	0	0	2000	1			
Lakeview	NB	0	0	0	1	0	0	0	2000	1			
Lakeview	SB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Lakeview NB right turns significantly impeded by through movements? (y/n)	n
Are the Lakeview SB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave EB right turns significantly impeded by through movements? (y/n)	n

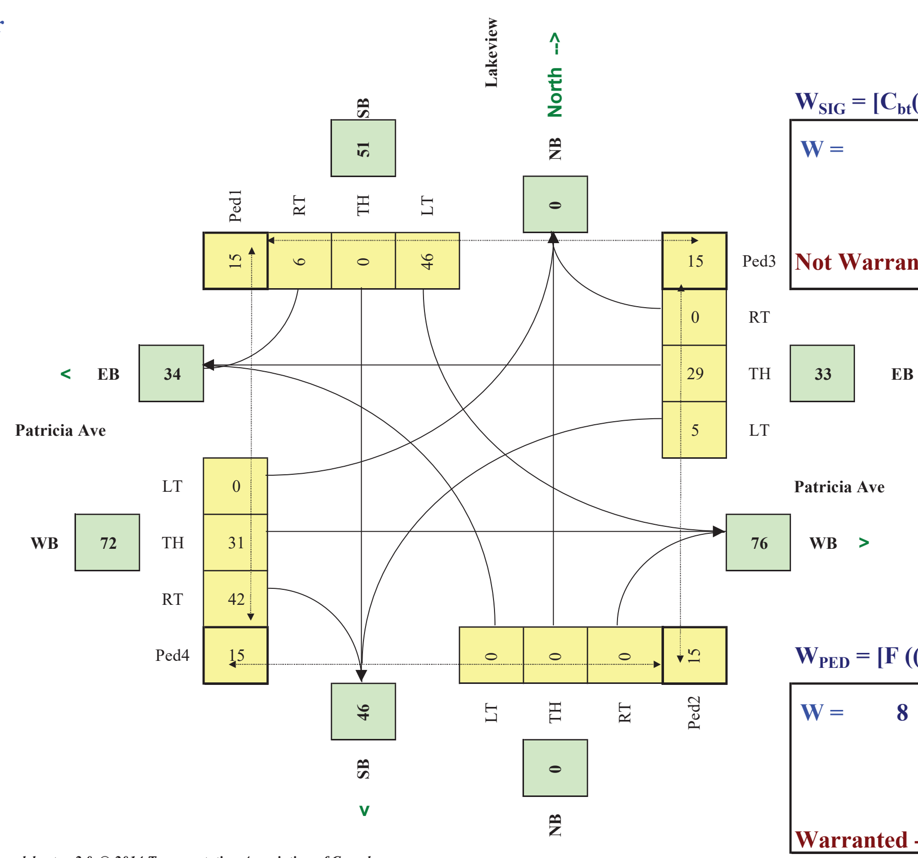
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Patricia Ave	EW	90	0.0%	n	0.0
Lakeview	NS	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	0	0	0	274	0	33	27	172	0	0	183	251	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**0**	**0**	**0**	**274**	**0**	**33**	**27**	**172**	**0**	**0**	**183**	**251**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**0**	**0**	**0**	**46**	**0**	**6**	**5**	**29**	**0**	**0**	**31**	**42**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\,(X_{v-p})\,L) / K_2] \times C_i$

W =	6	2	4
		Veh	*Ped*

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F\,((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 8

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	26th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Durum Dr	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	26th St & Durum Dr	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
for Warrant Calculation Results, please hit 'Page Down'				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
26th St	NB	0	0	0	1	0	0	0	2000	1			
26th St	SB	0	0	0	1	0	0	0	650	1			
Durum Dr	WB	0	0	0	1	0	0	0	2000	1			
Durum Dr	EB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Durum Dr WB right turns significantly impeded by through movements? (y/n)	n
Are the Durum Dr EB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St SB right turns significantly impeded by through movements? (y/n)	n

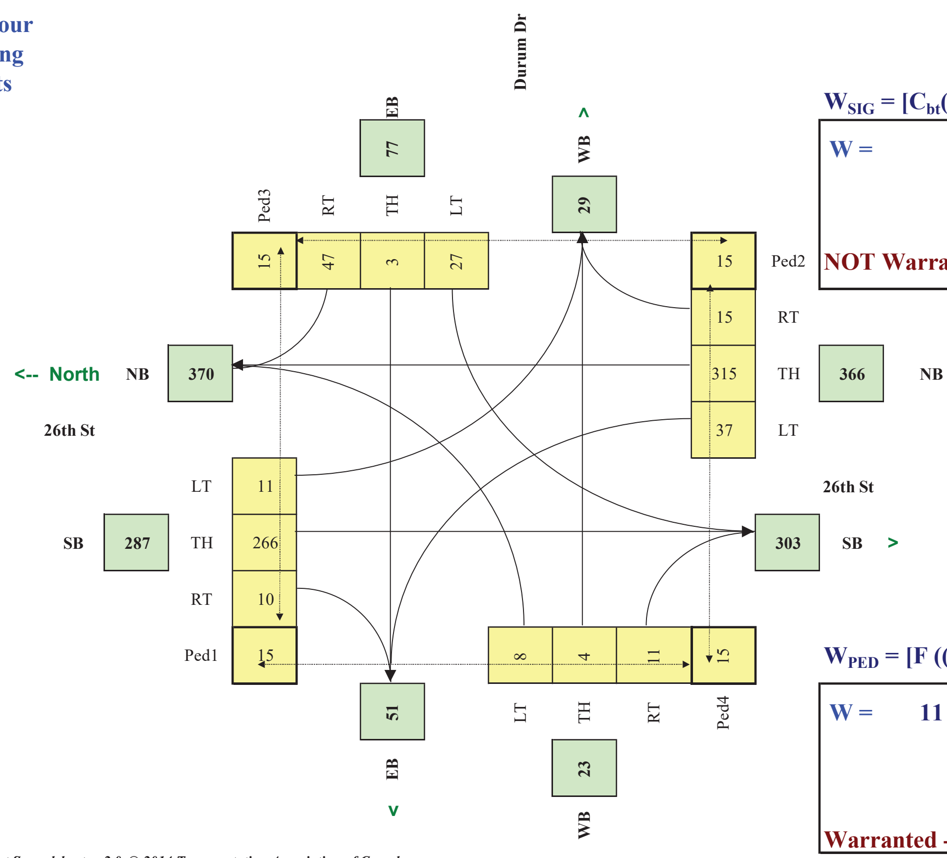
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
26th St	NS	50	0.0%	n	0.0
Durum Dr	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	221	1887	88	66	1594	62	159	20	283	49	22	66	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**221**	**1,887**	**88**	**66**	**1,594**	**62**	**159**	**20**	**283**	**49**	**22**	**66**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**37**	**315**	**15**	**11**	**266**	**10**	**27**	**3**	**47**	**8**	**4**	**11**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$

W =	51	30	21
		Veh	*Ped*

NOT Warranted

RESET SHEET

$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 11

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	26th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Maryland Ave	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	Maryland Ave & 26th St	Comments	2022 O	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
26th St	NB	0	0	0	1	0	0	0	2000	1			
26th St	SB	0	0	0	1	0	0	0	800	1			
Maryland Ave	WB	0	0	0	1	0	0	0	2000	1			
Maryland Ave	EB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Maryland Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Maryland Ave EB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St SB right turns significantly impeded by through movements? (y/n)	n

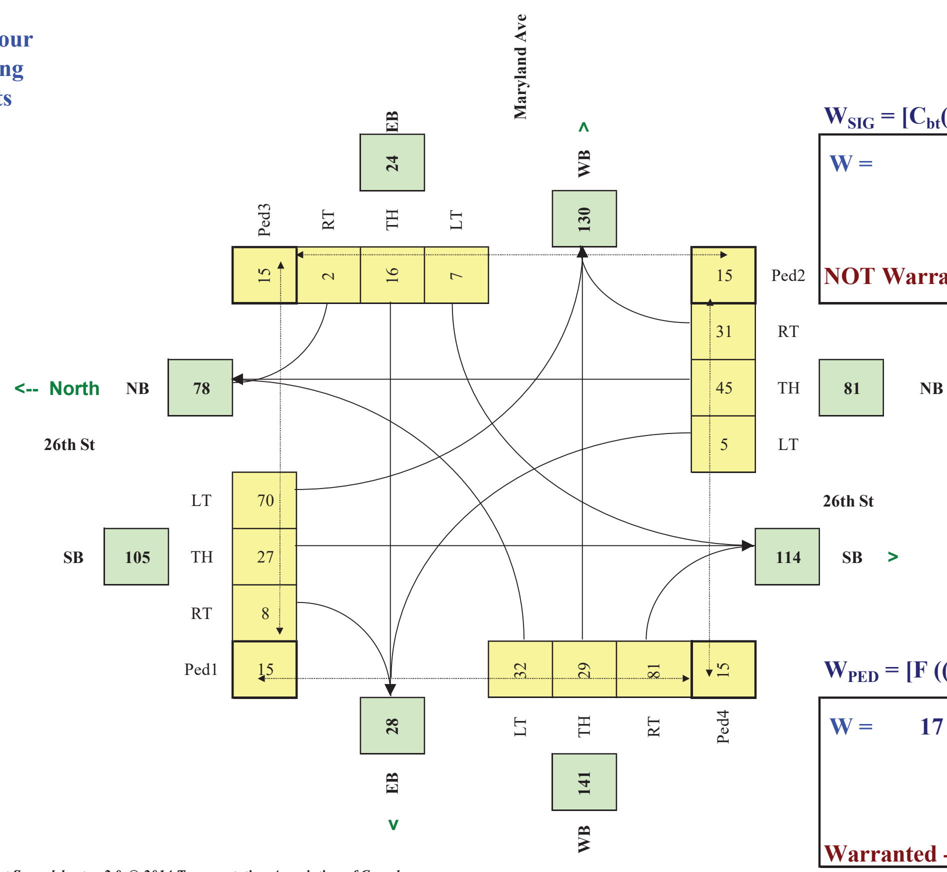
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	52,421
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
26th St	NS	50	0.0%	n	0.0
Maryland Ave	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	29	267	188	422	161	46	40	95	9	192	172	484	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**29**	**267**	**188**	**422**	**161**	**46**	**40**	**95**	**9**	**192**	**172**	**484**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**5**	**45**	**31**	**70**	**27**	**8**	**7**	**16**	**2**	**32**	**29**	**81**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$

W =	19	13	6
		Veh	*Ped*

NOT Warranted

RESET SHEET

$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 17

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	26th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Maryland Ave	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	Maryland Ave & 26th St	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
26th St	NB	0	0	0	1	0	0	0	2000	1			
26th St	SB	0	0	0	1	0	0	0	800	1			
Maryland Ave	WB	0	0	0	1	0	0	0	2000	1			
Maryland Ave	EB	0	0	0	1	0	0	0	2000	1			

Are the Maryland Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Maryland Ave EB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St SB right turns significantly impeded by through movements? (y/n)	n

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

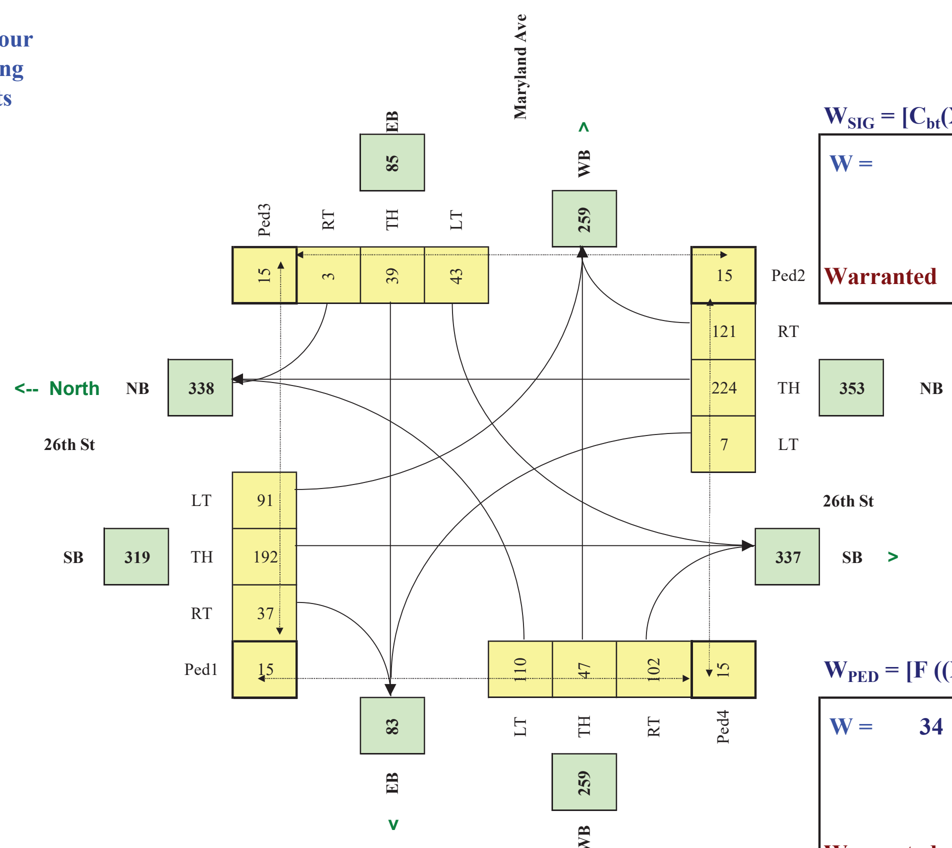
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
26th St	NS	50	0.0%	n	0.0
Maryland Ave	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	44	1346	727	544	1151	219	256	234	20	661	283	612	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	44	1,346	727	544	1,151	219	256	234	20	661	283	612	90	90	90	90	
Average (6-hour peak)	7	224	121	91	192	37	43	39	3	110	47	102	15	15	15	15	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$

W =	138	116	22
		Veh	*Ped*

Warranted

RESET SHEET

$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 34

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	26th St	Direction (EW or NS)	NS	Road Authority: Manitoba Infrastructure
Side Street (name)	Marylicia	Direction (EW or NS)	EW	City: Steinbach
Quadrant / Int #	26th St & Marylicia	Comments: 2052 D		Analysis Date: 2021 Sep 22, Wed
	CHECK SHEET			Count Date:
				Date Entry Format: (yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
26th St	NB	0	0	0	1	0	0	0	2000	1			
26th St	SB	0	0	0	1	0	0	0	2000	1			
Marylicia	WB	0	0	0	1	0	0	0	2000	1			
Marylicia	EB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Marylicia WB right turns significantly impeded by through movements? (y/n)	n
Are the Marylicia EB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St SB right turns significantly impeded by through movements? (y/n)	n

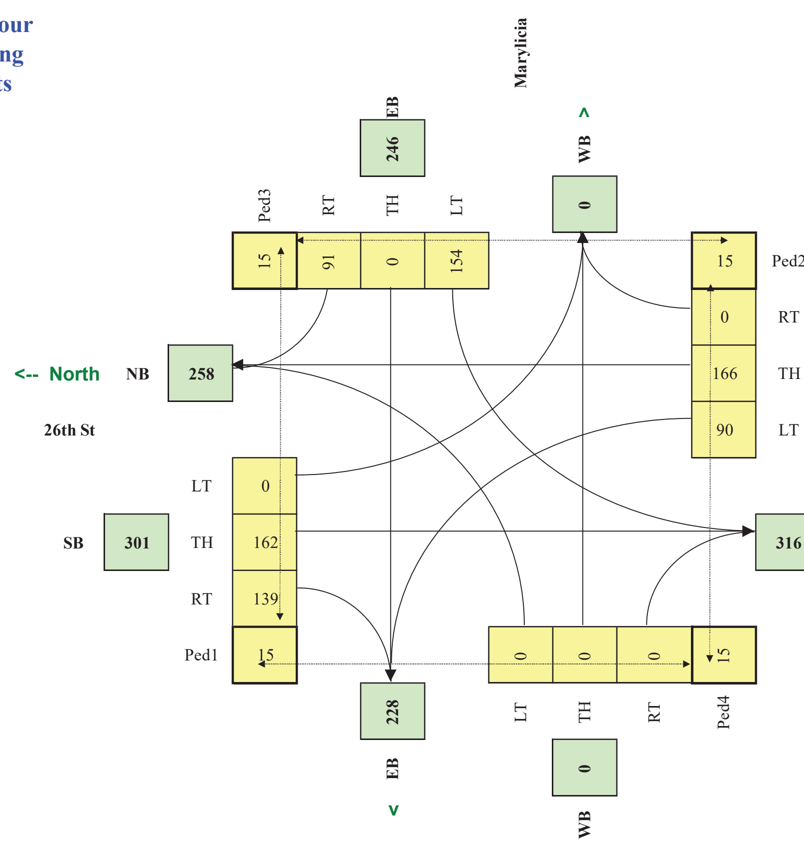
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
26th St	NS	50	0.0%	n	0.0
Marylicia	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	537	997	0	0	970	833	926	0	548	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**537**	**997**	**0**	**0**	**970**	**833**	**926**	**0**	**548**	**0**	**0**	**0**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**90**	**166**	**0**	**0**	**162**	**139**	**154**	**0**	**91**	**0**	**0**	**0**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F (X_{v-p}) L) / K_2] \times C_i$

W =	82	62	20
		Veh	*Ped*

NOT Warranted

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 29

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Patricia Ave	Direction (EW or NS)	EW	Road Authority:	Manitoba Infrastructure
Side Street (name)	26th St	Direction (EW or NS)	NS	City:	Steinbach
Quadrant / Int #	Patricia Ave & 26th St	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Patricia Ave	WB	0	0	0	1	0	0	0	2000	1			
Patricia Ave	EB	0	0	0	1	0	0	0	2000	1			
26th St	NB	0	0	0	1	0	0	0	2000	1			
26th St	SB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the 26th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 26th St SB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave EB right turns significantly impeded by through movements? (y/n)	n

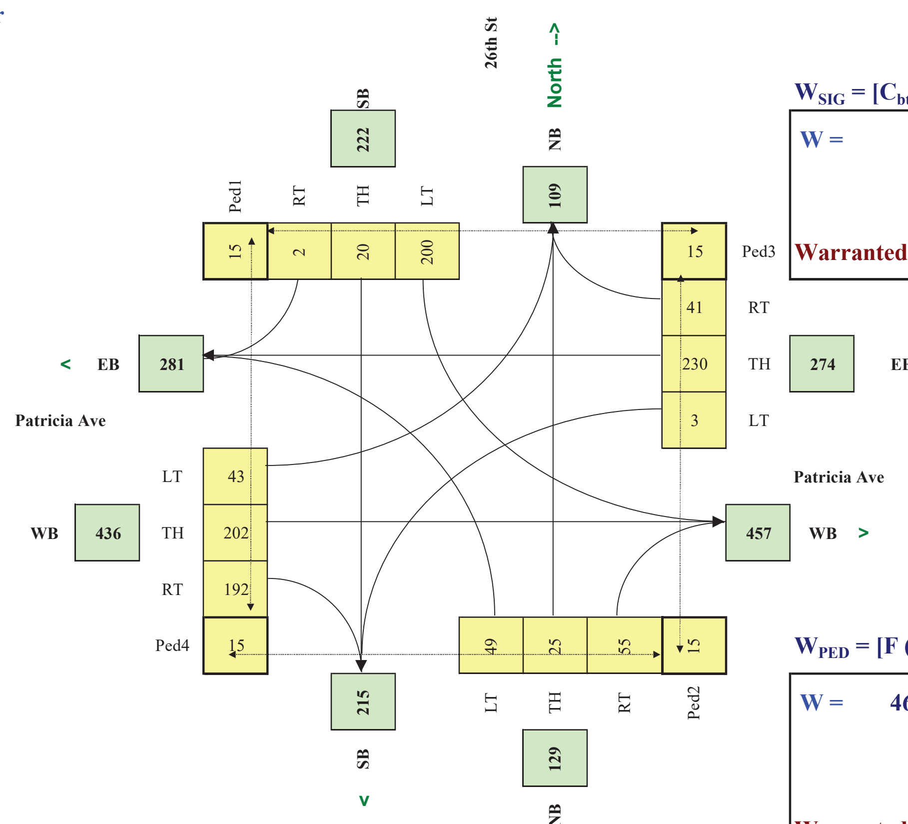
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Patricia Ave	EW	50	0.0%	n	0.0
26th St	NS	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	294	149	331	1198	120	12	20	1379	247	257	1212	1149	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	294	149	331	1,198	120	12	20	1,379	247	257	1,212	1,149	90	90	90	90	
Average (6-hour peak)	49	25	55	200	20	2	3	230	41	43	202	192	15	15	15	15	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F (X_{v-p}) L) / K_2] \times C_i$

W =	141	117	24
		Veh	*Ped*

Warranted

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 46

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Patricia Ave	Direction (EW or NS)	EW	Road Authority:	Manitoba Infrastructure
Side Street (name)	Brentwood Trace	Direction (EW or NS)	NS	City:	Steinbach
Quadrant / Int #	'atricia & Brentwood Trac	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Patricia Ave	WB	0	0	0	0	1	0	0	2000	1			
Patricia Ave	EB	0	1	0	0	0	0	0	2000	1			
Brentwood Trace	NB	0	0	0	0	0	0	0	2000	0			
Brentwood Trace	SB	0	0	0	1	0	0	0	2000	1			

Saturation Flow Rates (if not default) (vphpl)		Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Brentwood Trace NB right turns significantly impeded by through movements? (y/n)	n
Are the Brentwood Trace SB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave EB right turns significantly impeded by through movements? (y/n)	n

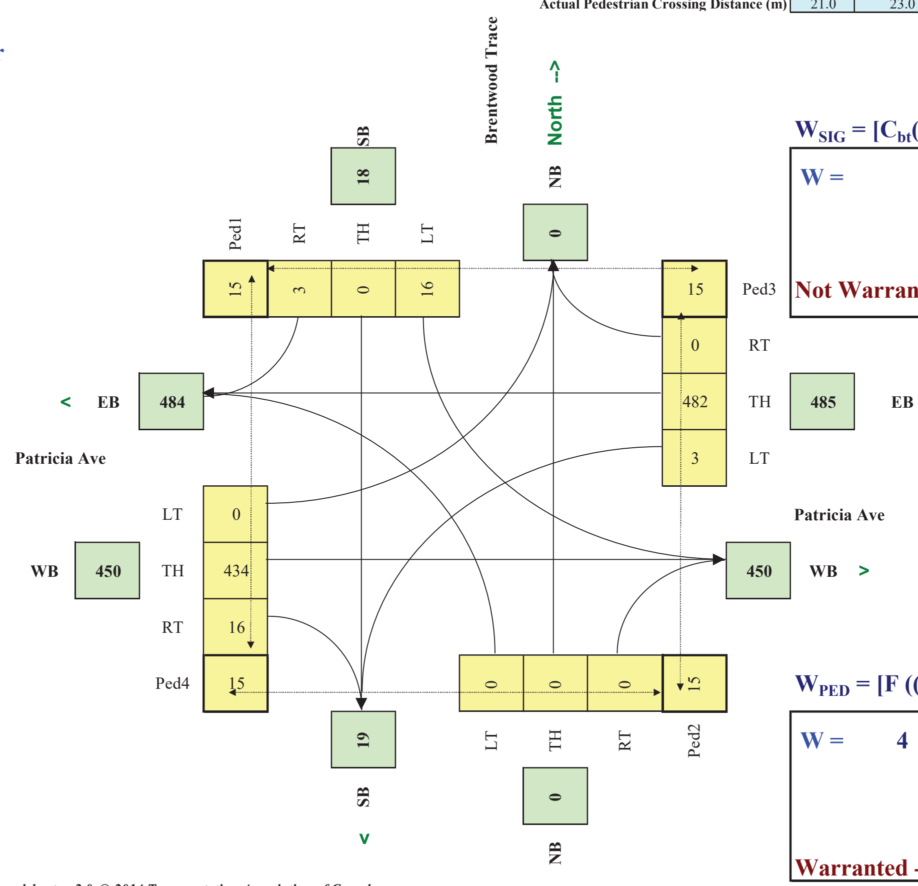
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Patricia Ave	EW	90	0.0%	n	0.0
Brentwood Trace	NS	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	0	0	0	93	0	15	20	2890	0	0	2604	93	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	0	0	0	93	0	15	20	2,890	0	0	2,604	93	90	90	90	90	
Average (6-hour peak)	0	0	0	16	0	3	3	482	0	0	434	16	15	15	15	15	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$

W =	47	12	35
		Veh	*Ped*

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 4

Warranted - Complex Intersection

Traffic Signal Warrant Spreadsheet - v2.0

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Patricia Ave	Direction (EW or NS)	EW	Road Authority:	Manitoba Infrastructure
Side Street (name)	West Access	Direction (EW or NS)	NS	City:	Steinbach
Quadrant / Int #	Patricia Ave & West Acces	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
for Warrant Calculation Results, please hit 'Page Down'				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Patricia Ave	WB	0	0	0	1	0	0	0	2000	1			
Patricia Ave	EB	0	0	0	1	0	0	0	2000	1			
West Access	NB	0	0	0	1	0	0	0	2000	1			
West Access	SB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the West Access NB right turns significantly impeded by through movements? (y/n)	n
Are the West Access SB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave EB right turns significantly impeded by through movements? (y/n)	n

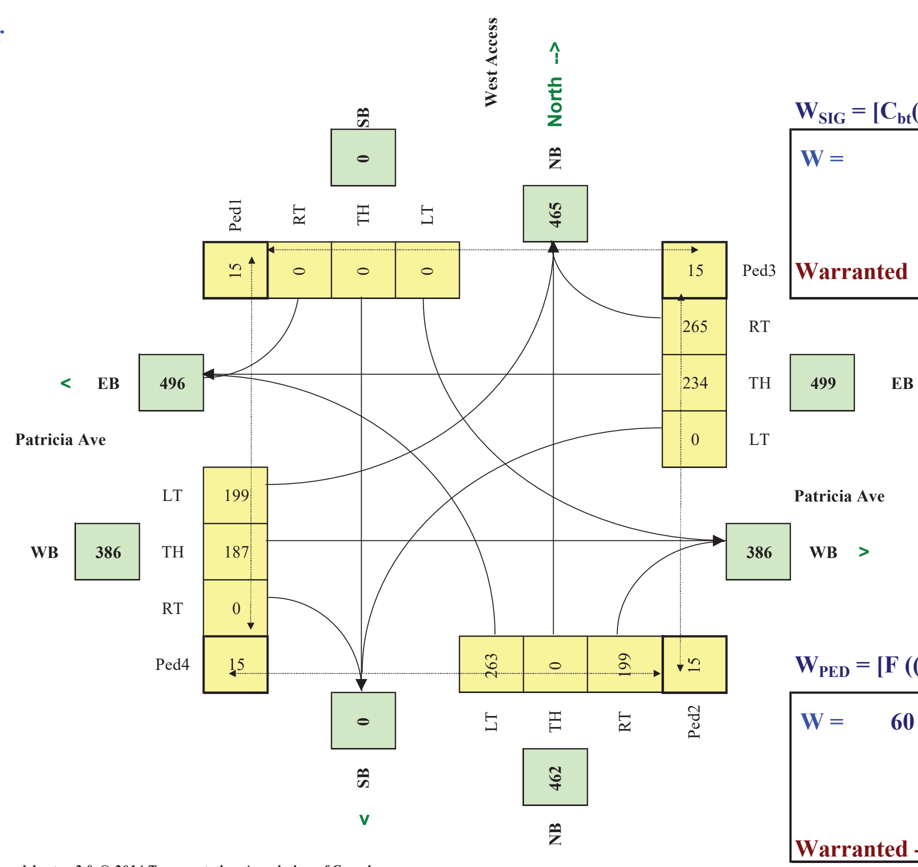
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Patricia Ave	EW	50	0.0%	n	0.0
West Access	NS	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	1577	0	1195	0	0	0	0	1401	1592	1195	1119	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**1,577**	**0**	**1,195**	**0**	**0**	**0**	**0**	**1,401**	**1,592**	**1,195**	**1,119**	**0**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**263**	**0**	**199**	**0**	**0**	**0**	**0**	**234**	**265**	**199**	**187**	**0**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$$

W =	211	180	31
		Veh	*Ped*

Warranted

RESET SHEET

$$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$$

W = 60

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	18th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Patricia Ave	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	18th St & Partrica Ave	Comments	2022 O	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
18th St	NB	1	0	0	0	1	0	0	2000	1			
18th St	SB	1	0	0	0	1	0	0	1600	1			
Patricia Ave	WB	0	0	0	1	0	0	0	2000	1			
Patricia Ave	EB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Patricia Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave EB right turns significantly impeded by through movements? (y/n)	n
Are the 18th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 18th St SB right turns significantly impeded by through movements? (y/n)	n

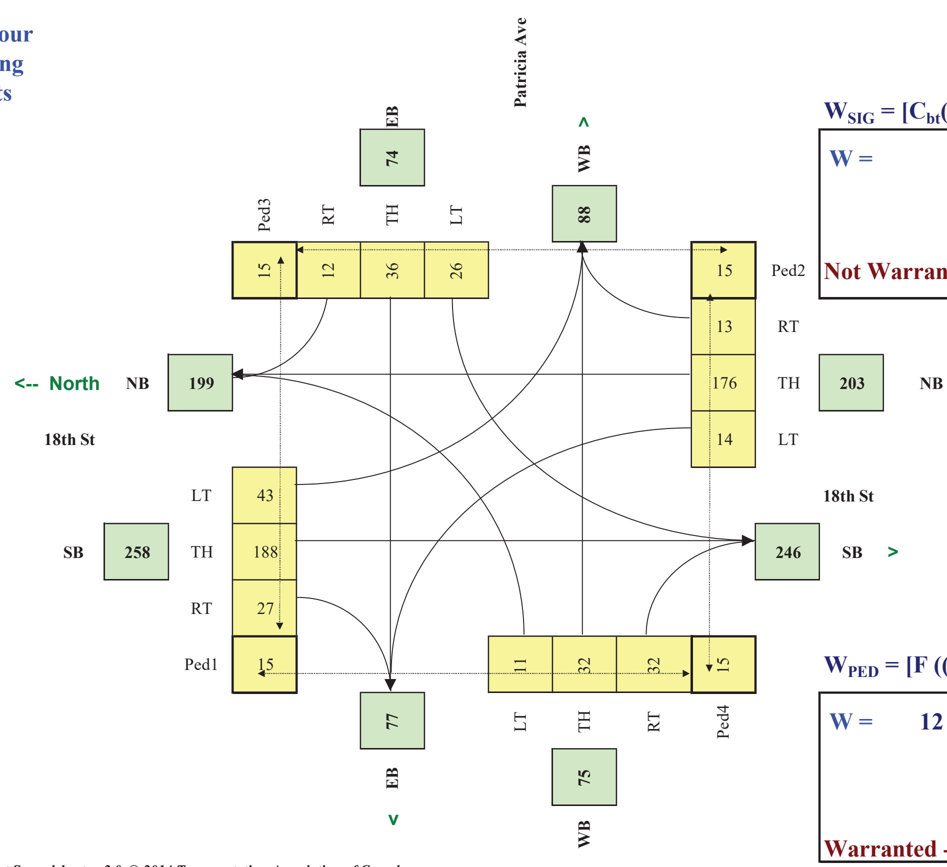
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	52,421
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
18th St	NS	80	0.0%	n	0.0
Patricia Ave	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	82	1058	79	258	1127	164	156	216	74	64	191	193	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**82**	**1,058**	**79**	**258**	**1,127**	**164**	**156**	**216**	**74**	**64**	**191**	**193**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**14**	**176**	**13**	**43**	**188**	**27**	**26**	**36**	**12**	**11**	**32**	**32**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$$

W =	57	40	17
		Veh	*Ped*

Not Warranted - Vs<75

RESET SHEET

$$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$$

W = 12

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	18th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	Patricia Ave	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	18th St & Partrica Ave	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
for Warrant Calculation Results, please hit 'Page Down'				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
18th St	NB	1	0	0	0	1	0	0	2000	1			
18th St	SB	1	0	0	0	1	0	0	1600	1			
Patricia Ave	WB	0	0	0	1	0	0	0	2000	1			
Patricia Ave	EB	0	0	0	1	0	0	0	2000	1			

Are the Patricia Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Patricia Ave EB right turns significantly impeded by through movements? (y/n)	n
Are the 18th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 18th St SB right turns significantly impeded by through movements? (y/n)	n

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

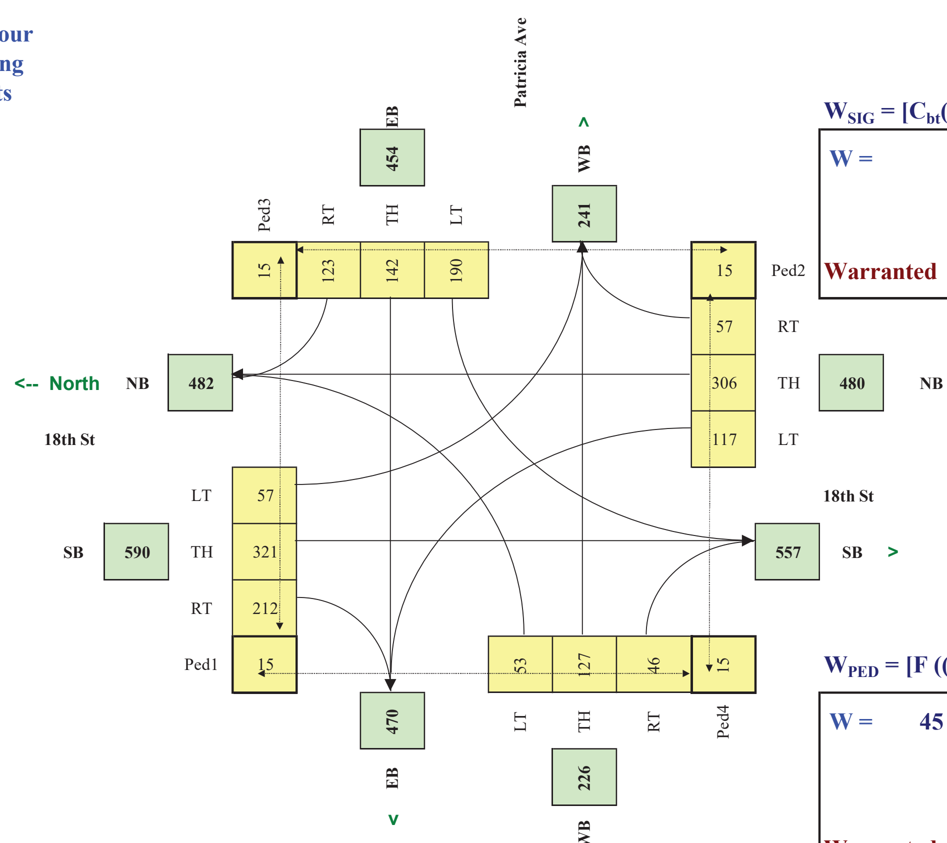
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
18th St	NS	80	0.0%	n	0.0
Patricia Ave	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	701	1838	339	344	1928	1269	1140	850	736	320	761	273	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**701**	**1,838**	**339**	**344**	**1,928**	**1,269**	**1,140**	**850**	**736**	**320**	**761**	**273**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**117**	**306**	**57**	**57**	**321**	**212**	**190**	**142**	**123**	**53**	**127**	**46**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$$

W = 436 397 39

Veh *Ped*

Warranted

RESET SHEET

$$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$$

W = 45

Warranted - Complex Intersection

Manitoba Infrastructure - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	18th St	Direction (EW or NS)	NS	Road Authority:	Manitoba Infrastructure
Side Street (name)	South Patricia New Access	Direction (EW or NS)	EW	City:	Steinbach
Quadrant / Int #	St & South Patricia New A	Comments	2052 D	Analysis Date:	2021 Sep 22, Wed
	CHECK SHEET			Count Date:	
				Date Entry Format:	(yyyy-mm-dd)

for Warrant Calculation Results, please hit 'Page Down'

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
18th St	NB	0	0	0	1	0	0	0	2000	1			
18th St	SB	0	0	0	1	0	0	0	2000	1			
South Patricia New Access	WB	0	0	0	1	0	0	0	2000	1			
South Patricia New Access	EB	0	0	0	1	0	0	0	2000	1			

	Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the South Patricia New Access WB right turns significantly impeded by through movements? (y/n)	n
Are the South Patricia New Access EB right turns significantly impeded by through movements? (y/n)	n
Are the 18th St NB right turns significantly impeded by through movements? (y/n)	n
Are the 18th St SB right turns significantly impeded by through movements? (y/n)	n

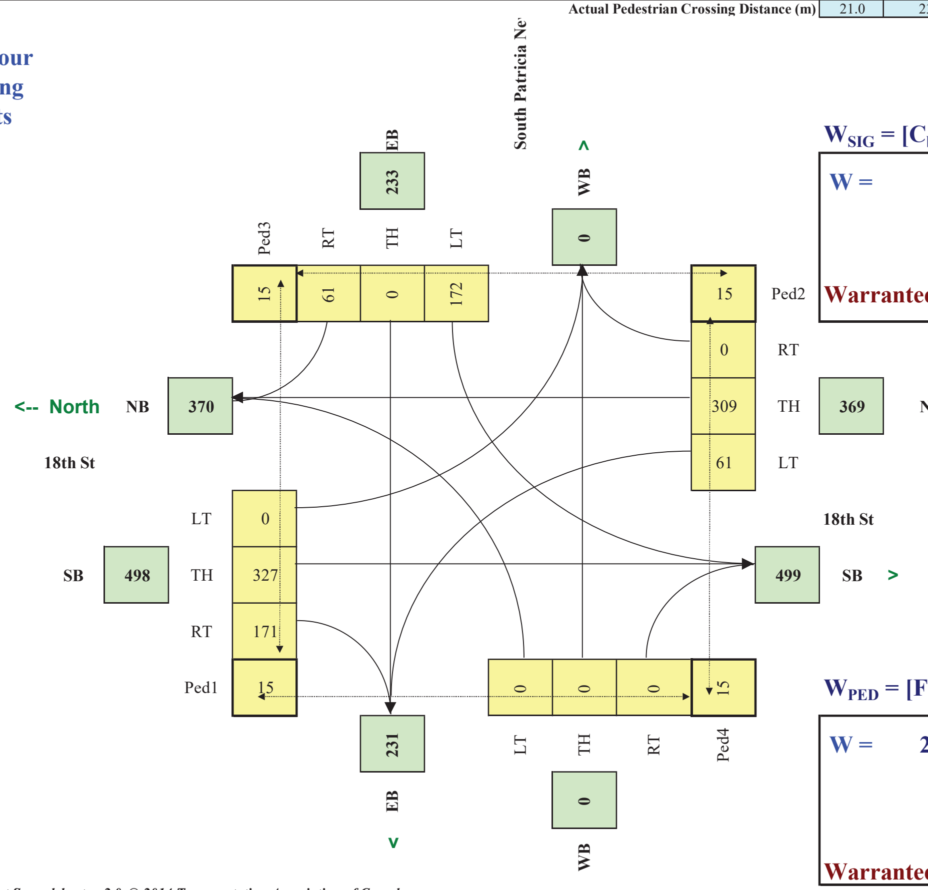
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	73,942
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
18th St	NS	50	0.0%	n	0.0
South Patricia New Access	EW	50	0.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			EB			WB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side	
7:00 - 8:00	364	1851	0	0	1962	1023	1031	0	367	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	Assumed
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	
Total (6-hour peak)	**364**	**1,851**	**0**	**0**	**1,962**	**1,023**	**1,031**	**0**	**367**	**0**	**0**	**0**	**90**	**90**	**90**	**90**	
Average (6-hour peak)	**61**	**309**	**0**	**0**	**327**	**171**	**172**	**0**	**61**	**0**	**0**	**0**	**15**	**15**	**15**	**15**	
Actual Pedestrian Crossing Distance (m)													21.0	23.0	17.0	13.0	

Average 6-hour Peak Turning Movements



$$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F\ (X_{v-p})\ L) / K_2] \times C_i$$

W =	132	102	30
		Veh	*Ped*

Warranted

RESET SHEET

$$W_{PED} = [F\ ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$$

W = 26

Warranted - Complex Intersection

APPENDIX E: Sensitivity Analysis Forecasts and Results

Appendix

E

RESIDENTIAL & SCHOOL UNITS - BY TYPE - PHASED DEVELOPMENT

Zone	Supply Location	Type	Area	% of Supply Location	Location Supply	2052	% at 2047	2047	% at 2042	2042	Supply % at 2037	2037	% at 2032	2032	% at 2027	2027
A	Brookwood South - 1900 34th St	SFH	242692.6	0.440315	345	152	0.25	38	0.15	23		0		0		0
	Brookwood South - 1900 34th St	TH	242692.6	0.440315	218	96	0.25	24	0.15	14		0		0		0
	Brookwood South - 1900 34th St	Apart.	242692.6	0.440315	391	172	0.25	43	0.15	26		0		0		0
B	Brookwood South - 1900 34th St	SFH	169121.5	0.306836	345	106	0.75	80	0.65	69	0.6	64	0.5	53	0.5	53
	Brookwood South - 1900 34th St	TH	169121.5	0.306836	218	67	0.75	50	0.65	44	0.6	40	0.5	34	0.5	34
	Brookwood South - 1900 34th St	Apart.	169121.5	0.306836	391	120	0.75	90	0.65	78	0.6	72	0.5	60	0.5	60
	Brookwood South - 1900 34th St	School		1	1	1	1	1	1	1		0		0		0
C	Brookwood South - 1900 34th St	SFH	139365.2	0.252849	345	87	1	87	0.65	57	0.65	57	0.25	22		0
	Brookwood South - 1900 34th St	TH	139365.2	0.252849	218	55	1	55	0.65	36	0.65	36	0.25	14		0
	Brookwood South - 1900 34th St	Apart.	139365.2	0.252849	391	99	1	99	0.65	64	0.65	64	0.25	25		0
D	Bellafield - 1955 34 St	SFH	241272.7	0.509434	353	180	1	180	1	180	1	180	1	180	0.5	90
	Bellafield - 1955 34 St	TH	241272.7	0.509434	211	107	1	107	1	107	1	107	1	107	0.5	54
	Bellafield - 1955 34 St	Apart.	241272.7	0.509434	543	277	1	277	1	277	1	277	1	277	0.5	139
E	Bellafield - 1955 34 St	SFH	178534	0.376964	353	133	1	133	1	133	0.25	33		0		0
	Bellafield - 1955 34 St	TH	178534	0.376964	211	80	1	80	1	80	0.25	20		0		0
	Bellafield - 1955 34 St	Apart.	178534	0.376964	543	205	1	205	1	205	0.25	51		0		0
F	Bellafield - 1955 34 St	SFH	53803.04	0.113602	353	40	1	40	1	40	0.5	20	0.25	10		0
	Bellafield - 1955 34 St	TH	53803.04	0.113602	211	24	1	24	1	24	0.5	12	0.25	6		0
	Bellafield - 1955 34 St	Apart.	53803.04	0.113602	543	62	1	62	1	62	0.5	31	0.25	16		0
G	110052 Patricia Ave	SFH	678399.1	1	222	222	1	222	1	222	0.75	167	0.5	111	0.25	56
	110052 Patricia Ave	TH	678399.1	1	167	167	1	167	0.5	84	0.25	42		0		0
	110052 Patricia Ave	Apart.	678399.1	1	438	438	1	438	0.5	219	0.25	110		0		0
H	2210 Maryland Ave	School	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2210 Maryland Ave	TH		1	0	0		0		0		0		0		0
	2210 Maryland Ave	Apart.		1	0	0		0		0		0		0		0
H	1905 26th St	SFH	1	1	0	0		0		0		0		0		0
	1905 26th St	TH		1	0	0		0		0		0		0		0
	1905 26th St	Apart.		1	190	190	1	190	1	190	1	190	0.5	95		0
I	5 Hummingbird Ln	SFH	33018.94	1	50	50	1	50		0		0		0		0
	5 Hummingbird Ln	TH		1	0	0		0		0		0		0		0
	5 Hummingbird Ln	Apart.		1	0	0		0		0		0		0		0
J	Morrison - 1700, 1720 30th St	SFH	287037	1	62	62	1	62	1	62	1	62	1	62	0.5	31
	Morrison - 1700, 1720 30th St	TH			0	0		0		0		0		0		0
	Morrison - 1700, 1720 30th St	Apart.			0	0		0		0		0		0		0
K	Brookwood North	SFH	184116.9	1	51	51	1	51	1	51	1	51	1	51	1	51
	Brookwood North	TH		1	0	0	1	0	1	0	1	0	1	0	1	0
	Brookwood North	Apart.		1	0	0	1	0	1	0	1	0	1	0	1	0
L		SFH	179057.1	1	0	0		0		0		0		0		0
		TH		1	0	0		0		0		0		0		0
		Apart.		1	0	0		0		0		0		0		0
M		SFH	196192.5	1	0	0		0		0		0		0		0
		TH		1	0	0		0		0		0		0		0
		Apart.		1	0	0		0		0		0		0		0
					TOTAL	3244		2856		2349		1687		1124		569
					% of 2052	100%		88%		72%		52%		35%		18%
					% Target (from Demand)	100%		86%		69%		52%		35%		19%

Notes
- All interim scenario build out based on assumed phasing
- Assume school in B, SFH in I
- DSFM school in H

COMMERCIAL UNITS - BY TYPE - PHASED DEVELOPMENT

Zone	Supply Location	Type	Area	% of Supply Location	Location Supply	2052	% at 2047	2047	% at 2042	2042	Supply % at 2037	2037	% at 2032	2032	% at 2027	2027
E					37.7	37.7		0		0		0		0		0
G					640.5	640.5	1	641	1	641	1	641	1	641	0.5	320

Information automatically filled in by spreadsheet formula

Item	Trigger	Forecast Horizon	Trigger Rationale	Capacity Check	Funding BG Share	Dev Share	Funding Rationale
Collector Streets							
Brookwood South - Connection to Lakeview Drive	Start of Zone B Development	2022				100%	Strictly development related
Brookwood South - Connection to Plateau Drive	Start of Zone B Development	2022				100%	Strictly development related
Brookwood South - Connection to 34th Street	Zone B >50% Development	2027	50% of Zone B generates 1,000 vpd, any more is way too much for Plateau Drive			100%	Strictly development related
Brookwood South - Connection to Patricia Avenue	Brookwood South Phase 2 Development	2032	Not needed for capacity, just convenience and construction access			100%	Strictly development related
Lakeview Drive Extension - North Portion	Brookwood South Phase 4 Development	2042	Not needed for capacity, just convenience and construction access for Phase 4			100%	Strictly development related
Lakeview Drive Extension - South Portion	Brookwood South Phase 2 Development	2032	Not needed for capacity, just convenience and construction access			100%	Strictly development related
Proposed East-West Collector - Brookwood South	Zone B >50% Development	2027				100%	Strictly development related
Bellafield - 26th Street Extension	Start of Zone F Development	2032	Access to Zone F	2027 PD ok without		90%	Share based on 2052 PD ADT, 26th south of Maryland
Bellafield - Connection to 34th Street	Start of Zone D Development	2022	Construction Access for Zone D - formalize to proper street when roundabout constructed			100%	Strictly development related
Bellafield - Connection to Patricia Avenue	Start of Zone F Development	2032	Access to Zone F, options for construction routing			100%	Strictly development related
Proposed East-West Collector - Bellafield	Start of Zone E Development	2037				100%	Strictly development related
Annex Lands - Residential Connection to Patricia	Start of Zone G Residential Development	2022				100%	Strictly development related
Annex Lands - Commercial Connection to Patricia	Start of Zone G Commercial Development	2022				100%	Strictly development related
Annex Lands - Commercial Connection to 18th Street	Need for Improvements at 18th & Patricia	2027				100%	Strictly development related
Annex Lands Residential Collector	With development in Zone G	2027				100%	Strictly development related
Annex Lands Internal Commercial Collectors	With development in Zone G	2027				100%	Strictly development related
Arterial Streets							
Patricia Ave Paving - Brentwood Trace to 26th Street	Start of Zone G Residential Development	2022	Provide paved surface to Annex Lands connection at 26th Street			95%	Share based on 2052 PD ADT, east of 26th
Patricia Ave Paving - 26th Street to 34th Street	Zone B >50% Development	2027	Forecast ADT 3500 vpd vs 1000 vpd existing			90%	Share based on 2052 PD ADT, west of 26th
Patricia Ave Paving - 34th Street to West	Brookwood South Phase 2 Development	2032	Provide paved surface to Brookwood South Connection to Patricia			75%	Share based on 2052 PD ADT, west of 34th
Patricia Ave Widening	Need for Improvements at 18th & Patricia	2027	Include with improvements at 18th Street and Patricia Avenue			85%	Share based on 2052 PD ADT, west of 18th
18th Street Widening	Need for Improvements at 18th & Patricia	2027	Include with improvements at 18th Street and Patricia Avenue			60%	Share based on 2052 PD ADT, north and south of Patricia
External Street Connections							
Brookwood South to West	Future External Development	N/A				100%	Strictly development related, can share with future development
Brookwood South to South	Future External Development	N/A				100%	Strictly development related, can share with future development
Bellafield to South	Future External Development	N/A				100%	Strictly development related, can share with future development
Bellafield to Brentwood Village	Start of Zone F Development	2032				0%	Needed for connectivity to existing network
Annex Lands to West	Future External Development	N/A				100%	Strictly development related, can share with future development
Intersections							
34th Street & Aberdeen Avenue Roundabout	As soon as possible	2022	Construction staging will be easier with less traffic			60%	Shared based on 2052 PD ADT, total entering volume
Aberdeen Avenue & Durum Drive	As soon as possible	2022	Construct as part of roundabout project			25%	Shared based on 2052 PD ADT, total entering volume
34th Street & Proposed Collector Roundabout	Zone B >50% Development	2027	Construct as part of collector street connection			85%	Shared based on 2052 PD ADT, total entering volume
34th Street & Patricia Avenue Roundabout	Zone B >50% Development	2027	Include as part of paving on Patricia Avenue to the east			75%	Shared based on 2052 PD ADT, total entering volume
Lakeview Drive & Proposed Collector Roundabout	Brookwood South Phase 2 Development	2032	Include with south portion of Lakeview Drive			100%	Strictly development related
26th Street & Maryland Avenue Roundabout	Start of Zone F Development	2032	Include with 26th Street Extension			70%	Shared based on 2052 PD ADT, total entering volume
26th Street & Proposed Collector Roundabout	Start of Zone F Development	2032				100%	Strictly development related
26th Street & Patricia Avenue Roundabout	Start of Zone D Development	2022				95%	Shared based on 2052 PD ADT, total entering volume
Patricia Avenue Commercial Access Roundabout	Start of Zone D Development	2022				95%	Shared based on 2052 PD ADT, total entering volume
18th Street & Patricia Avenue Signals + Turn Lanes	Need for Improvements at 18th & Patricia	2027	Traffic operations performance at 18th Street and Patricia Avenue	Needed in 2027 PD		65%	Shared based on 2052 PD ADT, total entering volume
18th Street Commercial Access Signals + Turn Lanes	Need for Improvements at 18th & Patricia	2027	Include with improvements at 18th Street and Patricia Avenue			65%	Shared based on 2052 PD ADT, total entering volume
Traffic Calming							
Plateau Drive	Start of Zone B Development	2022				100%	Required for traffic from Brookwood South / Brookwood North
Durum Drive	Monitor Speeds					35%	Shared based on 2052 PD ADT, Aberdeen Ave east of 34th (bound for Durum Drive)
Marquis Drive	Monitor Speeds					100%	Required for traffic from Bellafield
Maryland Avenue	Monitor Speeds					50%	Shared based on 2052 PD ADT, Maryland Avenue east of 26th Street
Active Transportation - Paths							
Brookwood South - West of Lakeview	Brookwood South Phase 2 Development	2032	Proceed with development of collector street and local street network			100%	Strictly development related
Brookwood South - Connection to 34th Street	Zone B >50% Development	2027	Wait for some demand from Brookwood South			100%	Strictly development related
Brookwood South - 34th Street	Zone B >50% Development	2027	Proceed with development in Zone B and Zone C, path along collector			100%	Strictly development related
Brookwood South - Proposed East-West Collector	Zone B >50% Development	2027	Proceed with development of collector street network			100%	Strictly development related
Brookwood South - Patricia Avenue	Brookwood South Phase 2 Development	2032	Wait for development to start reaching the south end of the SPA			100%	Strictly development related
Bellafield - Maryland Avenue ROW Connect to 34th	Zone B >50% Development	2027	Wait for some demand from Brookwood South			100%	Strictly development related
Bellafield - Maryland Avenue ROW Zone J	Zone J Local Streets	2022	Proceed with local streets in Zone J			100%	Strictly development related
Bellafield - West of Derlago (Marquis) Drive	Zone D Local Streets	2027	Proceed with development of local street network			100%	Strictly development related
Bellafield - Park Area	Start of Zone F Development	2032	Proceed with development of local street network			100%	Strictly development related
Bellafield - Proposed East-West Collector	Start of Zone E Development	2037	Proceed with development of collector street network			100%	Strictly development related
Bellafield - 26th Street Extension	Start of Zone F Development	2032	Proceed with development of collector street network			100%	Strictly development related
Bellafield - Patricia Avenue	Start of Zone E Development	2037	Wait for development to start reaching the south end of the SPA			100%	Strictly development related
Paths around DSFM School	Completion of DSFM School	2027	Wait for school			100%	Strictly development related
Annex Lands - Proposed Residential Collector	With development in Zone G	2027	Proceed with development of collector street network			100%	Strictly development related
Annex Lands - Internal	With development in Zone G	2027	Proceed with development of collector street network			100%	Strictly development related
Annex Lands - Patricia Avenue Commercial Access	With development in Zone G	2027	Proceed with development of collector street network			100%	Strictly development related
Annex Lands - 18th Street Commercial Access	With development in Zone G	2027	Proceed with development of collector street network			100%	Strictly development related
Active Transportation - Crossings							
Richmond Avenue West of 34th Street	Existing desire line	2022	Warrant for crossing under existing conditions			0%	Existing demand
34th Street south of Aberdeen Avenue	Zone B >50% Development	2027	Construct as part of corridor connecting Brookwood South and Bellafield			100%	Strictly development related
Brookwood South - Lakeview Drive north	Brookwood South Phase 4 Development	2042	Include in initial construction			100%	Strictly development related
Brookwood South - Proposed Collector at Plateau Drive	BSD School	2042	Wait for school			100%	Strictly development related
Bellafield - 26th Street at Connection to Brentwood Village	Start of Zone F Development	2032	Include in initial construction			100%	Strictly development related
Bellafield - 26th Street at Connection to DSFM School	Start of Zone F Development	2032	Wait for school			100%	Strictly development related
Maryland Avenue at Connection to DSFM School	Completion of DSFM School	2027	Include in initial construction			100%	Strictly development related
Annex Lands - Patricia Avenue Commercial Access at Internal Collector	With development in Zone G	2027	Include in initial construction			100%	Strictly development related
Transit							
Service to Brookwood South	Brookwood South Phase 4 Development	2042	Wait until collector network in place, substantial demand			100%	Strictly development related
Service to Bellafield	Start of Zone E Development	2037	Wait until collector network in place, substantial demand			100%	Strictly development related

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	69	4	17	51	14	11	5	86	28	6	1
Future Volume (Veh/h)	1	69	4	17	51	14	11	5	86	28	6	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	75	4	18	55	15	12	5	93	30	7	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	70			79			182	185	77	273	180	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	70			79			182	185	77	273	180	62
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			98	99	91	95	99	100
cM capacity (veh/h)	1531			1519			765	700	984	606	705	1002

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	80	88	110	38
Volume Left	1	18	12	30
Volume Right	4	15	93	1
cSH	1531	1519	937	629
Volume to Capacity	0.00	0.01	0.12	0.06
Queue Length 95th (m)	0.0	0.3	3.0	1.5
Control Delay (s)	0.1	1.6	9.3	11.1
Lane LOS	A	A	A	B
Approach Delay (s)	0.1	1.6	9.3	11.1
Approach LOS			A	B

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	61	73	51	104	25	112	38	318	187	213	187	20
Future Volume (veh/h)	61	73	51	104	25	112	38	318	187	213	187	20
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
Hourly flow rate (vph)	66	79	55	113	27	122	41	346	203	232	203	22
Approach Volume (veh/h)		200			262			590			457	
Crossing Volume (veh/h)		548			453			377			181	
High Capacity (veh/h)		898			969			1030			1202	
High v/c (veh/h)		0.22			0.27			0.57			0.38	
Low Capacity (veh/h)		723			786			840			995	
Low v/c (veh/h)		0.28			0.33			0.70			0.46	

Intersection Summary			
Maximum v/c High	0.57		
Maximum v/c Low	0.70		
Intersection Capacity Utilization	83.6%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	16.1
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	200	262	590	457
Demand Flow Rate, veh/h	206	267	612	472
Vehicles Circulating, veh/h	565	472	387	185
Vehicles Exiting, veh/h	92	527	384	554
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	10.1	10.2	25.1	10.4
Approach LOS	B	B	D	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	206	267	612	472
Cap Entry Lane, veh/h	642	705	767	939
Entry HV Adj Factor	0.971	0.980	0.964	0.968
Flow Entry, veh/h	200	262	590	457
Cap Entry, veh/h	624	691	739	909
V/C Ratio	0.321	0.379	0.798	0.503
Control Delay, s/veh	10.1	10.2	25.1	10.4
LOS	B	B	D	B
95th %tile Queue, veh	1	2	8	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	182	28	19	4	18	115	9	247	4	60	188	93
Future Volume (veh/h)	182	28	19	4	18	115	9	247	4	60	188	93
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
Hourly flow rate (vph)	198	30	21	4	20	125	10	268	4	65	204	101
Approach Volume (veh/h)		249			149			282			370	
Crossing Volume (veh/h)		273			476			293			34	
High Capacity (veh/h)		1118			951			1100			1348	
High v/c (veh/h)		0.22			0.16			0.26			0.27	
Low Capacity (veh/h)		919			770			904			1128	
Low v/c (veh/h)		0.27			0.19			0.31			0.33	

Intersection Summary			
Maximum v/c High	0.27		
Maximum v/c Low	0.33		
Intersection Capacity Utilization	66.9%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	249	149	282	370
Demand Flow Rate, veh/h	254	152	295	383
Vehicles Circulating, veh/h	284	493	299	34
Vehicles Exiting, veh/h	133	101	239	610
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.6	7.9	8.7	7.0
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	254	152	295	383
Cap Entry Lane, veh/h	851	690	838	1092
Entry HV Adj Factor	0.982	0.978	0.955	0.966
Flow Entry, veh/h	249	149	282	370
Cap Entry, veh/h	835	675	800	1055
V/C Ratio	0.299	0.220	0.352	0.351
Control Delay, s/veh	7.6	7.9	8.7	7.0
LOS	A	A	A	A
95th %tile Queue, veh	1	1	2	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	3	63	9	6	15	51	421	18	14	232	14
Future Volume (Veh/h)	36	3	63	9	6	15	51	421	18	14	232	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	39	3	68	10	7	16	55	458	20	15	252	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	887	878	260	937	875	468	267			478		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	887	878	260	937	875	468	267			478		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	84	99	91	95	97	97	96			99		
cM capacity (veh/h)	242	271	779	212	272	595	1297			1084		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	110	33	533	282
Volume Left	39	10	55	15
Volume Right	68	16	20	15
cSH	424	331	1297	1084
Volume to Capacity	0.26	0.10	0.04	0.01
Queue Length 95th (m)	7.8	2.5	1.0	0.3
Control Delay (s)	16.4	17.1	1.2	0.6
Lane LOS	C	C	A	A
Approach Delay (s)	16.4	17.1	1.2	0.6
Approach LOS	C	C		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	75	70	6	128	48	138	10	281	188	114	161	25
Future Volume (veh/h)	75	70	6	128	48	138	10	281	188	114	161	25
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
Hourly flow rate (vph)	82	76	7	139	52	150	11	305	204	124	175	27
Approach Volume (veh/h)		165			341			520			326	
Crossing Volume (veh/h)		438			398			282			202	
High Capacity (veh/h)		981			1013			1110			1182	
High v/c (veh/h)		0.17			0.34			0.47			0.28	
Low Capacity (veh/h)		797			825			912			977	
Low v/c (veh/h)		0.21			0.41			0.57			0.33	

Intersection Summary			
Maximum v/c High	0.47		
Maximum v/c Low	0.57		
Intersection Capacity Utilization	74.3%	ICU Level of Service	D

Intersection	
Intersection Delay, s/veh	11.3
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	165	341	520	326
Demand Flow Rate, veh/h	169	348	530	332
Vehicles Circulating, veh/h	446	406	288	206
Vehicles Exiting, veh/h	92	412	327	548
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.8	11.3	14.4	8.0
Approach LOS	A	B	B	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	169	348	530	332
Cap Entry Lane, veh/h	723	753	847	920
Entry HV Adj Factor	0.979	0.980	0.981	0.980
Flow Entry, veh/h	165	341	520	326
Cap Entry, veh/h	708	738	831	902
V/C Ratio	0.234	0.462	0.626	0.361
Control Delay, s/veh	7.8	11.3	14.4	8.0
LOS	A	B	B	A
95th %tile Queue, veh	1	2	4	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Right Turn Channelized						
Traffic Volume (veh/h)	97	14	17	205	24	43
Future Volume (veh/h)	97	14	17	205	24	43
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	15	18	223	26	47
Approach Volume (veh/h)	120		241			73
Crossing Volume (veh/h)	18		26			105
High Capacity (veh/h)	1365		1357			1276
High v/c (veh/h)	0.09		0.18			0.06
Low Capacity (veh/h)	1144		1136			1062
Low v/c (veh/h)	0.10		0.21			0.07

Intersection Summary			
Maximum v/c High	0.18		
Maximum v/c Low	0.21		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	4.9
Intersection LOS	A

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	120	241	73
Demand Flow Rate, veh/h	122	245	75
Vehicles Circulating, veh/h	18	27	107
Vehicles Exiting, veh/h	254	155	33
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.3	5.4	4.3
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	122	245	75
Cap Entry Lane, veh/h	1110	1100	1015
Entry HV Adj Factor	0.984	0.982	0.974
Flow Entry, veh/h	120	241	73
Cap Entry, veh/h	1092	1080	989
V/C Ratio	0.110	0.223	0.074
Control Delay, s/veh	4.3	5.4	4.3
LOS	A	A	A
95th %tile Queue, veh	0	1	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	94	178	86	17	119	31	67	134	10	18	165	26
Future Volume (veh/h)	94	178	86	17	119	31	67	134	10	18	165	26
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
Hourly flow rate (vph)	102	193	93	18	129	34	73	146	11	20	179	28
Approach Volume (veh/h)		388			181			230			227	
Crossing Volume (veh/h)		217			321			315			220	
High Capacity (veh/h)		1168			1076			1081			1166	
High v/c (veh/h)		0.33			0.17			0.21			0.19	
Low Capacity (veh/h)		965			882			887			962	
Low v/c (veh/h)		0.40			0.21			0.26			0.24	

Intersection Summary			
Maximum v/c High	0.33		
Maximum v/c Low	0.40		
Intersection Capacity Utilization	64.9%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	388	181	230	227
Demand Flow Rate, veh/h	396	185	238	237
Vehicles Circulating, veh/h	226	331	321	224
Vehicles Exiting, veh/h	235	228	301	292
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.4	7.0	7.9	6.9
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	396	185	238	237
Cap Entry Lane, veh/h	901	812	820	903
Entry HV Adj Factor	0.980	0.981	0.965	0.958
Flow Entry, veh/h	388	181	230	227
Cap Entry, veh/h	883	796	791	865
V/C Ratio	0.439	0.228	0.290	0.262
Control Delay, s/veh	9.4	7.0	7.9	6.9
LOS	A	A	A	A
95th %tile Queue, veh	2	1	1	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	270	91	72	137	124	167
Future Volume (veh/h)	270	91	72	137	124	167
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	293	99	78	149	135	182
Approach Volume (veh/h)	392			227	317	
Crossing Volume (veh/h)	135			293	78	
High Capacity (veh/h)	1246			1100	1303	
High v/c (veh/h)	0.31			0.21	0.24	
Low Capacity (veh/h)	1035			904	1087	
Low v/c (veh/h)	0.38			0.25	0.29	

Intersection Summary			
Maximum v/c High	0.31		
Maximum v/c Low	0.38		
Intersection Capacity Utilization	58.5%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	392	227	317
Demand Flow Rate, veh/h	400	232	324
Vehicles Circulating, veh/h	138	299	80
Vehicles Exiting, veh/h	266	239	451
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.3	7.4	6.7
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	400	232	324
Cap Entry Lane, veh/h	984	838	1043
Entry HV Adj Factor	0.980	0.979	0.979
Flow Entry, veh/h	392	227	317
Cap Entry, veh/h	965	820	1021
V/C Ratio	0.406	0.277	0.311
Control Delay, s/veh	8.3	7.4	6.7
LOS	A	A	A
95th %tile Queue, veh	2	1	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	28	38	18	48	10
Future Volume (Veh/h)	3	28	38	18	48	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	30	41	20	52	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	61				87	51
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	61				87	51
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	99
cM capacity (veh/h)	1542				912	1017

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	33	61	63
Volume Left	3	0	52
Volume Right	0	20	11
cSH	1542	1700	929
Volume to Capacity	0.00	0.04	0.07
Queue Length 95th (m)	0.0	0.0	1.7
Control Delay (s)	0.7	0.0	9.2
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	9.2
Approach LOS			A

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	14.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	25	71	5	5	40	160	5	15	10	188	20	59
Future Volume (veh/h)	25	71	5	5	40	160	5	15	10	188	20	59
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
Hourly flow rate (vph)	27	77	5	5	43	174	5	16	11	204	22	64
Approach Volume (veh/h)		109			222			32			290	
Crossing Volume (veh/h)		231			48			308			53	
High Capacity (veh/h)		1156			1334			1087			1329	
High v/c (veh/h)		0.09			0.17			0.03			0.22	
Low Capacity (veh/h)		953			1115			892			1110	
Low v/c (veh/h)		0.11			0.20			0.04			0.26	

Intersection Summary			
Maximum v/c High	0.22		
Maximum v/c Low	0.26		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	5.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	109	222	32	290
Demand Flow Rate, veh/h	115	228	36	297
Vehicles Circulating, veh/h	237	51	317	55
Vehicles Exiting, veh/h	115	301	34	223
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.5	5.4	5.3	6.2
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	115	228	36	297
Cap Entry Lane, veh/h	892	1074	823	1069
Entry HV Adj Factor	0.949	0.973	0.899	0.976
Flow Entry, veh/h	109	222	32	290
Cap Entry, veh/h	846	1045	740	1044
V/C Ratio	0.129	0.212	0.044	0.278
Control Delay, s/veh	5.5	5.4	5.3	6.2
LOS	A	A	A	A
95th %tile Queue, veh	0	1	0	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	2	212	56	25	111	79	91	36	91	160	13	3
Future Volume (veh/h)	2	212	56	25	111	79	91	36	91	160	13	3
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
Hourly flow rate (vph)	2	230	61	27	121	86	99	39	99	174	14	3
Approach Volume (veh/h)		293			234			237			191	
Crossing Volume (veh/h)		215			140			406			247	
High Capacity (veh/h)		1170			1241			1006			1141	
High v/c (veh/h)		0.25			0.19			0.24			0.17	
Low Capacity (veh/h)		967			1031			819			940	
Low v/c (veh/h)		0.30			0.23			0.29			0.20	

Intersection Summary			
Maximum v/c High	0.25		
Maximum v/c Low	0.30		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	293	234	237	191
Demand Flow Rate, veh/h	306	243	242	194
Vehicles Circulating, veh/h	219	143	420	256
Vehicles Exiting, veh/h	231	519	104	130
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.9	6.3	9.0	6.5
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	306	243	242	194
Cap Entry Lane, veh/h	908	979	742	875
Entry HV Adj Factor	0.959	0.963	0.980	0.983
Flow Entry, veh/h	293	234	237	191
Cap Entry, veh/h	871	943	728	860
V/C Ratio	0.337	0.248	0.326	0.222
Control Delay, s/veh	7.9	6.3	9.0	6.5
LOS	A	A	A	A
95th %tile Queue, veh	1	1	1	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	460	212	3	20	3
Future Volume (Veh/h)	3	460	212	3	20	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	500	230	3	22	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	233				738	232
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	233				738	232
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	100
cM capacity (veh/h)	1335				385	808

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	503	233	25
Volume Left	3	0	22
Volume Right	0	3	3
cSH	1335	1700	410
Volume to Capacity	0.00	0.14	0.06
Queue Length 95th (m)	0.1	0.0	1.5
Control Delay (s)	0.1	0.0	14.3
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	14.3
Approach LOS			B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Right Turn Channelized						
Traffic Volume (veh/h)	341	140	129	125	90	109
Future Volume (veh/h)	341	140	129	125	90	109
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	371	152	140	136	98	118
Approach Volume (veh/h)	523			276	216	
Crossing Volume (veh/h)	140			98	371	
High Capacity (veh/h)	1241			1283	1034	
High v/c (veh/h)	0.42			0.22	0.21	
Low Capacity (veh/h)	1031			1068	844	
Low v/c (veh/h)	0.51			0.26	0.26	

Intersection Summary			
Maximum v/c High	0.42		
Maximum v/c Low	0.51		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	6.5
Intersection LOS	A

Approach	EB	WB	NB
Entry Lanes	2	2	2
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	523	276	216
Demand Flow Rate, veh/h	545	286	220
Vehicles Circulating, veh/h	143	100	390
Vehicles Exiting, veh/h	243	510	298
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.5	4.9	6.3
Approach LOS	A	A	A

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	L	TR	L	TR
Assumed Moves	LT	R	L	TR	L	TR
RT Channelized						
Lane Util	0.716	0.284	0.500	0.500	0.455	0.545
Critical Headway, s	5.193	5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	390	155	143	143	100	120
Cap Entry Lane, veh/h	979	979	1022	1022	765	765
Entry HV Adj Factor	0.952	0.981	0.979	0.952	0.980	0.983
Flow Entry, veh/h	371	152	140	136	98	118
Cap Entry, veh/h	933	960	1001	974	750	752
V/C Ratio	0.398	0.158	0.140	0.140	0.131	0.157
Control Delay, s/veh	8.4	5.2	4.9	5.0	6.2	6.5
LOS	A	A	A	A	A	A
95th %tile Queue, veh	2	1	0	0	0	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	171	172	133	35	92	56	75	308	49	67	247	136
Future Volume (veh/h)	171	172	133	35	92	56	75	308	49	67	247	136
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
Hourly flow rate (vph)	186	187	145	38	100	61	82	335	53	73	268	148
Approach Volume (veh/h)		518			199			470			489	
Crossing Volume (veh/h)		379			603			446			220	
High Capacity (veh/h)		1028			859			975			1166	
High v/c (veh/h)		0.50			0.23			0.48			0.42	
Low Capacity (veh/h)		839			689			791			962	
Low v/c (veh/h)		0.62			0.29			0.59			0.51	

Intersection Summary			
Maximum v/c High	0.50		
Maximum v/c Low	0.62		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	518	199	470	489
Demand Flow Rate, veh/h	534	206	490	506
Vehicles Circulating, veh/h	394	626	460	228
Vehicles Exiting, veh/h	340	324	468	604
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.2	7.1	8.2	6.6
Approach LOS	A	A	A	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	LT	R	LT	TR	LT	TR
Assumed Moves	LT	R	LT	R	LT	TR	LT	TR
RT Channelized								
Lane Util	0.723	0.277	0.699	0.301	0.469	0.531	0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	386	148	144	62	230	260	238	268
Cap Entry Lane, veh/h	841	858	707	729	800	819	952	963
Entry HV Adj Factor	0.965	0.980	0.958	0.984	0.961	0.959	0.965	0.966
Flow Entry, veh/h	373	145	138	61	221	249	230	259
Cap Entry, veh/h	812	840	677	717	769	785	919	931
V/C Ratio	0.459	0.173	0.204	0.085	0.287	0.318	0.250	0.278
Control Delay, s/veh	10.4	6.0	7.7	5.9	8.0	8.3	6.5	6.7
LOS	B	A	A	A	A	A	A	A
95th %tile Queue, veh	2	1	1	0	1	1	1	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	110	43	50	322	302	113
Future Volume (veh/h)	110	43	50	322	302	113
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	47	54	350	328	123
Approach Volume (veh/h)	167			404	451	
Crossing Volume (veh/h)	328			120	54	
High Capacity (veh/h)	1070			1261	1328	
High v/c (veh/h)	0.16			0.32	0.34	
Low Capacity (veh/h)	877			1049	1109	
Low v/c (veh/h)	0.19			0.39	0.41	

Intersection Summary			
Maximum v/c High	0.34		
Maximum v/c Low	0.41		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	5.5
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	2	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	167	404	451
Demand Flow Rate, veh/h	170	423	469
Vehicles Circulating, veh/h	344	122	55
Vehicles Exiting, veh/h	180	392	489
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.3	5.6	5.5
Approach LOS	A	A	A

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	L	TR	LT	TR	LT	TR
Assumed Moves	L	TR	LT	TR	LT	TR
RT Channelized						
Lane Util	0.718	0.282	0.470	0.530	0.469	0.531
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	122	48	199	224	220	249
Cap Entry Lane, veh/h	873	888	1031	1037	1084	1087
Entry HV Adj Factor	0.984	0.979	0.955	0.957	0.963	0.959
Flow Entry, veh/h	120	47	190	214	212	239
Cap Entry, veh/h	859	870	985	993	1044	1043
V/C Ratio	0.140	0.054	0.193	0.216	0.203	0.229
Control Delay, s/veh	5.6	4.6	5.5	5.7	5.3	5.6
LOS	A	A	A	A	A	A
95th %tile Queue, veh	0	0	1	1	1	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Volume (veh/h)	1	89	11	75	104	48	7	1	29	27	2	1
Future Volume (Veh/h)	1	89	11	75	104	48	7	1	29	27	2	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	97	12	82	113	52	8	1	32	29	2	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	165			109			410	434	103	440	414	139
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	165			109			410	434	103	440	414	139
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			94			98	100	97	94	100	100
cM capacity (veh/h)	1413			1481			526	486	952	487	499	909

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	110	247	41	32
Volume Left	1	82	8	29
Volume Right	12	52	32	1
cSH	1413	1481	806	495
Volume to Capacity	0.00	0.06	0.05	0.06
Queue Length 95th (m)	0.0	1.3	1.2	1.6
Control Delay (s)	0.1	2.8	9.7	12.8
Lane LOS	A	A	A	B
Approach Delay (s)	0.1	2.8	9.7	12.8
Approach LOS			A	B

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	35	41	68	283	89	149	60	330	142	131	355	78
Future Volume (veh/h)	35	41	68	283	89	149	60	330	142	131	355	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
Hourly flow rate (vph)	38	45	74	308	97	162	65	359	154	142	386	85
Approach Volume (veh/h)		157			567			578			613	
Crossing Volume (veh/h)		836			462			225			470	
High Capacity (veh/h)		712			962			1161			956	
High v/c (veh/h)		0.22			0.59			0.50			0.64	
Low Capacity (veh/h)		560			780			958			775	
Low v/c (veh/h)		0.28			0.73			0.60			0.79	

Intersection Summary			
Maximum v/c High	0.64		
Maximum v/c Low	0.79		
Intersection Capacity Utilization	97.3%	ICU Level of Service	F

Intersection	
Intersection Delay, s/veh	27.9
Intersection LOS	D

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	157	567	578	613
Demand Flow Rate, veh/h	161	581	600	637
Vehicles Circulating, veh/h	864	482	231	482
Vehicles Exiting, veh/h	255	349	794	581
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	13.4	30.1	15.5	41.2
Approach LOS	B	D	C	E

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	161	581	600	637
Cap Entry Lane, veh/h	476	698	897	698
Entry HV Adj Factor	0.974	0.976	0.963	0.962
Flow Entry, veh/h	157	567	578	613
Cap Entry, veh/h	464	681	864	671
V/C Ratio	0.338	0.833	0.669	0.913
Control Delay, s/veh	13.4	30.1	15.5	41.2
LOS	B	D	C	E
95th %tile Queue, veh	1	9	5	12

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	111	20	21	6	26	67	26	354	6	90	427	189
Future Volume (veh/h)	111	20	21	6	26	67	26	354	6	90	427	189
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
Hourly flow rate (vph)	121	22	23	7	28	73	28	385	7	98	464	205
Approach Volume (veh/h)		166			108			420			767	
Crossing Volume (veh/h)		569			534			241			63	
High Capacity (veh/h)		883			908			1147			1318	
High v/c (veh/h)		0.19			0.12			0.37			0.58	
Low Capacity (veh/h)		710			732			945			1101	
Low v/c (veh/h)		0.23			0.15			0.44			0.70	

Intersection Summary			
Maximum v/c High	0.58		
Maximum v/c Low	0.70		
Intersection Capacity Utilization	84.1%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	13.7
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	166	108	420	767
Demand Flow Rate, veh/h	168	110	440	796
Vehicles Circulating, veh/h	594	556	245	65
Vehicles Exiting, veh/h	267	129	517	601
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.3	7.6	10.9	17.1
Approach LOS	A	A	B	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	168	110	440	796
Cap Entry Lane, veh/h	624	648	884	1059
Entry HV Adj Factor	0.986	0.986	0.954	0.963
Flow Entry, veh/h	166	108	420	767
Cap Entry, veh/h	615	639	844	1020
V/C Ratio	0.269	0.170	0.498	0.752
Control Delay, s/veh	9.3	7.6	10.9	17.1
LOS	A	A	B	C
95th %tile Queue, veh	1	1	3	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Volume (veh/h)	36	6	65	13	5	15	49	465	23	16	518	14
Future Volume (Veh/h)	36	6	65	13	5	15	49	465	23	16	518	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	39	7	71	14	5	16	53	505	25	17	563	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1246	1240	570	1302	1236	518	578			530		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1246	1240	570	1302	1236	518	578			530		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	71	96	86	87	97	97	95			98		
cM capacity (veh/h)	135	163	521	109	164	558	996			1037		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	117	35	583	595
Volume Left	39	14	53	17
Volume Right	71	16	25	15
cSH	250	187	996	1037
Volume to Capacity	0.47	0.19	0.05	0.02
Queue Length 95th (m)	17.6	5.1	1.3	0.4
Control Delay (s)	31.4	28.7	1.4	0.4
Lane LOS	D	D	A	A
Approach Delay (s)	31.4	28.7	1.4	0.4
Approach LOS	D	D		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	45	39	4	171	83	140	10	356	141	132	387	77
Future Volume (veh/h)	45	39	4	171	83	140	10	356	141	132	387	77
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
Hourly flow rate (vph)	49	42	4	186	90	152	11	387	153	143	421	84
Approach Volume (veh/h)		95			428			551			648	
Crossing Volume (veh/h)		750			447			234			287	
High Capacity (veh/h)		763			974			1153			1106	
High v/c (veh/h)		0.12			0.44			0.48			0.59	
Low Capacity (veh/h)		605			790			951			908	
Low v/c (veh/h)		0.16			0.54			0.58			0.71	

Intersection Summary			
Maximum v/c High	0.59		
Maximum v/c Low	0.71		
Intersection Capacity Utilization	96.6%	ICU Level of Service	F

Intersection	
Intersection Delay, s/veh	17.3
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	95	428	551	648
Demand Flow Rate, veh/h	97	437	562	661
Vehicles Circulating, veh/h	765	456	239	293
Vehicles Exiting, veh/h	189	345	623	600
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.5	15.9	14.1	22.1
Approach LOS	A	C	B	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	97	437	562	661
Cap Entry Lane, veh/h	526	716	890	843
Entry HV Adj Factor	0.981	0.980	0.981	0.980
Flow Entry, veh/h	95	428	551	648
Cap Entry, veh/h	516	702	873	826
V/C Ratio	0.184	0.610	0.632	0.784
Control Delay, s/veh	9.5	15.9	14.1	22.1
LOS	A	C	B	C
95th %tile Queue, veh	1	4	5	8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Right Turn Channelized						
Traffic Volume (veh/h)	152	19	68	95	14	53
Future Volume (veh/h)	152	19	68	95	14	53
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	165	21	74	103	15	58
Approach Volume (veh/h)	186		177			73
Crossing Volume (veh/h)	74		15			165
High Capacity (veh/h)	1307		1369			1217
High v/c (veh/h)	0.14		0.13			0.06
Low Capacity (veh/h)	1091		1147			1009
Low v/c (veh/h)	0.17		0.15			0.07

Intersection Summary			
Maximum v/c High	0.14		
Maximum v/c Low	0.17		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	4.9
Intersection LOS	A

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	186	177	73
Demand Flow Rate, veh/h	189	180	74
Vehicles Circulating, veh/h	75	15	168
Vehicles Exiting, veh/h	120	227	96
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.2	4.7	4.5
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	189	180	74
Cap Entry Lane, veh/h	1048	1113	955
Entry HV Adj Factor	0.984	0.981	0.984
Flow Entry, veh/h	186	177	73
Cap Entry, veh/h	1032	1092	940
V/C Ratio	0.180	0.162	0.077
Control Delay, s/veh	5.2	4.7	4.5
LOS	A	A	A
95th %tile Queue, veh	1	1	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	53	85	34	10	123	37	47	296	14	44	303	91
Future Volume (veh/h)	53	85	34	10	123	37	47	296	14	44	303	91
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
Hourly flow rate (vph)	58	92	37	11	134	40	51	322	15	48	329	99
Approach Volume (veh/h)		187			185			388			476	
Crossing Volume (veh/h)		388			431			198			196	
High Capacity (veh/h)		1021			986			1186			1188	
High v/c (veh/h)		0.18			0.19			0.33			0.40	
Low Capacity (veh/h)		832			801			981			982	
Low v/c (veh/h)		0.22			0.23			0.40			0.48	

Intersection Summary			
Maximum v/c High	0.40		
Maximum v/c Low	0.48		
Intersection Capacity Utilization	58.5%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	187	185	388	476
Demand Flow Rate, veh/h	191	189	405	495
Vehicles Circulating, veh/h	405	449	202	200
Vehicles Exiting, veh/h	290	158	394	438
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.8	8.2	9.4	11.3
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	191	189	405	495
Cap Entry Lane, veh/h	754	721	923	925
Entry HV Adj Factor	0.980	0.980	0.958	0.961
Flow Entry, veh/h	187	185	388	476
Cap Entry, veh/h	738	707	884	889
V/C Ratio	0.253	0.262	0.439	0.535
Control Delay, s/veh	7.8	8.2	9.4	11.3
LOS	A	A	A	B
95th %tile Queue, veh	1	1	2	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	162	133	147	298	300	221
Future Volume (veh/h)	162	133	147	298	300	221
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	176	145	160	324	326	240
Approach Volume (veh/h)	321			484	566	
Crossing Volume (veh/h)	326			176	160	
High Capacity (veh/h)	1072			1207	1222	
High v/c (veh/h)	0.30			0.40	0.46	
Low Capacity (veh/h)	878			999	1013	
Low v/c (veh/h)	0.37			0.48	0.56	

Intersection Summary			
Maximum v/c High	0.46		
Maximum v/c Low	0.56		
Intersection Capacity Utilization	80.2%	ICU Level of Service	D

Intersection	
Intersection Delay, s/veh	11.2
Intersection LOS	B

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	321	484	566
Demand Flow Rate, veh/h	328	493	578
Vehicles Circulating, veh/h	333	180	163
Vehicles Exiting, veh/h	408	481	510
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	9.6	10.7	12.5
Approach LOS	A	B	B

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	328	493	578
Cap Entry Lane, veh/h	810	944	960
Entry HV Adj Factor	0.979	0.981	0.980
Flow Entry, veh/h	321	484	566
Cap Entry, veh/h	793	926	941
V/C Ratio	0.405	0.522	0.602
Control Delay, s/veh	9.6	10.7	12.5
LOS	A	B	B
95th %tile Queue, veh	2	3	4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	59	54	72	55	6
Future Volume (Veh/h)	10	59	54	72	55	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	64	59	78	60	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	137				184	98
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	137				184	98
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	99
cM capacity (veh/h)	1447				799	958

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	75	137	67
Volume Left	11	0	60
Volume Right	0	78	7
cSH	1447	1700	813
Volume to Capacity	0.01	0.08	0.08
Queue Length 95th (m)	0.2	0.0	2.0
Control Delay (s)	1.2	0.0	9.8
Lane LOS	A		A
Approach Delay (s)	1.2	0.0	9.8
Approach LOS			A

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	21.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	52	104	5	10	121	278	5	25	10	282	15	51
Future Volume (veh/h)	52	104	5	10	121	278	5	25	10	282	15	51
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
Hourly flow rate (vph)	57	113	5	11	132	302	5	27	11	307	16	55
Approach Volume (veh/h)		175			445			43			378	
Crossing Volume (veh/h)		334			89			477			148	
High Capacity (veh/h)		1065			1292			951			1233	
High v/c (veh/h)		0.16			0.34			0.05			0.31	
Low Capacity (veh/h)		872			1077			770			1024	
Low v/c (veh/h)		0.20			0.41			0.06			0.37	

Intersection Summary			
Maximum v/c High	0.34		
Maximum v/c Low	0.41		
Intersection Capacity Utilization	68.4%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	8.2
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	175	445	43	378
Demand Flow Rate, veh/h	183	459	48	387
Vehicles Circulating, veh/h	343	93	490	156
Vehicles Exiting, veh/h	200	444	35	396
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.2	8.7	6.5	8.3
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	183	459	48	387
Cap Entry Lane, veh/h	802	1030	692	967
Entry HV Adj Factor	0.958	0.970	0.902	0.978
Flow Entry, veh/h	175	445	43	378
Cap Entry, veh/h	768	999	624	945
V/C Ratio	0.228	0.446	0.069	0.400
Control Delay, s/veh	7.2	8.7	6.5	8.3
LOS	A	A	A	A
95th %tile Queue, veh	1	2	0	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	7	347	47	84	377	349	30	18	50	288	30	2
Future Volume (veh/h)	7	347	47	84	377	349	30	18	50	288	30	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
Hourly flow rate (vph)	8	377	51	91	410	379	33	20	54	313	33	2
Approach Volume (veh/h)		436			880			107			348	
Crossing Volume (veh/h)		437			61			698			534	
High Capacity (veh/h)		982			1320			796			908	
High v/c (veh/h)		0.44			0.67			0.13			0.38	
Low Capacity (veh/h)		797			1103			633			732	
Low v/c (veh/h)		0.55			0.80			0.17			0.48	

Intersection Summary			
Maximum v/c High	0.67		
Maximum v/c Low	0.80		
Intersection Capacity Utilization	80.3%	ICU Level of Service	D

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	2	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	436	880	107	348
Demand Flow Rate, veh/h	456	910	109	355
Vehicles Circulating, veh/h	446	62	723	557
Vehicles Exiting, veh/h	466	770	179	415
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	16.8	8.5	9.4	15.1
Approach LOS	C	A	A	C

Lane	Left	Left	Right	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT	R	LTR	LTR
RT Channelized					
Lane Util	1.000	0.575	0.425	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	456	523	387	109	355
Cap Entry Lane, veh/h	723	1062	1062	548	647
Entry HV Adj Factor	0.956	0.957	0.979	0.978	0.981
Flow Entry, veh/h	436	501	379	107	348
Cap Entry, veh/h	692	1016	1040	536	635
V/C Ratio	0.630	0.492	0.364	0.199	0.548
Control Delay, s/veh	16.8	9.4	7.3	9.4	15.1
LOS	C	A	A	A	C
95th %tile Queue, veh	4	3	2	1	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	679	807	35	18	3
Future Volume (Veh/h)	5	679	807	35	18	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	738	877	38	20	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	915				1644	896
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	915				1644	896
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				82	99
cM capacity (veh/h)	745				109	339

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	743	915	23
Volume Left	5	0	20
Volume Right	0	38	3
cSH	745	1700	119
Volume to Capacity	0.01	0.54	0.19
Queue Length 95th (m)	0.2	0.0	5.1
Control Delay (s)	0.2	0.0	42.2
Lane LOS	A		E
Approach Delay (s)	0.2	0.0	42.2
Approach LOS			E

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Right Turn Channelized						
Traffic Volume (veh/h)	248	452	402	347	495	420
Future Volume (veh/h)	248	452	402	347	495	420
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	270	491	437	377	538	457
Approach Volume (veh/h)	761			814	995	
Crossing Volume (veh/h)	437			538	270	
High Capacity (veh/h)	982			905	1121	
High v/c (veh/h)	0.78			0.90	0.89	
Low Capacity (veh/h)	797			730	922	
Low v/c (veh/h)	0.95			1.12	1.08	

Intersection Summary			
Maximum v/c High	0.90		
Maximum v/c Low	1.12		
Intersection Capacity Utilization	72.7%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	16.1
Intersection LOS	C

Approach	EB	WB	NB
Entry Lanes	2	2	2
Conflicting Circle Lanes	0	0	0
Adj Approach Flow, veh/h	761	814	995
Demand Flow Rate, veh/h	785	842	1015
Vehicles Circulating, veh/h	446	549	283
Vehicles Exiting, veh/h	945	749	947
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	16.1	18.9	13.7
Approach LOS	C	C	B

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	L	TR	L	TR
Assumed Moves	LT	R	L	TR	L	TR
RT Channelized						
Lane Util	0.362	0.638	0.530	0.470	0.541	0.459
Critical Headway, s	5.193	5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	284	501	446	396	549	466
Cap Entry Lane, veh/h	723	723	653	653	851	851
Entry HV Adj Factor	0.952	0.980	0.980	0.952	0.980	0.981
Flow Entry, veh/h	270	491	437	377	538	457
Cap Entry, veh/h	689	709	639	621	834	835
V/C Ratio	0.393	0.693	0.683	0.607	0.645	0.547
Control Delay, s/veh	10.5	19.2	20.3	17.4	15.0	12.1
LOS	B	C	C	C	C	B
95th %tile Queue, veh	2	6	5	4	5	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	316	186	180	102	230	54	223	458	96	72	557	404
Future Volume (veh/h)	316	186	180	102	230	54	223	458	96	72	557	404
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
Hourly flow rate (vph)	343	202	196	111	250	59	242	498	104	78	605	439
Approach Volume (veh/h)		741			420			844			1122	
Crossing Volume (veh/h)		794			1083			623			603	
High Capacity (veh/h)		737			581			846			859	
High v/c (veh/h)		1.01			0.72			1.00			1.31	
Low Capacity (veh/h)		581			448			677			689	
Low v/c (veh/h)		1.27			0.94			1.25			1.63	

Intersection Summary			
Maximum v/c High	1.31		
Maximum v/c Low	1.63		
Intersection Capacity Utilization	103.8%	ICU Level of Service	G

Intersection	
Intersection Delay, s/veh	40.0
Intersection LOS	E

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	1	1
Adj Approach Flow, veh/h	741	420	844	1122
Demand Flow Rate, veh/h	762	435	876	1163
Vehicles Circulating, veh/h	828	1120	642	622
Vehicles Exiting, veh/h	957	398	948	933
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	37.3	29.3	26.0	56.2
Approach LOS	E	D	D	F

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	LT	R	LT	TR	LT	TR
Assumed Moves	LT	R	LT	R	LT	TR	LT	TR
RT Channelized								
Lane Util	0.738	0.262	0.862	0.138	0.470	0.530	0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	5.193	5.193	5.193	5.193
Entry Flow, veh/h	562	200	375	60	412	464	547	616
Cap Entry Lane, veh/h	607	633	488	516	595	595	607	607
Entry HV Adj Factor	0.970	0.980	0.961	0.983	0.963	0.964	0.964	0.965
Flow Entry, veh/h	545	196	361	59	397	447	527	595
Cap Entry, veh/h	589	620	469	507	573	573	585	585
V/C Ratio	0.926	0.316	0.769	0.116	0.693	0.780	0.902	1.015
Control Delay, s/veh	47.2	10.0	32.7	8.6	22.7	28.9	43.2	67.7
LOS	E	B	D	A	C	D	E	F
95th %tile Queue, veh	12	1	7	0	5	7	11	16

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	340	116	110	438	504	334
Future Volume (veh/h)	340	116	110	438	504	334
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	370	126	120	476	548	363
Approach Volume (veh/h)	496			596	911	
Crossing Volume (veh/h)	548			370	120	
High Capacity (veh/h)	898			1035	1261	
High v/c (veh/h)	0.55			0.58	0.72	
Low Capacity (veh/h)	723			845	1049	
Low v/c (veh/h)	0.69			0.71	0.87	

Intersection Summary			
Maximum v/c High	0.72		
Maximum v/c Low	0.87		
Intersection Capacity Utilization	68.8%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	9.4
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	2	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	496	596	911
Demand Flow Rate, veh/h	506	622	945
Vehicles Circulating, veh/h	575	377	122
Vehicles Exiting, veh/h	492	704	877
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	11.2	8.6	8.9
Approach LOS	B	A	A

Lane	Left	Right	Left	Right	Left	Right
Designated Moves	L	TR	LT	TR	LT	TR
Assumed Moves	L	TR	LT	TR	LT	TR
RT Channelized						
Lane Util	0.745	0.255	0.469	0.531	0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	377	129	292	330	444	501
Cap Entry Lane, veh/h	734	756	852	868	1031	1037
Entry HV Adj Factor	0.981	0.977	0.960	0.958	0.964	0.963
Flow Entry, veh/h	370	126	280	316	428	483
Cap Entry, veh/h	720	738	817	831	994	999
V/C Ratio	0.514	0.171	0.343	0.380	0.431	0.483
Control Delay, s/veh	12.7	6.7	8.4	8.9	8.5	9.3
LOS	B	A	A	A	A	A
95th %tile Queue, veh	3	1	2	2	2	3

Lane Group	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	228	21	149	282	370
v/c Ratio	0.60	0.04	0.25	0.40	0.57
Control Delay	20.0	1.2	5.0	12.0	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	1.2	5.0	12.0	13.8
Queue Length 50th (m)	11.4	0.0	1.0	12.6	15.9
Queue Length 95th (m)	35.9	1.1	10.8	35.1	46.2
Internal Link Dist (m)	223.6		126.7	770.1	323.4
Turn Bay Length (m)		10.0			
Base Capacity (vph)	674	902	962	1229	1097
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.34	0.02	0.15	0.23	0.34

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	28	19	4	18	115	9	247	4	60	188	93
Future Volume (vph)	182	28	19	4	18	115	9	247	4	60	188	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.89			1.00			0.96	
Flt Protected		0.96	1.00		1.00			1.00			0.99	
Satd. Flow (prot)		1805	1601		1668			1825			1770	
Flt Permitted		0.65	1.00		0.99			0.98			0.89	
Satd. Flow (perm)		1231	1601		1651			1793			1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	198	30	21	4	20	125	10	268	4	65	204	101
RTOR Reduction (vph)	0	0	14	0	86	0	0	1	0	0	24	0
Lane Group Flow (vph)	0	228	7	0	63	0	0	281	0	0	346	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		12.9	12.9		12.9			16.5			16.5	
Effective Green, g (s)		12.9	12.9		12.9			16.5			16.5	
Actuated g/C Ratio		0.31	0.31		0.31			0.40			0.40	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		383	498		514			714			630	
v/s Ratio Prot												
v/s Ratio Perm		c0.19	0.00		0.04			0.16			c0.22	
v/c Ratio		0.60	0.01		0.12			0.39			0.55	
Uniform Delay, d1		12.0	9.9		10.2			8.9			9.6	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		2.5	0.0		0.1			0.4			1.0	
Delay (s)		14.5	9.9		10.3			9.2			10.6	
Level of Service		B	A		B			A			B	
Approach Delay (s)		14.1			10.3			9.2			10.6	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	41.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	371	152	140	136	98	118
v/c Ratio	0.38	0.09	0.48	0.11	0.24	0.26
Control Delay	17.7	0.1	43.4	11.6	40.1	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.7	0.1	43.4	11.6	40.1	8.2
Queue Length 50th (m)	48.4	0.0	17.5	15.5	19.0	0.0
Queue Length 95th (m)	73.7	0.0	20.5	24.8	34.1	14.7
Internal Link Dist (m)	190.0			351.8	113.5	
Turn Bay Length (m)		40.0	50.0			
Base Capacity (vph)	988	1601	462	1235	402	451
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.09	0.30	0.11	0.24	0.26

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	341	140	129	125	90	109
Future Volume (vph)	341	140	129	125	90	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1830	1601	3471	1830	1789	1601
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1830	1601	3471	1830	1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	371	152	140	136	98	118
RTOR Reduction (vph)	0	0	0	0	0	91
Lane Group Flow (vph)	371	152	140	136	98	27
Heavy Vehicles (%)	5%	2%	2%	5%	2%	2%
Turn Type	NA	Free	Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	64.8	120.0	10.2	81.0	27.0	27.0
Effective Green, g (s)	64.8	120.0	10.2	81.0	27.0	27.0
Actuated g/C Ratio	0.54	1.00	0.08	0.68	0.22	0.22
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	988	1601	295	1235	402	360
v/s Ratio Prot	c0.20		c0.04	0.07	c0.05	
v/s Ratio Perm		0.09				0.02
v/c Ratio	0.38	0.09	0.47	0.11	0.24	0.07
Uniform Delay, d1	15.9	0.0	52.3	6.8	38.1	36.6
Progression Factor	1.00	1.00	0.73	1.65	1.00	1.00
Incremental Delay, d2	1.1	0.1	1.2	0.2	1.4	0.4
Delay (s)	17.0	0.1	39.5	11.5	39.6	37.0
Level of Service	B	A	D	B	D	D
Approach Delay (s)	12.1			25.7	38.2	
Approach LOS	B			C	D	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	186	187	145	38	100	61	82	335	53	73	268	148
v/c Ratio	0.73	0.52	0.34	0.21	0.28	0.16	0.51	0.16	0.05	0.48	0.13	0.09
Control Delay	48.8	35.7	3.4	39.6	40.6	4.5	69.3	11.4	1.3	62.0	14.2	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.8	35.7	3.4	39.6	40.6	4.5	69.3	11.4	1.3	62.0	14.2	0.1
Queue Length 50th (m)	39.5	29.8	0.0	7.6	20.2	0.0	19.9	17.2	0.0	16.7	15.0	0.0
Queue Length 95th (m)	61.1	45.4	2.1	15.8	31.8	6.2	29.9	30.1	2.6	30.8	28.5	0.0
Internal Link Dist (m)		351.8			274.1			180.0			292.9	
Turn Bay Length (m)	75.0			75.0		60.0	90.0		75.0	90.0		75.0
Base Capacity (vph)	510	716	715	368	716	676	313	2045	975	298	2030	1601
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.26	0.20	0.10	0.14	0.09	0.26	0.16	0.05	0.24	0.13	0.09

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	172	133	35	92	56	75	308	49	67	247	136
Future Volume (vph)	171	172	133	35	92	56	75	308	49	67	247	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1830	1601	1789	1830	1601	1789	3476	1601	1789	3476	1601
Flt Permitted	0.69	1.00	1.00	0.50	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1304	1830	1601	941	1830	1601	1789	3476	1601	1789	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	186	187	145	38	100	61	82	335	53	73	268	148
RTOR Reduction (vph)	0	0	116	0	0	49	0	0	22	0	0	0
Lane Group Flow (vph)	186	187	29	38	100	12	82	335	31	73	268	148
Heavy Vehicles (%)	2%	5%	2%	2%	5%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			Free
Actuated Green, G (s)	23.6	23.6	23.6	23.6	23.6	23.6	9.5	69.4	69.4	9.0	68.9	120.0
Effective Green, g (s)	23.6	23.6	23.6	23.6	23.6	23.6	9.5	69.4	69.4	9.0	68.9	120.0
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.20	0.20	0.08	0.58	0.58	0.08	0.57	1.00
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	256	359	314	185	359	314	141	2010	925	134	1995	1601
v/s Ratio Prot		0.10			0.05		c0.05	c0.10		0.04	0.08	
v/s Ratio Perm	c0.14		0.02	0.04		0.01			0.02			c0.09
v/c Ratio	0.73	0.52	0.09	0.21	0.28	0.04	0.58	0.17	0.03	0.54	0.13	0.09
Uniform Delay, d1	45.2	43.1	39.4	40.4	41.0	39.0	53.3	11.8	10.9	53.5	11.8	0.0
Progression Factor	0.75	0.74	0.24	1.00	1.00	1.00	1.14	0.81	0.78	1.00	1.00	1.00
Incremental Delay, d2	9.5	1.3	0.1	0.6	0.4	0.1	6.0	0.2	0.1	4.5	0.1	0.1
Delay (s)	43.4	33.0	9.8	40.9	41.4	39.1	66.5	9.7	8.5	58.0	11.9	0.1
Level of Service	D	C	A	D	D	D	E	A	A	E	B	A
Approach Delay (s)		30.2			40.6			19.5			15.2	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	120	47	54	350	328	123
v/c Ratio	0.60	0.21	0.40	0.13	0.14	0.11
Control Delay	62.6	15.1	61.0	3.4	4.3	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.6	15.1	61.0	3.4	4.3	0.7
Queue Length 50th (m)	27.3	0.0	12.3	8.3	4.6	0.0
Queue Length 95th (m)	44.6	10.6	24.7	14.7	8.4	0.0
Internal Link Dist (m)	91.8			168.8	180.0	
Turn Bay Length (m)		60.0	75.0			75.0
Base Capacity (vph)	551	526	327	2739	2372	1131
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.09	0.17	0.13	0.14	0.11

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	110	43	50	322	302	113
Future Volume (vph)	110	43	50	322	302	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1789	1601	1789	3476	3476	1601
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1789	1601	1789	3476	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	47	54	350	328	123
RTOR Reduction (vph)	0	42	0	0	0	40
Lane Group Flow (vph)	120	5	54	350	328	83
Heavy Vehicles (%)	2%	2%	2%	5%	5%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	13.4	13.4	7.9	94.6	80.7	80.7
Effective Green, g (s)	13.4	13.4	7.9	94.6	80.7	80.7
Actuated g/C Ratio	0.11	0.11	0.07	0.79	0.67	0.67
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	199	178	117	2740	2337	1076
v/s Ratio Prot	c0.07		c0.03	0.10	c0.09	
v/s Ratio Perm		0.00				0.05
v/c Ratio	0.60	0.03	0.46	0.13	0.14	0.08
Uniform Delay, d1	50.8	47.5	54.0	3.0	7.1	6.8
Progression Factor	1.00	1.00	1.00	1.00	0.52	0.28
Incremental Delay, d2	5.1	0.1	2.9	0.1	0.1	0.1
Delay (s)	55.8	47.6	56.9	3.1	3.8	2.0
Level of Service	E	D	E	A	A	A
Approach Delay (s)	53.5			10.3	3.3	
Approach LOS	D			B	A	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	265	546	402	370	599	420
v/c Ratio	0.64	0.34	1.02	0.47	0.90	0.49
Control Delay	27.7	0.6	64.7	11.2	40.6	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.7	0.6	64.7	11.2	40.6	4.3
Queue Length 50th (m)	26.3	0.0	~47.7	39.9	60.5	0.0
Queue Length 95th (m)	42.1	0.0	#74.1	21.6	#130.6	16.7
Internal Link Dist (m)	190.0			351.8	113.5	
Turn Bay Length (m)		40.0				
Base Capacity (vph)	549	1601	395	915	667	860
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.34	1.02	0.40	0.90	0.49

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	244	502	370	340	551	386
Future Volume (vph)	244	502	370	340	551	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1830	1601	1789	1830	1789	1601
Flt Permitted	1.00	1.00	0.35	1.00	0.95	1.00
Satd. Flow (perm)	1830	1601	664	1830	1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	265	546	402	370	599	420
RTOR Reduction (vph)	0	0	0	0	0	263
Lane Group Flow (vph)	265	546	402	370	599	157
Heavy Vehicles (%)	5%	2%	2%	5%	2%	2%
Turn Type	NA	Free	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free	8			2
Actuated Green, G (s)	13.6	60.0	25.6	25.6	22.4	22.4
Effective Green, g (s)	13.6	60.0	25.6	25.6	22.4	22.4
Actuated g/C Ratio	0.23	1.00	0.43	0.43	0.37	0.37
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	414	1601	395	780	667	597
v/s Ratio Prot	0.14		c0.10	0.20	c0.33	
v/s Ratio Perm		0.34	c0.33			0.10
v/c Ratio	0.64	0.34	1.02	0.47	0.90	0.26
Uniform Delay, d1	21.0	0.0	16.6	12.4	17.7	13.1
Progression Factor	1.00	1.00	0.98	0.78	1.00	1.00
Incremental Delay, d2	7.4	0.6	48.5	1.9	14.8	0.2
Delay (s)	28.4	0.6	64.7	11.6	32.5	13.3
Level of Service	C	A	E	B	C	B
Approach Delay (s)	9.7			39.2	24.6	
Approach LOS	A			D	C	

Intersection Summary			
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	322	192	185	104	240	59	232	477	98	78	585	417
v/c Ratio	0.92	0.30	0.27	0.27	0.37	0.09	0.79	0.32	0.13	0.54	0.51	0.26
Control Delay	65.5	27.1	7.0	27.3	29.0	0.3	67.2	18.0	2.8	66.2	37.0	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.5	27.1	7.0	27.3	29.0	0.3	67.2	18.0	2.8	66.2	37.0	0.4
Queue Length 50th (m)	75.2	28.5	6.9	16.8	40.4	0.0	46.4	40.4	4.1	17.8	60.4	0.0
Queue Length 95th (m)	#113.3	42.6	10.5	27.8	55.9	0.0	73.4	52.4	6.7	33.5	87.2	0.0
Internal Link Dist (m)		351.8			274.1			180.0			292.9	
Turn Bay Length (m)	75.0			75.0		60.0	90.0		75.0	90.0		75.0
Base Capacity (vph)	420	777	786	470	777	758	344	1509	750	166	1149	1601
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.25	0.24	0.22	0.31	0.08	0.67	0.32	0.13	0.47	0.51	0.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	296	177	170	96	221	54	213	439	90	72	538	384
Future Volume (vph)	296	177	170	96	221	54	213	439	90	72	538	384
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1830	1601	1789	1830	1601	1789	3476	1601	1789	3476	1601
Flt Permitted	0.53	1.00	1.00	0.59	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	989	1830	1601	1108	1830	1601	1789	3476	1601	1789	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	322	192	185	104	240	59	232	477	98	78	585	417
RTOR Reduction (vph)	0	0	119	0	0	38	0	0	56	0	0	0
Lane Group Flow (vph)	322	192	66	104	240	21	232	477	42	78	585	417
Heavy Vehicles (%)	2%	5%	2%	2%	5%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			Free
Actuated Green, G (s)	42.6	42.6	42.6	42.6	42.6	42.6	19.7	50.9	50.9	8.5	39.7	120.0
Effective Green, g (s)	42.6	42.6	42.6	42.6	42.6	42.6	19.7	50.9	50.9	8.5	39.7	120.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.36	0.16	0.42	0.42	0.07	0.33	1.00
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	351	649	568	393	649	568	293	1474	679	126	1149	1601
v/s Ratio Prot		0.10			0.13		c0.13	0.14		0.04	c0.17	
v/s Ratio Perm	c0.33		0.04	0.09		0.01			0.03			0.26
v/c Ratio	0.92	0.30	0.12	0.26	0.37	0.04	0.79	0.32	0.06	0.62	0.51	0.26
Uniform Delay, d1	37.0	27.9	26.0	27.5	28.7	25.3	48.2	23.1	20.4	54.2	32.3	0.0
Progression Factor	1.01	0.99	1.99	1.00	1.00	1.00	1.02	0.69	0.45	1.00	1.00	1.00
Incremental Delay, d2	25.7	0.2	0.1	0.4	0.4	0.0	13.1	0.6	0.2	8.7	1.6	0.4
Delay (s)	63.0	27.7	51.9	27.9	29.1	25.3	62.3	16.4	9.3	62.9	33.9	0.4
Level of Service	E	C	D	C	C	C	E	B	A	E	C	A
Approach Delay (s)		50.4			28.2			28.7			23.1	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	340	116	111	465	539	335
v/c Ratio	0.80	0.25	0.58	0.20	0.31	0.34
Control Delay	56.9	7.0	62.9	8.9	6.2	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	7.0	62.9	8.9	6.2	2.3
Queue Length 50th (m)	75.7	0.0	25.3	20.6	6.8	0.0
Queue Length 95th (m)	99.1	13.0	42.0	34.2	38.0	15.4
Internal Link Dist (m)	129.4			191.2	180.0	
Turn Bay Length (m)		60.0	75.0			75.0
Base Capacity (vph)	655	660	283	2302	1759	975
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.18	0.39	0.20	0.31	0.34

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	313	107	102	428	496	308
Future Volume (vph)	313	107	102	428	496	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1789	1601	1789	3476	3476	1601
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1789	1601	1789	3476	3476	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	340	116	111	465	539	335
RTOR Reduction (vph)	0	88	0	0	0	165
Lane Group Flow (vph)	340	28	111	465	539	170
Heavy Vehicles (%)	2%	2%	2%	5%	5%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	28.5	28.5	12.7	79.5	60.8	60.8
Effective Green, g (s)	28.5	28.5	12.7	79.5	60.8	60.8
Actuated g/C Ratio	0.24	0.24	0.11	0.66	0.51	0.51
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	424	380	189	2302	1761	811
v/s Ratio Prot	c0.19		c0.06	0.13	c0.16	
v/s Ratio Perm		0.02				0.11
v/c Ratio	0.80	0.07	0.59	0.20	0.31	0.21
Uniform Delay, d1	43.1	35.5	51.2	7.9	17.3	16.3
Progression Factor	1.00	1.00	1.00	1.00	0.30	0.57
Incremental Delay, d2	10.5	0.1	4.6	0.2	0.4	0.5
Delay (s)	53.5	35.6	55.8	8.1	5.7	9.8
Level of Service	D	D	E	A	A	A
Approach Delay (s)	49.0			17.3	7.2	
Approach LOS	D			B	A	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	51.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Intersection Delay, s/veh	18.7
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	159	500	691	322
Demand Flow Rate, veh/h	162	510	705	329
Vehicles Circulating, veh/h	604	393	287	365
Vehicles Exiting, veh/h	90	599	479	538
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.4	17.3	25.9	10.1
Approach LOS	A	C	D	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	162	510	705	329
Cap Entry Lane, veh/h	618	763	848	784
Entry HV Adj Factor	0.979	0.980	0.980	0.978
Flow Entry, veh/h	159	500	691	322
Cap Entry, veh/h	604	748	831	767
V/C Ratio	0.262	0.669	0.831	0.419
Control Delay, s/veh	9.4	17.3	25.9	10.1
LOS	A	C	D	B
95th %tile Queue, veh	1	5	10	2

Intersection	
Intersection Delay, s/veh	17.7
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	92	462	560	624
Demand Flow Rate, veh/h	94	471	571	637
Vehicles Circulating, veh/h	778	433	237	326
Vehicles Exiting, veh/h	185	375	635	578
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.5	16.8	14.4	22.5
Approach LOS	A	C	B	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	94	471	571	637
Cap Entry Lane, veh/h	519	733	892	816
Entry HV Adj Factor	0.981	0.981	0.980	0.980
Flow Entry, veh/h	92	462	560	624
Cap Entry, veh/h	509	719	874	799
V/C Ratio	0.181	0.643	0.640	0.781
Control Delay, s/veh	9.5	16.8	14.4	22.5
LOS	A	C	B	C
95th %tile Queue, veh	1	5	5	8